Short-Term Assessment of Reliability: 2022 Quarter 3

A Report by the
New York Independent System Operator

October 13, 2022

Contents

Executive Summary

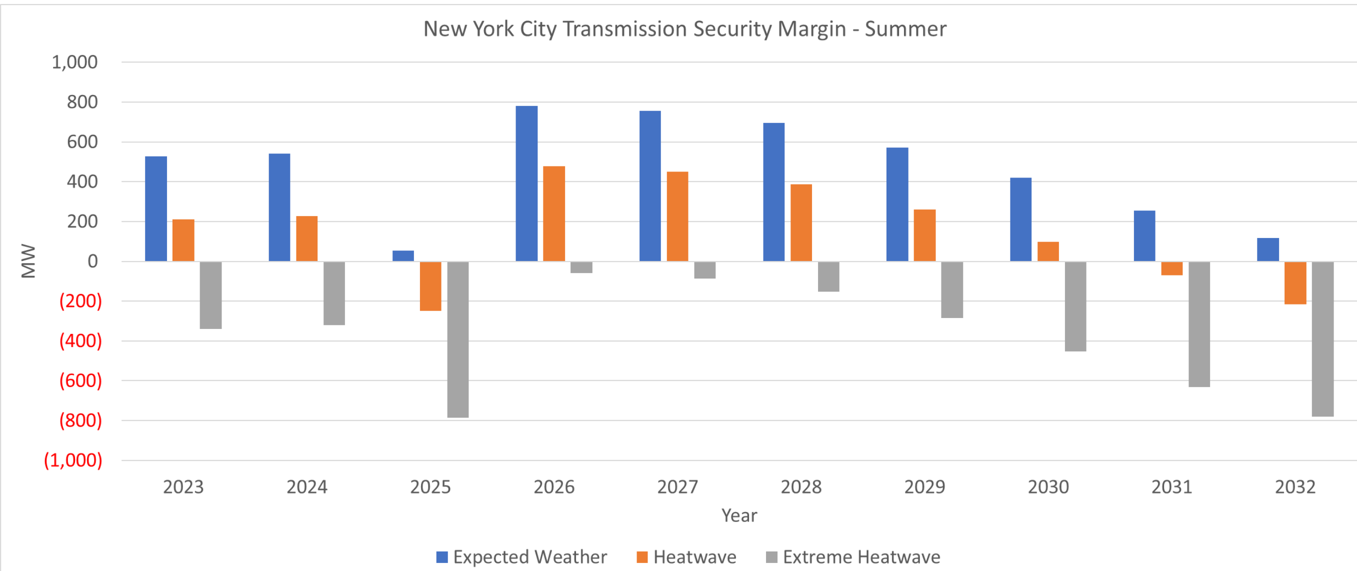
This report sets forth the 2022 Quarter 3 Short-Term Assessment of Reliability ("STAR") findings for the five-year study period of July 15, 2022 through July 15, 2027. Included in this STAR is the proposed retirement of the Helix Ravenswood, LLC's Ravenswood 10 (Zone J, 25 MW (nameplate)) generator on May 1, 2023.

This assessment finds the planned Bulk Power Transmission Facilities ("BPTF") through the study period are within applicable reliability criteria based on expected weather and with the assumed planned projects meeting their proposed in-service dates. The NYISO assessed the resource adequacy of the overall system. Additionally, the NYISO performed a transmission security assessment of the BPTF. No Short-Term Reliability Needs were identified for the BPTF system. No generator deactivation reliability needs were observed in the local assessments performed by Consolidated Edison Company of New York, Inc. ("Con Edison").

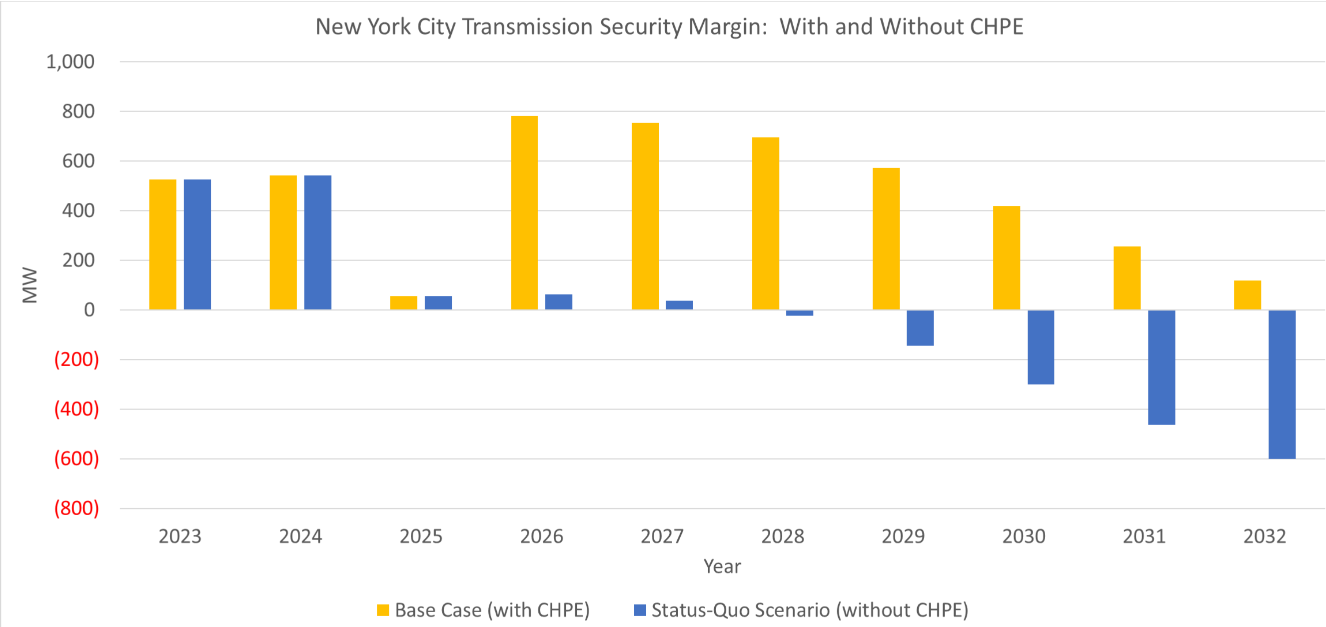
Central Hudson identified transmission security issues in its transmission district on its non-BPTF system. These are primarily driven by the assumed unavailability of certain generation in its district affected by the DEC's Peaker Rule. Given that those generators have not yet provided complete Generator Deactivation Notices to the NYISO, the local non-BPTF criteria violations identified by Central Hudson are not being assessed to identify possible Generator Deactivation Reliability Needs at this time.

For the bulk transmission security margin assessment, "tipping points" are evaluated for the statewide system margin, as well as Lower Hudson Valley, New York City, and Long Island localities. Transmission security margins included in this assessment are employed to identify plausible changes in conditions or assumptions that might adversely impact the reliability of the system. For this evaluation, a BPTF reliability need is identified when the margin is less than zero under baseline expected weather, normal transfer criteria. The transmission security margins account for expected generator availability, transmission limitations, and demand forecasts using baseline expected weather forecasts consistent with the 2022 Load & Capacity Data report ("Gold Book"). This assessment is performed using a deterministic approach and a spreadsheet-based method.

The baseline transmission security margins for the Lower Hudson Valley, New York City, and Long Island localities, as well as the statewide system margin, are observed to be sufficient for all study years. The reliability of the New York City area faces the greatest risk due to limited generation and transmission to serve forecasted demand. Under expected summer weather, the grid is sufficient throughout the five-year STAR study horizon, but with margins extremely narrow in 2025. The narrow transmission security margins are primarily due to the planned unavailability of simple cycle combustion turbines to comply with the New York Department of Environmental Conservation's (DEC's) Peaker Rule in 2025. The summer margin improves in 2026 with the scheduled addition of the Champlain Hudson Power Express (CHPE) connection from Hydro Quebec to New York City but reduces through time as demand grows within New York City. However, potential heatwaves of various degrees pose risks throughout the next ten years, especially in 2025. In addition, while CHPE will contribute to reliability in the summer, the facility is not expected to provide any capacity in the winter.



The reliability margins within New York City may not be sufficient even for expected weather if (i) the CHPE project experiences a significant delay, (ii) forecasted demand in New York City increases by as little as 60 MW in 2025, or (iii) there are additional generator deactivations beyond what is already planned. Some generation affected by the DEC's Peaker Rule may need to remain in-service until CHPE or other permanent solutions are completed to maintain a reliable grid. Without the CHPE project in-service by 2026 and other offsetting changes or solutions, the reliability margins continue to be less than 100 MW until 2028, at which time the New York City grid as otherwise planned could not provide reliable service for the forecasted system conditions. This deficiency would grow to approximately 600 MW by 2032.



The wholesale electricity markets administered by the NYISO are an important tool to help mitigate these risks. The markets are designed, and continue to evolve and adapt, to send appropriate price signals for new market entry and retention of resources that assist in maintaining reliability. The potential risks and resource needs identified in the NYISO's analyses may be resolved by new capacity resources coming into service, construction of additional transmission facilities, and/or increased energy efficiency and integration of demand-side resources. The NYISO is tracking the progression of many projects that may contribute to grid reliability, including numerous offshore wind facilities that have not yet met the inclusion rules for reliability assessments. The NYISO will continue to monitor these market-based resources and other developments to determine whether changing system resources and conditions could impact the reliability of the New York bulk electric grid.

As generators that are subject to the DEC's Peaker Rule submit their Generator Deactivation Notices, the NYISO and the responsible Transmission Owners will continue to evaluate in future STARs whether Generator Deactivation Reliability Needs arise from the deactivation of Initiating Generators.[1]

[1] Per OATT 38.1, an "Initiating Generator" is "a Generator with a nameplate rating that exceeds 1 MW that submits a Generator Deactivation Notice for purposes of becoming Retired or entering into a Mothball Outage or that has entered into an ICAP Ineligible Forced Outage pursuant to Section 5.18.2.1 of the ISO Services Tariff, which action is being evaluated by the ISO in accordance with its Short-Term Reliability Process requirements in this Section 38 of the ISO OATT."

Purpose

In 2019, the NYISO established a quarterly Short-Term Reliability Process ("STRP") with its requirements prescribed in Attachments Y and FF of the NYISO's Open Access Transmission Tariff ("OATT"). The STRP evaluates the first five years of the planning horizon, with a focus on needs arising in the first three years of the study period. With this process in place, the biennial Reliability Planning Process focuses on identifying and resolving longer-term needs through the Reliability Needs Assessment ("RNA") and the Comprehensive Reliability Plan ("CRP").

The first step in the STRP is the Short-Term Assessment of Reliability ("STAR"). STARs are performed quarterly to proactively address reliability needs that may arise within five years ("Short-Term Reliability Needs")[2] due to various changes to the grid such as generator deactivations, revised transmission plans, and updated load forecasts. Transmission Owners also assess the impact of generator deactivations on their local systems. A Short-Term Reliability Need that is observed within the first three years of the study period constitutes a "Near-Term Reliability Need."[3] Should a Near-Term Reliability Need be identified in a STAR, the NYISO solicits and selects the solution to address the need. If a need arises beyond the first three years of the study period, the NYISO may choose to address the need within the STRP or, if time permits, through the long-term Reliability Planning Process.

This STAR report sets forth the 2022 Quarter 3 findings for the study period from the STAR Start Date (July 15, 2022) through July 15, 2027. The NYISO assessed the potential reliability impacts to the Bulk Power Transmission Facilities ("BPTF") considering system changes, including the availability of resources and the status of transmission plans in accordance with the NYISO Reliability Planning Process Manual.[4] As part of this STAR, the NYISO performed analysis in coordination with Con Edison to determine whether any observed violation or potential violation of one or more reliability criteria and applicable local criteria could be addressed by the continued availability or operation of a deactivating generator (*i.e.*, a Generator Deactivation Reliability Need[5]). For this STAR, the deactivating generators included in this assessment are listed in Figure 1. The NYISO along with Con Edison timely completed this analysis within the 90-day period that commenced on July 15, 2022.

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[2] OATT Section 38.1 contains the tariff definition of a "Short-Term Reliability Process Need."

[3] OATT Section 38.1 contains the tariff definition of a "Near-Term Reliability Need." *See also*, OATT Section 38.3.6.

[4] NYISO Reliability Planning Process Manual, April 2, 2021. *See:* https://www.nyiso.com/documents/20142/2924447/rpp_mnl.pdf

[5] Per OATT 38.1, a "Generator Deactivation Reliability Need" is "a condition identified by the ISO in a STAR or a Generator Deactivation Assessment as a violation or potential violation of one or more Reliability Criteria and applicable local criteria. Violations and potential violations identified in a STAR are only Generator Deactivation Reliability Needs if the need can be resolved, in whole or in part, by the continued availability or operation of an Initiating Generator. A Generator Deactivation Reliability Need is a type of Short-Term Reliability Process Need."

Assumptions

The NYISO evaluated the study period using the most recent Reliability Planning Process base case and data available as of July 14, 2022 before the July 15, 2022 Q2 STAR start date. In accordance with the base case inclusion rules,[6] generation and transmission projects are added to the base case if they have met significant milestones such that there is a reasonable expectation of timely completion of the project. A summary of key projects is provided in Appendix C. The NYISO is tracking the progression of many projects that may contribute to grid reliability, including numerous offshore wind facilities that have not yet met the inclusion rules for reliability assessments. These additional tracked projects are listed in the *2022 Gold Book* and in **Appendix D** of the 2022 RNA.

This assessment used the major assumptions included in the 2022 RNA. Consistent with the NYISO's obligations under its tariffs, the NYISO provided information to stakeholders on the modeling assumptions employed in this assessment. Details regarding the study assumptions were reviewed with stakeholders at the July 26, 2022 Electric System Planning Working Group ("ESPWG")/Transmission Planning Advisory Subcommittee ("TPAS"). The meeting materials are posted on the NYISO's public website.[7]

Generation Assumptions

Generator Deactivation Notices

For this STAR, the deactivating generators included in this assessment are listed in Figure 1. A list of all generator deactivations, including those evaluated in prior STARs, is provided in Appendix C. The posting of generator deactivation notices for retirement, mothball outage, or ICAP ineligible forced outage are available on the NYISO website under the Short-Term Reliability Process.[8] Additionally, the Sithe Batavia generator (Zone B, 67.3 MW (nameplate)) withdrew its retirement notice on April 25, 2022 and Allegheny Cogen (Zone B, 67 MW (nameplate)) withdrew its retirement notice on July 2, 2022.

[6] *See* NYISO Reliability Planning Process Manual Section 3.

[7] Short-Term Assessment of Reliability: 2022 Q3 Key Study Assumptions

[8] See https://www.nyiso.com/short-term-reliability-process then Generator Deactivation Notices/Planned Retirement Notices or Generator Deactivation Notices/IIFO Notifications

Figure 1: 2022 Quarter 3 STAR Generator Deactivations

Generating Unit	Submitting Entity	PTID	Responsible Transmission Owner	Zone	Nameplate MW	Unit Type	Date of Completed Deactivation Notice	Retire/Mothball Outage/ICAP Ineligible Forced Outage (IIFO)	Proposed Deactivation/IIFO Date
Ravenswood 10	Helix Ravenswood, LLC	24258	Con Edison	J	25	Jet Engine	6/21/2022	Retire	5/1/2023

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

In 2019, the New York State Department of Environmental Conservation ("DEC") adopted a regulation to limit nitrogen oxides (NOx) emissions from simple-cycle combustion turbines (referred to as the "Peaker Rule")[9]. Combustion turbines known as "peakers" typically operate to maintain bulk power system reliability during the most stressful operating conditions, such as periods of peak electricity demand. The Peaker Rule will impact turbines located mainly in the lower Hudson Valley, New York City and Long Island. Many of these units also maintain transmission security by supplying energy within certain areas of the grid referred to as "load pockets." Load pockets represent transmission-constrained geographic areas where a portion of electrical demand can only be served by local generators due to transmission limitations that occur during certain operating conditions.

The Peaker Rule provides a phased reduction in emission limits, in 2023 and 2025, during the ozone season (May 1-September 30) and allows several options for achieving compliance with the new lower limits applicable during the ozone season. The rule required peaking unit owners to submit compliance plans to the DEC in March 2020. Compliance plans submitted to the DEC were provided to the NYISO for assessment and inclusion in the Reliability Planning Process base case. Considering all peaker unit compliance plans, approximately 1,600 MW of peaker generation capability would be unavailable during the summer by 2025 to comply with the emissions requirements. A subset of those generators would be unavailable starting in 2023. Remaining peaker units have stated either that they comply with the emission limits as currently operated, or proposed equipment upgrades to achieve the emissions limits.

A list of peaker generation removals is provided in Figure 2. Peaker generators that have already completed a Generator Deactivation Notice or entered an IIFO are indicated in the table. Additionally, the table notes the STAR study or other assessments where these generators have been evaluated once the generator completed their generator deactivation notice or entered into an IIFO.

The DEC regulations include a provision to allow an affected generator to continue to operate up to two years, with a possible further two-year extension, after the compliance deadline if the generator is designated by the NYISO or by the local transmission owner as needed to resolve a reliability need until a permanent solution is in place.

9 DEC Peaker Rule

Figure 2: Status Changes Due to DEC Peaker Rule

Owner/Operator	Station	Zone	Nameplate (MW)	CRIS (MW) (1)		Capability (MW) (1)		Status Change Date (2)	STAR Evaluation or Other Assessment
				Summer	Winter	Summer	Winter		
National Grid	West Babylon 4	K	52.4	49.0	64.0	41.2	63.4	12/12/2020 (R)	Other (6), (8)
Astoria Generating Company, L.P.	Gowanus 1-8 (7)	J	20.0	16.1	21.0	16.0	21.0	2/1/2021 (IIFO)	2021 Q1
National Grid	Glenwood GT 01 (4)	K	16.0	14.6	19.1	13.0	15.3	2/28/2021 (R)	2020 Q3 (8)
Helix Ravenswood, LLC	Ravenswood 11	J	25.0	20.2	25.7	16.1	22.4	12/1/2021 (IIFO)	2022 Q1
Helix Ravenswood, LLC	Ravenswood 01	J	18.6	8.8	11.5	7.7	11.1	1/1/2022 (IIFO)	2022 Q1
Astoria Generating Company, L.P.	Gowanus 1-1 through 1-7	J	140.0	122.6	160.1	117.1	161.2	11/1/2022	2022 Q2
Astoria Generating Company, L.P.	Gowanus 4-1 through 4-8	J	160.0	140.1	182.9	138.8	183.4	11/1/2022	2022 Q2
Consolidated Edison Co. of NY, Inc.	Hudson Ave 3	J	16.3	16.0	20.9	12.3	15.6	11/1/2022	2022 Q2
Consolidated Edison Co. of NY, Inc.	Hudson Ave 5	J	16.3	15.1	19.7	15.3	18.6	11/1/2022	2022 Q2
Central Hudson Gas & Elec. Corp.	Coxsackie GT	G	21.6	21.6	26.0	19.2	24.0	5/1/2023	
Central Hudson Gas & Elec. Corp.	South Cairo	G	21.6	19.8	25.9	18.9	23.0	5/1/2023	
Consolidated Edison Co. of NY, Inc.	74 St. GT 1 & 2	J	37.0	39.1	49.2	39.3	45.2	5/1/2023	2022 Q2
Astoria Generating Company, L.P.	Astoria GT 01	J	16.0	15.7	20.5	13.6	19.0	5/1/2023	
NRG Power Marketing, LLC	Astoria GT 2-1, 2-2, 2-3, 2-4	J	186.0	165.8	204.1	141.6	183.7	5/1/2023	2022 Q2
NRG Power Marketing, LLC	Astoria GT 3-1, 3-2, 3-3, 3-4	J	186.0	170.7	210.0	140.5	182.8	5/1/2023	2022 Q2
NRG Power Marketing, LLC	Astoria GT 4-1, 4-2, 4-3, 4-4	J	186.0	167.9	206.7	138.3	180.3	5/1/2023	2022 Q2
Helix Ravenswood, LLC	Ravenswood 10	J	25.0	21.2	27.0	16.0	22.3	5/1/2023	2022 Q3
National Grid	Glenwood GT 03 (3) (4)	K	55.0	54.7	71.5	44.7	66.5	5/1/2023	
National Grid	Northport GT	K	16.0	13.8	18.0	12.0	15.7	5/1/2023	
National Grid	Port Jefferson GT 01	K	16.0	14.1	18.4	12.6	17.3	5/1/2023	
National Grid	Shoreham 1 (3) (4)	K	52.9	48.9	63.9	44.7	64.6	5/1/2023	
National Grid	Shoreham 2 (3) (4)	K	18.6	18.5	23.5	15.7	20.0	5/1/2023	
Consolidated Edison Co. of NY, Inc.	59 St. GT 1	J	17.1	15.4	20.1	13.1	18.8	5/1/2025	
NRG Power Marketing, LLC	Arthur Kill GT 1	J	20.0	16.5	21.6	12.1	15.1	5/1/2025	
Astoria Generating Company, L.P.	Gowanus 2-1 through 2-8 (5)	J	160.0	152.8	199.6	145.5	186.9	5/1/2025	
Astoria Generating Company, L.P.	Gowanus 3-1 through 3-8 (5)	J	160.0	146.8	191.7	137.4	183.5	5/1/2025	
Astoria Generating Company, L.P.	Narrows 1-1 through 2-8 (5)	J	352.0	309.1	403.6	291.5	382.0	5/1/2025	
	Prior to Summer 2022		132.0	108.7	141.3	94.0	133.2		
	Prior to Summer 2023		1,170.3	1,065.6	1,348.3	940.6	1,243.2		
	Prior to Summer 2025		709.1	640.6	836.6	599.6	786.3		
	Total		2,011.4	1,814.9	2,326.2	1,634.2	2,162.7		

Notes

1. MW values are from the 2022 Load and Capacity Data Report
2. Dates identified by generators in their DEC Peaker Rule compliance plan submittals for transitioning the facility to Retired, Blackstart, or will be out-of-service in the summer ozone season or the date in which the generator entered (or proposed to enter) Retired (R) or Mothball Outage (MO) or the date on which the generator entered ICAP Ineligible Forced Outage (IIFO)
3. Generator changed DEC peaker rule compliance plan as compared to the 2020 RNA and all STARs prior to 2021 Q3
4. Long Island Power Authority (LIPA) has submitted notifications to the DEC per part 227-3 of the peaker rule stating that these units are needed for reliability allowing these units to operate until at least May 1, 2025. Due to the future nature of these units being operated only as designated by the operator as an emergency operating procedure the NYISO will continue to plan for these units be unavailable starting May 2023
5. These units have indicated they will be out-of-service during the ozone season (May through September) in their comliance plans in response to the DEC peaker rule.
6. This unit was evaluated in a stand-alone generator deactivation assessment prior to the creation of the Short-Term Reliabilty Process
7. The retirement of this unit is also evaluated in the 2022 Q2 STAR
8. Unit operating as a load modifier

Study assumptions for this STAR are derived from the 2022 RNA, except for the changes to generation assumptions specified below.

Generator Return-to-Service

There are no generators that have returned to service beyond those included in prior STARs. A list of generators that have returned to service included in prior STARs is provided in Appendix C.

Generator Additions

There are no generation additions beyond those included in the 2022 RNA. However, Calverton Solar (Q#0678) (Zone K, 22.9 MW (nameplate)) went into service in June 2022. A list of generator additions, including updates to planned commercial operation dates as included in the 2022 RNA, is provided in Appendix C.

Load Assumptions

The NYISO used the baseline load forecasts for this assessment consistent with the 2022 Gold Book with the following load projects in the NYISO interconnection queue: Q#0580 – WNY STAMP, Q#0776 – Greenidge Load, Q#0849 – Somerset Load, Q#0850 – Cayuga Load, and Q#0979 – North Country Data Center (load increase). The load assumptions used in this STAR are the same as those used for the 2022 RNA.

Transmission Assumptions

Existing Transmission

The transmission assumptions utilized in this assessment are the same as those used for the 2022 RNA. However, there are several outages which occur prior to the RNA study period. Figure 3 shows the changes in existing transmission outage assumptions compared to the prior STAR.

Figure 3: Changes to Existing Transmission Facilities Modeled Out-of-Service

From	To	kV	ID	Out-of-Service Through	
				Prior STAR	Current STAR
Moses	Moses	230/115	AT2	12/2022	3/2023

A complete list of existing transmission facilities that are modeled as out-of-service for this assessment is also provided in Appendix C.

Proposed Transmission

There are no other changes to proposed transmission assumptions beyond those included in the 2022 RNA. Details of the proposed transmission assumptions included in the RNA are provided in Appendix C.

Findings

Grid reliability is determined by assessing transmission security and resource adequacy. Transmission security is the ability of the electric system to withstand disturbances such as electric short circuits or unanticipated loss of system elements without involuntarily disconnecting firm load. Resource adequacy is the ability of electric systems to supply the aggregate electrical demand and energy requirements of customers, taking into account scheduled and reasonably expected unscheduled outages of system elements.

For the 2022 RNA and starting with this 2022 Quarter 3 STAR, enhancements to the application of reliability rules were employed for both transmission security and resource adequacy:

- For transmission security, to represent that not all generation will be available at any given time, a derating factor is applied to thermal units. Additionally, intermittent, weather dependent generation is dispatched according to its expected availability coincident with the represented system condition. The enhancements also include the ability to identify BPTF reliability needs in instances where the transmission security margin for a constrained area of the system is less than zero MW.[10]
- 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.

This assessment finds that reliability criteria would be met for the BPTF throughout the five-year study period under the assumed and forecasted base case system conditions.

Resource Adequacy Assessments

The NYISO assessed the resource adequacy of the New York Control Area ("NYCA") system, against the one-day-in-ten-years (*i.e.,* 0.1 days per year) loss of load expectation ("LOLE") NYSRC and NPCC criterion, which measures the probability of disconnecting firm load due to resource deficiencies. This assessment finds that the planned system through the study period meets the resource adequacy criterion. Details about the resource adequacy study assumptions are provided in Appendix D.

Transmission Security Assessments

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

[11]Attachment I of Transmission, Expansion, and Interconnection Manual.

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"[11] describes the methodology for that analysis.

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. Intermittent generation is represented based on expected output during the modeled system conditions.[12]

Transmission security margins are included in this assessment to identify plausible changes in conditions or assumptions that might adversely impact the reliability of the system. The transmission security margin is the ability to meet load plus losses and system reserve (*i.e.*, total capacity requirement) using NYCA generation, interchange, and including temperature-based generation derates (total resources). This assessment is performed using a deterministic approach through a spreadsheet-based method. For this evaluation, a BPTF reliability need is identified when the margin is less than zero under baseline expected weather, normal transfer criteria. For the purposes of identifying reliability needs on the BPTF using transmission security margin calculations, thermal generation MW capability is considered available based on NERC five-year class averages for the relevant type of unit.[13] Derates for thermal generation are included due to the aging fleet without expected replacement, while the share of intermittent, weather dependent, generation is growing. Figure 4 shows the NERC five-year class-average outate rate for combined cycle, gas turbine, fossil steam turbine, and jet engine generators. Figure 5 shows the impact of the thermal derates on the total resources available statewide, as well as the Lower Hudson Valley, New York City, and Long Island localities. Reductions in thermal derates over time are driven by the assumed generator deactivations in this assessment.

[11]Attachment I of Transmission, Expansion, and Interconnection Manual.

[12]The RNA assumptions matrix is posted under the July 1, 2022 TPAS/ESPWG meeting materials, which is available at here, and also in Appendix D.

[13] The NERC five-year class average EFORd data is available here.

Figure 4: NERC Five-Year Class Average Outage Rate

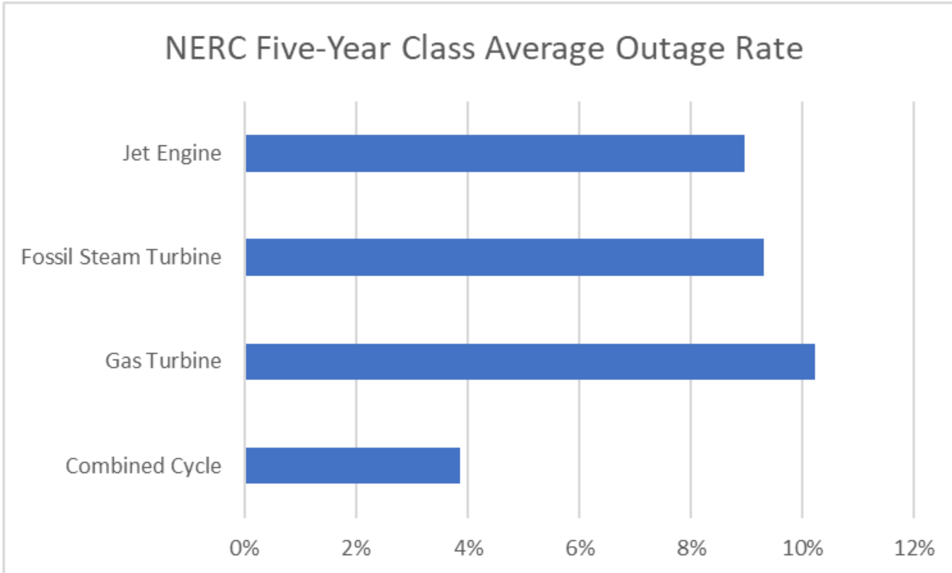
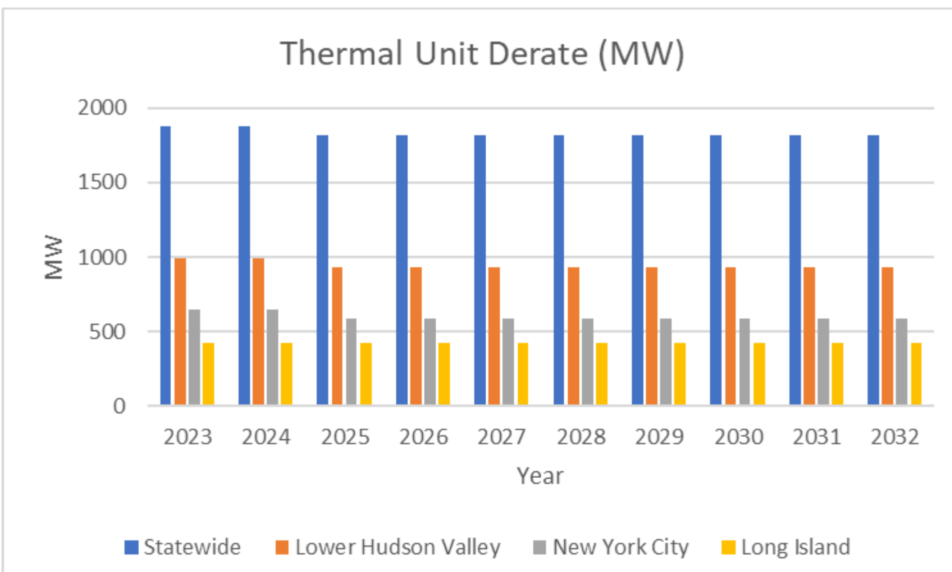


Figure 5: Thermal Unit Derate (MW) for New York



For the transmission security margin assessment, margins are evaluated for the statewide system margin, as well as Lower Hudson Valley, New York City, and Long Island localities. In this evaluation, a BPTF reliability need is identified when the margin is less than zero under baseline expected weather, normal transfer criteria conditions. Additional details regarding the impact of heatwaves, cold snaps, and other system conditions are provided in **Appendix E** for informational purposes.

The NYISO performed a transmission security assessment of the BPTF and identified no Short-Term

Reliability Needs. This assessment finds that the planned BPTF system through the study period is within transmission security criteria. Con Edison evaluated the impact of the Ravenswood 10 generator deactivation on its non-BPTF. No non-BPTF generator deactivation reliability needs were observed by Con Edison. The NYISO reviewed and verified the analyses performed by Con Edison.

Steady State Assessment

In the NYISO's evaluation of the BPTF, thermal overloads are observed on the National Grid Clay-Woodard (#17) 115 kV transmission line (specifically the Clay-Euclid segment of the line). This observation is summarized in Figure 6. This issue was first observed in the 2021 Quarter 3 STAR.[14] At the October 1, 2021 ESPWG/TPAS meeting, National Grid presented an LTP update to install a 3% series reactor at the Woodard 115 kV substation on the Clay-Woodard 115 kV line.[15] This series reactor is planned to be in-service by December 31, 2023. As such, the observed thermal overload in summer 2023 is still observed. As discussed in the 2021 Quarter 3 STAR, National Grid will utilize an interim operating procedure to address this overload until the permanent series reactor solution is placed in-service. After incorporating the described operating procedure and solution, there are no thermal criteria violations.

Figure 6: Summary of BPTF N-1-1 Thermal Overloads

Zone	Owner	Element	Normal Rating (MVA)	Contingency Rating (MVA)	1st Contingency	2nd Contingency	2023 Summer Peak Flow (%)	2025 Summer Peak Flow (%)	2027 Summer Peak Flow (%)
C	National Grid	Clay-Woodard (Clay-Euclid) (#17) 115 kV	220	252	Elbridge 345/115 kV	Geres Lock Stuck Breaker R815	102	-	-

A potential steady-state transmission security violation was identified for the study period under expected winter peak conditions. No other steady-state transmission security related needs were observed under other system conditions, including daytime light load conditions, which captured a high penetration of behind-the-meter solar resources

The identified transmission security issue is a low voltage violation 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 violation at the Porter 115 kV bus is observed starting in winter 2025-26 due to the retirement of the two Porter 230/115 kV buses, which is planned to occur that winter with the Smart Path Connect Project (interconnection queue #Q1125), and the

[14] https://www.nyiso.com/documents/20142/16004172/2021-Q3-STAR-Report-vFinal2.pdf/

[15] https://www.nyiso.com/documents/20142/25058472/03_National%20Grid%20NY%20Local%20Transmission%20Plan%20Update%2010-2021.pdf/

increasing load in Zone E observed in winter. The evaluation did not observe the low voltage violation at the Porter 115 kV bus under summer peak load conditions because the load forecast for Zone E is higher in winter than in summer. Since the low voltage needs observed at the Porter 115 kV bus occur due to the planned changes with Q1125, this issue will be addressed through the NYISO's interconnection process.

Dynamics Assessment

No BPTF dynamic criteria violations were observed for this assessment. Additionally, no dynamic stability related non-BPTF generator deactivation reliability needs were observed for this assessment.

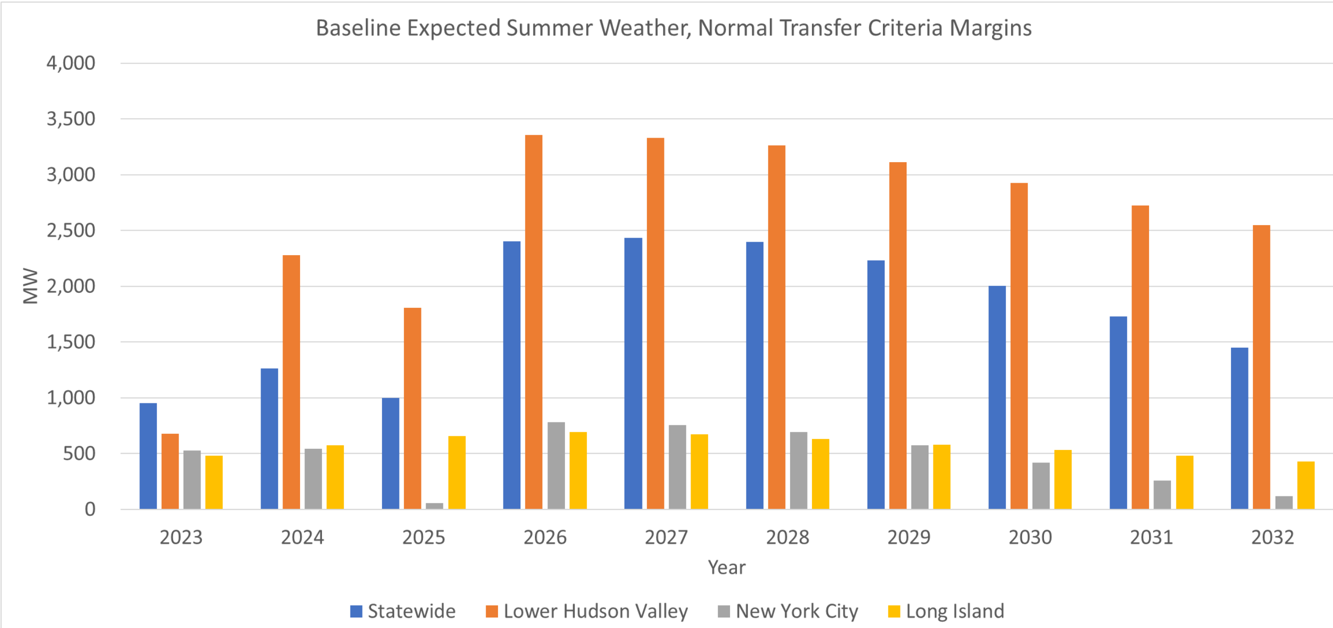
Short Circuit Assessment

No BPTF short-circuit criteria violations were observed in this assessment. Additionally, no short-circuit non-BPTF generator deactivation reliability needs were observed in this assessment.

Transmission Security Margin Assessment

For the transmission security margin assessment, "tipping points" are evaluated for the statewide system margin, and for the Lower Hudson Valley, New York City, and Long Island localities. In the Lower Hudson Valley and Long Island localities, the BPTF system is designed to remain reliable in the event of two non-simultaneous outages (N-1-1). In the Con Edison service territory, the 345 kV transmission system and specific portions of the 138 kV transmission system are designed to remain reliability after the occurrence of two non-simultaneous outages and a return to normal ratings (N-1-1-0). Figure 7 provides a summary of the margins under baseline expected summer weather, normal transfer criteria conditions. While the margins are sufficient statewide (as well as in all localities), the margins within New York City are very narrow in 2025 (just over 50 MW). With the planned addition of CHPE, there is an increase in the observed margins beginning summer 2026. However, the margin decreases between 2026 and 2032 due to increased load. By 2032, the margin within New York City reduces to just over 100 MW.

Figure 7: Summary of Baseline Expected Summer Weather, Normal Transfer Criteria Margins



Although the New York City transmission security margins are sufficient, considering the hourly margins, which are shown in Figure 8 (year 2025) and Figure 9 (year 2032), the New York City margins are extremely narrow for several hours of the day under expected weather conditions. Under heatwaves or extreme heatwaves, the margins are deficient for nearly half of the day.

Figure 8: New York City Transmission Security Margin Hourly Curve - 2025

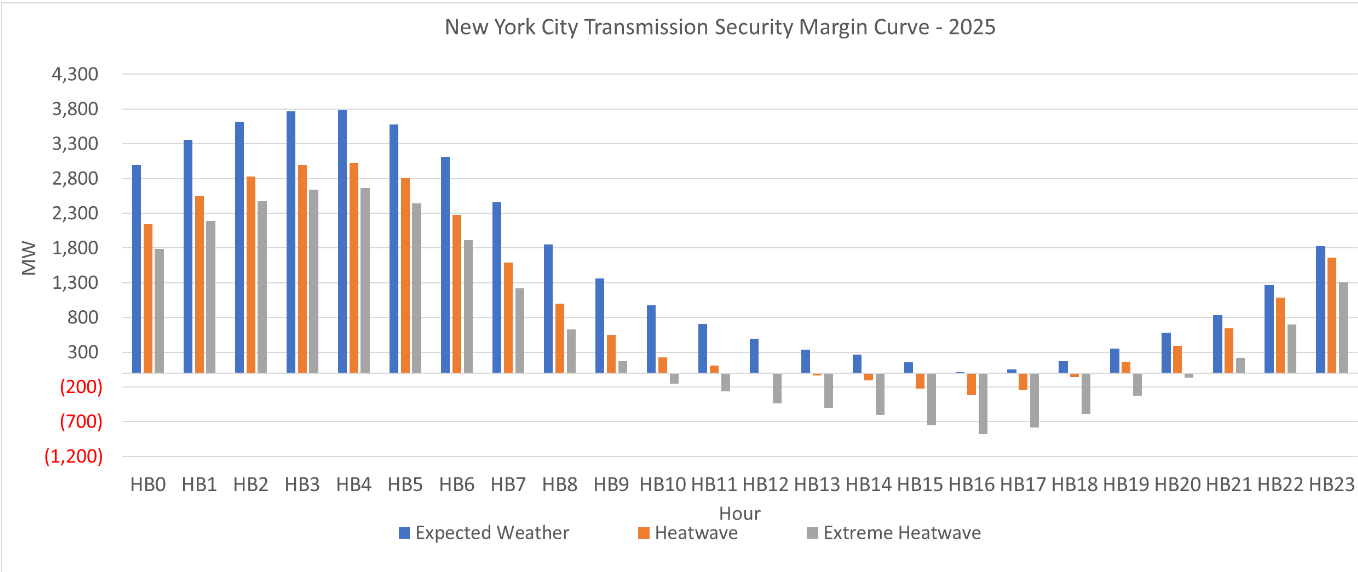
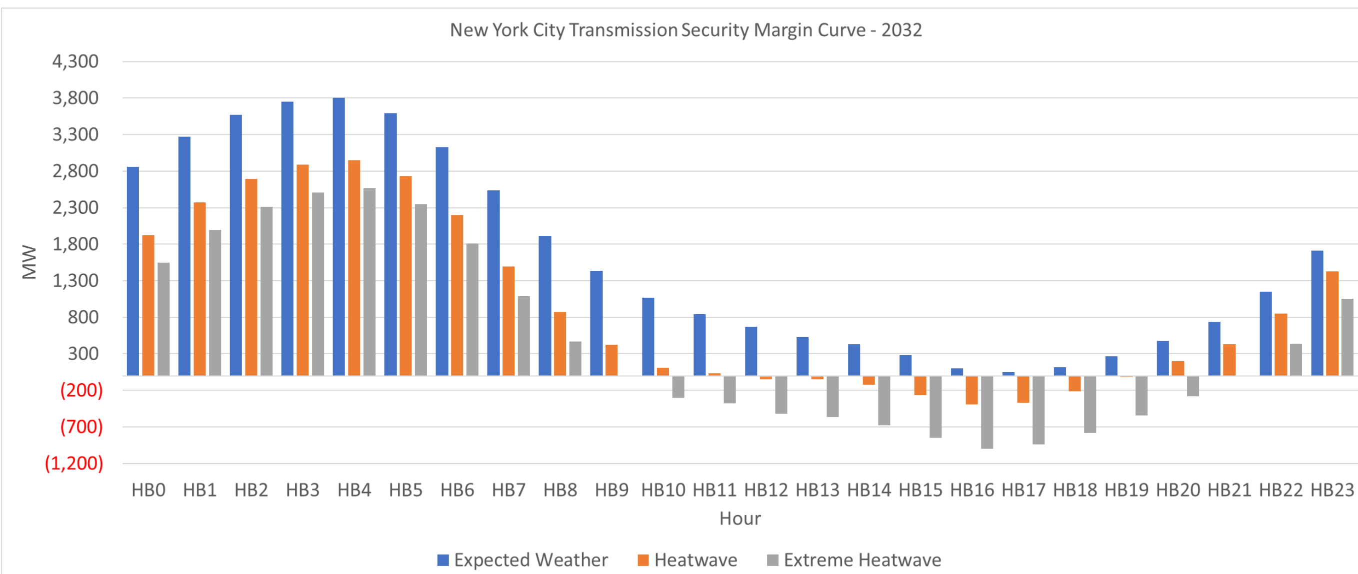
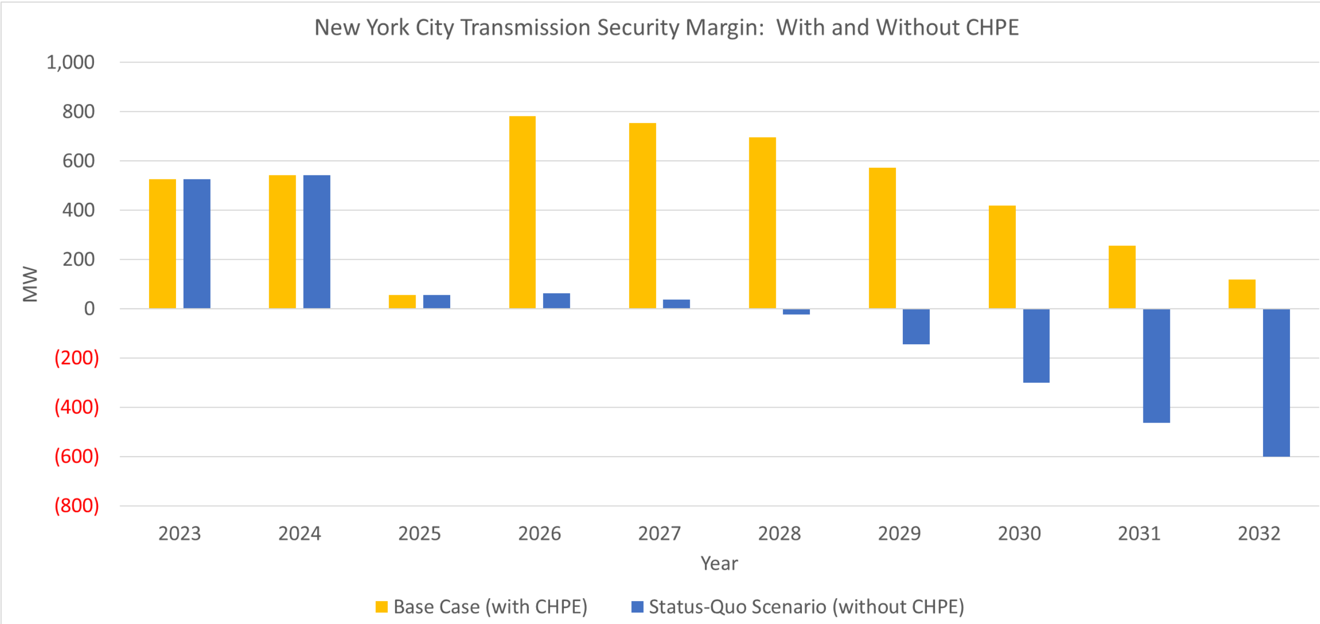


Figure 9: New York City Transmission Security Margin Hourly Curve - 2032



The reliability margins within New York City may not be sufficient even for expected weather if (i) the CHPE project experiences a significant delay, (ii) forecasted demand in New York City increases by as little as 60 MW in 2025, or (iii) there are additional generator deactivations beyond what is already planned. Some generation affected by the DEC Peaker Rule may need to remain in-service until CHPE or other permanent solutions are completed to maintain a reliable grid. As shown in Figure 10, without the CHPE project in-service by 2026 and other offsetting changes or solutions, the reliability margins continue to be less than 100 MW until 2028, at which time the New York City grid as otherwise planned could not provide reliable service for the forecasted system conditions. This deficiency would grow to approximately 600 MW by 2032.

Figure 10: New York City Transmission Security Margin With and Without CHPE



Additional details regarding the margin calculations are provided in Appendix E. Appendix E also shows impact on the margin from heatwaves, cold snaps, and other system conditions for informational purposes.

Additional Transmission Owner Local Criteria Assessments (For Information Only)

As described in the following sections, Central Hudson identified transmission security issues in their service territories on their non-BPTF systems, as recorded in prior STARs. The local non-BPTF criteria violations identified below are not Generator Deactivation Reliability Needs and are provided for information only.[16]

Central Hudson Assessment

Central Hudson currently owns and operates two 25 MVA (nameplate) combustion turbines that are subject to the DEC Peaker Rule, namely the Coxsackie and South Cairo generators. Both of these generators provide local substation reserve capacity for transformer outages and post-contingency voltage support for the Westerlo transmission loop. Without these generators, there is no reserve capability for local transformer outages and the Westerlo loop is voltage constrained. These transmission security issues, first identified in the 2020 Quarter 3 STAR, arise on non-BPTF facilities beginning in 2023 and continuing through 2025. At the October 25, 2021 ESPWG/TPAS meeting, Central Hudson updated its LTP to address the Westerlo transmission loop voltage issue.[17] The LTP includes the installation of a STATCOM and capacitor bank and the South Cairo and Freehold substations with a planned in-service date by December 2024.

[16] *See* OATT §§ 38.1 (definition of Generator Deactivation Reliability Need) 38.2 (scope of Short-Term Reliability Process), 38.10.1.2 (other reliability needs that arise on non-BPTFs may be reported in a STAR for informational purposes).

[17] https://www.nyiso.com/documents/20142/25620932/02 Central Hudson Local Transmission Plan.pdf/

Conclusions and Determination

This assessment finds the planned BPTF system through the study period meets applicable reliability criteria. This assessment does not identify any Generator Deactivation Reliability Need following the retirement of the Ravenswood 10 unit. As such, Helix Ravenswood, LLC has satisfied the applicable requirements under the NYISO's Short-Term Reliability Process to retire its unit on or after the date indicated in its generator deactivation notice.[18]

[18] Helix Ravenswood, LLC must complete all required NYISO administrative processes and procedures prior to retirement of Ravenswood 10. See Technical Bulletin 185 Generator Deactivation Process and Technical Bulletin 250 Short-Term Reliability Process. The NYISO's determination in this Short-Term Reliability Process does not relieve Helix Ravenswood, LLC of any obligations it has with respect to its participation in the NYISO markets. If Helix Ravenswood rescinds its Generator Deactivation Notice or do not retire Ravenswood 10 within 730 days of July 15, 2022, then it will be required to submit a new Generator Deactivation Notice in order to deactivate the Generator(s) and will be required to repay study costs in accordance with Section 38.14 of the OATT.

Appendix A: List of Short-Term Reliability Needs

No short-term reliability needs are observed for this assessment.

Appendix B: Short-Term Reliability Process Solution List

The Short-Term Reliability Process solution list and the status of these solutions is posted on the NYISO website at the following location:

https://www.nyiso.com/documents/20142/19556596/SolutionStatus-03092021.pdf/

Appendix C: Summary of Study Assumptions

This assessment used the major assumptions included in the 2022 RNA. Consistent with the NYISO's obligations under its tariffs, the NYISO provided information to stakeholders on the modeling assumptions employed in this assessment. Details regarding the study assumptions were reviewed with stakeholders at the July 26, 2022 Electric System Planning Working Group ("ESPWG")/Transmission Planning Advisory Subcommittee ("TPAS"). The meeting materials are posted on the NYISO's public website.[19] The figures below summarize the changes to generation, load, and transmission.

Generation Assumptions

Figure 11: Completed Generator Deactivations

Owner/ Operator	Plant Name	Zone	Nameplate (MW)	CRIS (MW)		Capability (MW)		Status	Deactivation Date (6)
				Summer	Winter	Summer	Winter		
International Paper Company	Ticonderoga (1)	F	9.0	7.6	7.5	9.5	9.8	I	5/1/2017
Helix Ravenswood, LLC	Ravenswood 2-4	J	42.9	39.8	50.6	30.7	41.6	I	4/1/2018
	Ravenswood 3-1	J	42.9	40.5	51.5	31.9	40.8	I	4/1/2018
	Ravenswood 3-2	J	42.9	38.1	48.5	29.4	40.3	I	4/1/2018
	Ravenswood 3-4	J	42.9	35.8	45.5	31.2	40.8	I	4/1/2018
Exelon Generation Company LLC	Monroe Livingston	B	2.4	2.4	2.4	2.4	2.4	R	9/1/2019
Innovative Energy Systems, Inc.	Steuben County LF	C	3.2	3.2	3.2	3.2	3.2	R	9/1/2019
Consolidated Edison Co. of NY, Inc	Hudson Ave 4	J	16.3	13.9	18.2	14.0	16.3	R	9/10/2019
New York State Elec. & Gas Corp.	Auburn - State St	C	7.4	5.8	6.2	4.1	7.3	R	10/1/2019
Somerset Operating Company, LLC	Somerset	A	655.1	686.5	686.5	676.4	684.4	R	3/12/2020
Entergy Nuclear Power Marketing, LLC	Indian Point 2	H	1,299.0	1,026.5	1,026.5	1,011.5	1,029.4	R	4/30/2020
Cayuga Operating Company, LLC	Cayuga 1	C	155.3	154.1	154.1	151.0	152.0	R	6/4/2020
Albany Energy, LLC	Albany LFGE (3)	F	5.6	4.5	4.5	5.6	5.6	I	7/1/2020
Eastern Generation, LLC	Gowanus 1-8 (4)	J	20.0	16.1	21.0	16.0	21.0	I	2/1/2021
Entergy Nuclear Power Marketing, LLC	Indian Point 3	H	1,012.0	1,040.4	1,040.4	1,036.3	1,038.3	R	4/30/2021
Helix Ravenswood, LLC	Ravenswood GT 11 (5)	J	25.0	20.2	25.7	16.1	22.4	I	12/1/2021
Helix Ravenswood, LLC	Ravenswood GT 1 (5)	J	18.6	8.8	11.5	7.7	11.1	I	1/1/2022
Exelon Generation Company LLC	Madison County LF	E	1.6	1.6	1.6	1.6	1.6	I	4/1/2022
Nassau Energy, LLC	Trigen CC	K	55.0	51.6	60.1	38.5	51.0	I	5/24/2022
		Total	3,457.1	3,197.4	3,265.5	3,117.1	3,219.3		

Notes
(1) Part of SCR program
(2) This date is the proposed Generator Deactivation Date stated in the generator deactivation notice.
(3) The Generator Deactivation Assessment for this generator was included in the 2020 Quarter 3 STAR
(4) The Generator Deactivation Assessment for this generator was included in the 2021 Quarter 1 STAR. The 2022 Q2 STAR includes the assessment for the Retirement of this generator.
(5) The Generator Deactivation Assessment for this generator was included in the 2022 Quarter 1 STAR
(6) This table only includes units that have entered into IIFO or have completed the generator deactivation process.

[19] Short-Term Assessment of Reliability: 2022 Q3 Key Study Assumptions

Figure 12: Proposed Generator Deactivations

Owner/ Operator	Plant Name (1)	Zone	Nameplate (MW)	CRIS (MW)		Capability (MW)		Status	Deactivation date (2)	STAR Evaluation
				Summer	Winter	Summer	Winter			
Seneca Power Partners. L.P.	Sithe Sterling	B	65.3	57.4	72.1	49.2	61.9	R	5/2/2022	2022 Q1
Astoria Generating Company, L.P.	Gowanus 1-1 through 1-8 (3)	J	160	138.7	181.1	133.1	182.2	R	11/1/2022	2022 Q2
Astoria Generating Company, L.P.	Gowanus 4-1 through 4-8	J	160	140.1	182.9	138.8	183.4	R	11/1/2022	2022 Q2
Consolidated Edison Co. of NY, Inc.	Hudson Ave 3	J	16.3	16.0	20.9	12.3	15.6	R	11/1/2022	2022 Q2
Consolidated Edison Co. of NY, Inc.	Hudson Ave 5	J	16.3	15.1	19.7	15.3	18.6	R	11/1/2022	2022 Q2
Consolidated Edison Co. of NY, Inc.	74 St. GT 1 & 2	J	37	39.1	49.2	39.3	45.2	R	5/1/2023	2022 Q2
NRG Power Marketing, LLC	Astoria GT 2-1, 2-2, 2-3, 2-4	J	186	165.8	204.1	141.6	183.7	R	5/1/2023	2022 Q2
NRG Power Marketing, LLC	Astoria GT 3-1, 3-2, 3-3, 3-4	J	186	170.7	210.0	140.5	182.8	R	5/1/2023	2022 Q2
NRG Power Marketing, LLC	Astoria GT 4-1, 4-2, 4-3, 4-4	J	186	167.9	206.7	138.3	180.3	R	5/1/2023	2022 Q2
		Total	1012.9	910.8	1146.7	808.4	1053.7			

Notes
(1) This table includes units that have proposed to Retire or enter Mothball Outage and have a completed generator deactivation notice but have yet to complete the generator deactivation process.
(2) Date in which the generator proposed Retire (R) or enter Mothball Outage (MO)
(3) Gowanus 1-8 is currently on IIFO.

Figure 13: Generator Return-to-Service

Generator Name	Zone	MW (nameplate)	Returned to Service	STAR Assessment	Notes
Hudson Ave 3	J	16.3	7/10/2020	2020 Q4	1

Notes
1. This generator status changes May 2023 to comply with the DEC Peaker Rule

Figure 14: Generator Additions

NYISO Interconnection Queue #	Project Name/(Owner)	Zone	Point of Interconnection	Type	COD or I/S Date	Summer Peak MW	Notes
758	Independence GS1 to GS4 {Dynegy Marketing and Trade, LLC)	C	Scriba 345 kV	Gas	I/S	9.0	3
731	Branscomb Solar (Branscomb Solar, LLC)	F	Battenkill - Eastover 115kV	S	I/S	20	1
678	Calverton Solar Energy Center (LI Solar Generation, LLC)	K	Edwards Substation 138kV	S	I/S	22.9	2
769	North County Energy Storage (New York Power Authority)	D	Willis 115kV	ES	03/2022	20	
759	KCE NY6	A	Gardenville - Bethlehem Steel Wind 115kV	ES	04/2022	20	1
768	Janis Solar (Janis Solar LLC)	C	Willet 34.5kV	S	04/2022	20	1
670	Skyline Solar (SunEast Skyline Solar LLC)	E	Campus Rd - Clinton 46kV	S	04/2022	20	1
775	Puckett Solar (Puckett Solar, LLC)	E	Chenango Forks Substation 34.5kV	S	04/2022	20	1
682	Grissom Solar (Grissom Solar, LLC)	F	Ephratah - Florida 115kV	S	06/2022	20	1
748	Regan Solar (Regan Solar, LLC)	F	Market Hill - Johnstown 69kV	S	06/2022	20	1
807	Hilltop Solar (SunEast Hilltop Solar LLC)	E	Eastover - Schaghticoke 115kV	S	07/2022	20	
734	Ticonderoga Solar (ELP Ticonderoga Solar LLC)	F	ELP Ticonderoga Solar LLC	S	08/2022	20	1
422	Eight Point Wind Enery Center (NextEra Energy Resources, LLC)	B	Bennett 115kV	W	09/2022	101.8	2
735	ELP Stillwater Solar (ELP Stillwater Solar LLC)	F	Luther Forest - Mohican 115kV	S	09/2022	20	
666	Martin Solar (Martin Solar LLC)	A	Arcade - Five Mile 115kV	S	10/2022	20	1
667	Bakerstand Solar (Bakerstand Solar LLC)	A	Machias - Maplehurst 34.5kV	S	10/2022	20	1
531	Number 3 Wind Energy (Invenergy Wind Development LLC)	E	Taylorville - Boonville 115kV	W	10/2022	103.9	2
579	Bluestone Wind (Bluestone Wind, LLC)	E	Afton - Stilesville 115kV	W	10/2022	111.8	2
565	Tayandenega Solar (Tayandenega Solar, LLC)	F	St. Johnsville - Inghams 115kV	S	10/2022	20	1

NYISO Interconnection Queue #	Project Name/(Owner)	Zone	Point of Interconnection	Type	COD or I/S Date	Summer Peak MW	Notes
505	Ball Hill Wind (Ball Hill Wind Energy, LLC)	A	Dunkirk - Gardenville 230kV	W	11/2022	100.0	2
721	Excelsior Energy Center (Excelsior Energy Center, LLC)	A	N. Rochester - Niagara 345 kV	S	11/2022	280.0	2
618	High River Solar (High River Energy Center, LLC)	F	Inghams - Rotterdam 115kV	S	11/2022	90.0	2
619	East Point Solar (East Point Energy Center, LLC)	F	Cobleskill - Marshville 69kV	S	11/2022	50.0	2
564	Rock District Solar (Rock District Solar, LLC)	F	Sharon - Cobleskill 69kV	S	12/2022	20	1
570	Albany County 1 (Hecate Energy Albany 1 LLC)	F	Long Lane - Lafarge 115kV	S	12/2022	20	1
598	Albany County 2 (Hecate Energy Albany 2 LLC)	F	Long Lane - Lafarge 115kV	S	12/2022	20	1
638	Pattersonville (Pattersonville Solar Facility, LLC)	F	Rotterdam - Meco 115kV	S	12/2022	20	1
730	Darby Solar (Darby Solar, LLC)	F	Mohican - Schaghticoke 115kV	S	12/2022	20	1
572	Greene County 1 (Hecate Energy Greene 1 LLC)	G	Coxsackie - North Catskill 69kV	S	01/2023	20	1
573	Greene County 2 (Hecate Energy Greene 2 LLC)	G	Coxsackie Substation 13.8kV	S	03/2023	10	1
592	Niagara Solar (Duke Energy Renewables Solar, LLC)	B	Bennington 34.5kV Substation	S	05/2023	20	
584	Dog Corners Solar (SED NY Holdings LLC)	C	Aurora Substation 34.5kV	S	05/2023	20	1
590	Scipio Solar (Duke Energy Renewables Solar, LLC)	C	Scipio 34.5kV Substation	S	05/2023	18	
545	Sky High Solar (Sky High Solar, LLC)	C	Tilden -Tully Center 115kV	S	06/2023	20	1
586	Watkins Road Solar (SED NY Holdings LLC)	E	Watkins Rd - Ilion 115kV	S	06/2023	20	1
581	Hills Solar (SunEast Hills Solar LLC)	E	Fairfield - Inghams 115kV	S	08/2023	20	
612	South Fork Wind Farm (South Fork Wind, LLC)	K	East Hampton 69kV	OSW	08/2023	96.0	2
695	South Fork Wind Farm II (South Fork Wind, LLC)	K	East Hampton 69kV	OSW	08/2023	40.0	2

NYISO Interconnection Queue #	Project Name/(Owner)	Zone	Point of Interconnection	Type	COD or I/S Date	Summer Peak MW	Notes
637	Flint Mine Solar (Flint Mine Solar LLC)	G	LaFarge - Pleasant Valley 115kV, Feura Bush - North Catskill 115kV	S	09/2023	100.0	2
848	Fairway Solar (SunEast Fairway Solar LLC.)	E	McIntyre - Colton 115kV	S	10/2023	20	
617	Watkins Glen Solar Watkins Glen Energy Center, LLC	C	Bath - Montour Falls 115kV	S	11/2023	50.0	2
720	Trelina Solar Energy Center (Trelina Solar Energy Center, LLC)	C	Border City - Station 168 115 KV	S	11/2023	80.0	2
855	NY13 Solar (Bald Mountain Solar LLC)	F	Mohican - Schaghticoke 115kV	S	11/2023	20	
396	Baron Winds (Baron Winds, LLC)	C	Hillside - Meyer 230kV	W	12/2023	238.4	2
495	Mohawk Solar (Mohawk Solar LLC)	F	St. Johnsville - Marshville 115kV	W	11/2024	90.5	2

Notes

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

(2) All proposed large generators obtained or are assumed to obtain both Energy Resource Interconnection Service (ERIS) and CRIS and are modled both in 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.

(3) Large generator, ERIS only

Load Assumptions

The 2022 Quarter 3 STAR uses the base load forecasts for the study years consistent with the 2022 Gold Book with the following load projects in the NYISO interconnection queue: Q0580 – WNY STAMP, Q0776 – Greenidge Load, Q0849 – Somerset Load, Q0850 – Cayuga Load, and Q0979 – North Country Data Center (load increase).[20]

Transmission Assumptions

The study assumptions for existing transmission facilities that are modeled as out-of-service are listed in Figure 15. Figure 16 shows the Con Edison series reactor status utilized in the 2022 RNA as well as for this STAR. There are no changes to the Con Edison series reactor assumptions in this STAR compared to the 2022 RNA. Figure 17 provides a summary of the Transmission Interconnection Procedures (TIP) projects and the Transmission Owner Local Transmission Plans (LTPs) as listed in the 2022 Load and Capacity Data Report that are included in the 2022 RNA, as well as this STAR. Figure 18 provides additional updates to National Grid's LTP that were not included in the 2022 Load and Capacity Data report. These LTP projects were presented to stakeholders at the March 24, 2022 ESPWG/TPAS meeting.[21] Figure 19 lists additional non-LTP projects that were not included in the 2022 Load and Capacity Data report but were included in the 2022 RNA.

[20] Since an SIS has not been completed for Q#979 by the start of this STAR, the project was only evaluated from a resource adequacy perspective.

[21] https://www.nyiso.com/documents/20142/29418084/03%202022%20Q1STAR%20LTP%20Update%20Nat%20Grid.pdf/

Figure 15: Existing Transmission Facilities Modeled Out-of-Service

From	To	kV	ID	Out-of-Service Through Prior STAR	Out-of-Service Through Current STAR
Marion	Farragut	345	B3402	Long-Term	
Marion	Farragut	345	C3403	Long-Term	
Moses	St. Lawrence	230	L33P	07/2022	
Plattsburg (1)	Plattsburg	230/115	AT1	12/2022	
Moses	Moses	230/115	AT2	12/2022	3/2023
Newbridge	Newbridge	345/138	BK1	08/2022	
Sprain Brook	East Garden City	345	Y49	10/1/2022 through 5/31/2023	

Notes

(1) A spare transformer is placed in-service during the outage

Figure 16: Con Edison Proposed Series Reactor Status

Terminals		ID	kV	Prior to Summer 2023	Starting Summer 2023
Dunwoodie	Mott Haven	71	345	By-Passed	In-Service
Dunwoodie	Mott Haven	72	345	By-Passed	In-Service
Sprainbrook	W. 49th Street	M51	345	By-Passed	In-Service
Sprainbrook	W. 49th Street	M52	345	By-Passed	In-Service
Farragut	Gowanus	41	345	In-Service	By-Passed
Farragut	Gowanus	42	345	In-Service	By-Passed
Sprainbrook	East Garden City	Y49	345	In-Service	By-Passed

Figure 17: Firm Transmission Plans (from the 2022 Load and Capacity Data Report Section VII)

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to		Nominal Voltage in kV		# of ckts	Thermal Ratings		Project Description / Conductor Size	Class Year / Type of Construction
							Operating	Design		Summer	Winter		
TIP Projects (19) (included in FERC 715 Base Case)													
[430]	National Grid	Dennison	Alcoa	3	In service	2021	115	115	1	1513	1851	954 ACSR. Alcoa-Dennison Line #12.	OH
545A	NextEra Energy Transmission NY	Dysinger (New Station)	East Stolle (New Station)	20	S	2022	345	345	1	1356 MVA	1612 MVA	Western NY - Empire State Line Project	OH
545A	NextEra Energy Transmission NY	Dysinger (New Station)	Dysinger (New Station)	PAR	S	2022	345	345	1	700 MVA	700 MVA	Western NY - Empire State Line Project	
556	LSP/NGRID	Porter	Rotterdam	-71.8	S	2022	230	230	1	1066	1284	AC Transmission Project Segment A/1-795 ACSR/1-1431 ACSR/2-954 ACSS	
556	LSP/NGRID	Porter	Rotterdam	-72.1	S	2022	230	230	1	1066	1284	AC Transmission Project Segment A/1-795 ACSR/1-1431 ACSR/2-954 ACSS	
556	LSP/NGRID	Edic	New Scotland	-83.5	S	2022	345	345	1	2190	2718	AC Transmission Project Segment A/2-795 ACSR	
556	NGRID	Rotterdam	New Scotland	-18.1	S	2022	115	230	1	1212	1284	AC Transmission Project Segment A/1-1033.5 ACSR/1-1192.5 ACSR	
556	LSP/NGRID	Edic	Gordon Rd (New Station)	68.7	S	2022	345	345	1	3410	3709	AC Transmission Project Segment A/2-795 ACSR/2-954 ACSS	
556	LSP/NGRID	Gordon Rd (New Station)	New Scotland	24.9	S	2022	345	345	1	2190	2718	AC Transmission Project Segment A/2-795 ACSR/2-954 ACSS	
556	LSP	Gordon Rd (New Station)	Rotterdam	transformer	S	2022	345/230	345/230	2	478 MVA	478 MVA	AC Transmission Project Segment A	
556	LSP/NGRID	Gordon Rd (New Station)	New Scotland	-24.9	S	2023	345	345	1	2190	2718	AC Transmission Project Segment A/2-795 ACSR/2-954 ACSS	
556	LSP	Gordon Rd (New Station)	Princetown (New Station)	5.3	S	2023	345	345	1	3410	3709	AC Transmission Project Segment A/2-954 ACSS	
556	LSP	Princetown (New Station)	New Scotland	20.1	S	2023	345	345	2	3410	3709	AC Transmission Project Segment A/2-954 ACSS	
556	LSP/NGRID	Princetown (New Station)	New Scotland	19.8	S	2023	345	345	1	2190	2718	AC Transmission Project Segment A/2-795 ACSR	

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to		Nominal Voltage in kV		# of	Thermal Ratings		Project Description / Conductor Size	Class Year / Type of Construction
							Operating	Design	ckts	Summer	Winter		
556	LSP/NYPA/NGRID	Edic	Princetown (New Station)	67.0	W	2023	345	345	2	3410	3709	AC Transmission Project Segment A/2-954 ACSS	
556	NYPA	Edic	Marcy	1.4	W	2023	345	345	1	3150	3750	AC Transmission Project Segment A; Terminal Equipment Upgrades to existing line	
556	NGRID	Rotterdam	Rotterdam	remove substation	S	2029	230	230	N/A	N/A	N/A	Rotterdam 230kV Substation Retirement	
556	NGRID	Rotterdam	Eastover Rd	-23.8	S	2029	230	230	1	1114	1284	Rotterdam 230kV Substation Retirement, reconnect existing line	
556	LSP	Gordon Rd (New Station)	Rotterdam	remove transformer	S	2029	345/230	345/230	2	478 MVA	478 MVA	Rotterdam 230kV Substation Retirement	
556	NGRID	Gordon Rd (New Station)	Eastover Rd	23.8	S	2029	230	230	1	1114	1284	Rotterdam 230kV Substation Retirement; reconnect existing line	
556	LSP	Gordon Rd (New Station)	Gordon Rd (New Station)	transformer	S	2029	345/230	345/230	1	478 MVA	478 MVA	Rotterdam 230kV Substation Retirement, reconnect transformer to existing line	
556	LSP	Gordon Rd (New Station)	Rotterdam	transformer	S	2029	345/115	345/115	2	650 MVA	650 MVA	Rotterdam 230kV Substation Retirement	
543	NGRID	Greenbush	Hudson	-26.4	W	2023	115	115	1	648	800	AC Transmission Project Segment B	
543	NGRID	Hudson	Pleasant Valley	-39.2	W	2023	115	115	1	648	800	AC Transmission Project Segment B	
543	NGRID	Schodack	Churchtown	-26.7	W	2023	115	115	1	937	1141	AC Transmission Project Segment B	
543	NGRID	Churchtown	Pleasant Valley	-32.2	W	2023	115	115	1	806	978	AC Transmission Project Segment B	
543	NGRID	Milan	Pleasant Valley	-16.8	W	2023	115	115	1	806	978	AC Transmission Project Segment B	
543	NGRID	Lafarge	Pleasant Valley	-60.4	W	2023	115	115	1	584	708	AC Transmission Project Segment B	
543	NGRID	North Catskill	Milan	-23.9	W	2023	115	115	1	937	1141	AC Transmission Project Segment B	
543	O&R	Shoemaker, Middle	Sugarloaf, Chester	-12.0	W	2023	138	138	1	1098	1312	AC Transmission Project Segment B	
543	NGRID	New Scotland	Alps	-30.6	W	2023	345	765	1	2015	2140	AC Transmission Project Segment B	

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to		Nominal Voltage in kV		# of	Thermal Ratings		Project Description / Conductor Size	Class Year / Type of Construction
							Operating	Design	ckts	Summer	Winter		
543	New York Transco	Hudson	Churchtown	7.4	W	2023	115	115	1	648	798	AC Transmission Project Segment B	
543	New York Transco	Churchtown	Pleasant Valley	32.2	W	2023	115	115	1	623	733	AC Transmission Project Segment B	
543	NGRID	Lafarge	Churchtown	28.2	W	2023	115	115	1	582	708	AC Transmission Project Segment B	
543	NGRID	North Catskill	Churchtown	8.4	W	2023	115	115	1	648	848	AC Transmission Project Segment B	
543	New York Transco	Knickerbocker (New Station)	Pleasant Valley	55.1	W	2023	345	345	1	3836	4097	AC Transmission Project Segment B	
543	New York Transco	Knickerbocker (New Station)	Knickerbocker (New Station)	series capacitor	W	2023	345	345	1	3836	4097	AC Transmission Project Segment B	
543	NGRID	Knickerbocker (New Station)	New Scotland	12.4	W	2023	345	345	1	2381	3099	AC Transmission Project Segment B	
543	NGRID	Knickerbocker (New Station)	Alps	18.1	W	2023	345	345	1	2552	3134	AC Transmission Project Segment B	
543	New York Transco	Rock Tavern	Sugarloaf	12.0	W	2023	115	115	1	1647	2018	AC Transmission Project Segment B; 1-1590 ACSR	OH
543	New York Transco	Sugarloaf	Sugarloaf	Transformer	W	2023	138/115	138/115	---	1652	1652	AC Transmission Project Segment B	
543	New York Transco	Van Wagner (New Station)	---	Cap Bank	W	2023	345	345	---	N/A	N/A	AC Transmission Project Segment B	
543	NGRID	Athens	Pleasant Valley	-39.39	W	2023	345	345	1	2228	2718	Loop Line into new Van Wagner Substation/2-795 ACSR	OH
543	NGRID	Leeds	Pleasant Valley	-39.34	W	2023	345	345	1	2228	2718	Loop Line into new Van Wagner Substation/2-795 ACSR	OH
543	NGRID	Athens	Van Wagner (New Station)	38.65	W	2023	345	345	1	2228	2718	Loop Line into new Van Wagner Substation/2-795 ACSR	OH
543	NGRID	Leeds	Van Wagner (New Station)	38.63	W	2023	345	345	1	2228	2718	Loop Line into new Van Wagner Substation/2-795 ACSR	OH
543	New York Transco	Van Wagner (New Station)	Pleasant Valley	0.71	W	2023	345	345	1	3861	4087	Loop Line into new Van Wagner Substation/Reconductor w/2-795 ACSS	OH
543	New York Transco	Van Wagner (New Station)	Pleasant Valley	0.71	W	2023	345	345	1	3861	4087	Loop Line into new Van Wagner	OH

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							Operating	Design		Summer	Winter		
												Substation/Reconductor w/2-795 ACSS	
543	New York Transco	Dover (New Station)	Dover (New Station)	Phase Shifter	W	2023	345	345	---	2510	2510	Loop Line 398 into new substation and install 2 x 750 MVAr PARs	---
543	ConEd	Cricket Valley	CT State Line	-3.46	W	2023	345	345	1	2220	2700	Loop Line into new Dover Substation/2-795 ACSS	OH
543	ConEd	Cricket Valley	Dover (New Station)	0.30	W	2023	345	345	1	2220	2700	Loop Line into new Dover Substation/2-795 ACSS	OH
543	ConEd	Dover (New Station)	CT State Line	3.13	W	2023	345	345	1	2220	2700	Loop Line into new Dover Substation/2-795 ACSS	OH
1125	NYPA	Edic	Marcy	1.4	W	2025	345	345	1	4030	4880	SPCP Terminal Equipment Upgrades to existing line	
1125	NYPA	Moses	Haverstock	2	W	2025	230	230	3	1089	1330	SPCP: Existing Moses - Adirondack (MA1), Moses - Adirondack (MA2), and Moses - Willis (MW2) 230 kV Lines to Haverstock Substation. 1 – 795 kcmil ACSR 26/7 “Drake”	
1125	NYPA	Moses	Moses	SUB	W	2025	230	230	N/A	N/A	N/A	SPCP: Terminal Upgrades at Moses 230 kV Substation and Transformer T3 and MW-2 breaker positions interchanged	
1125	NYPA	Haverstock 230 kV	Haverstock 345 kV	xfmr	W	2025	230/345	230/345	3	753	753	SPCP: Haverstock 230/345 kV xfmr-1, xfmr-2 and xfmr-3. Given Amp Ratings are for High Voltage side of xfmr.	
1125	NYPA	Haverstock	Haverstock	SUB	W	2025	345	345	N/A	N/A	N/A	SPCP: Haverstock 345 kV Substation. New Shunt Capacitor Banks.	

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							Operating	Design		Summer	Winter		
1125	NYPA	Haverstock	Adirondack	83.7	W	2025	345	345	2	2177	2663	SPCP: Existing Moses - Adirondack (MA1), Moses - Adirondack (MA2) 230kV lines to Haverstock Substation. Creating new Haverstock to Adirondack (HA1) and Haverstock to Adirondack (HA2) 345kV lines. 2 – 795 kcmil ACSR 26/7 “Drake”	
1125	NYPA	Adirondack 115 kV	Adirondack 345 kV	xfmr	W	2025	115/345	115/345	1	192	221	SPCP: Adirondack 115/345 kV xfmr. Given Amp Ratings are for High Voltage side of xfmr.	
1125	NYPA	Adirondack	Adirondack	SUB	W	2025	345	345	N/A	N/A	N/A	SPCP: Adirondack 345 kV Substation. New Shunt Capacitor Banks. New Shunt Reactor Banks.	
1125	NYPA	Haverstock	Willis	34.99	W	2025	345	345	2	3119	3660	SPCP: Existing Moses - Willis (MW1) and Moses - Willis (MW2) 230 kV Lines diverted to to Haverstock Substation. Creating Haverstock - Willis (HW1) and Haverstock - Willis (HW1) 345 kV Lines. 2 – 795 kcmil ACSS 26/7 “Drake”	
1125	NYPA	Willis 345 kV	Willis 230 kV	xfmr	W	2025	345/230	345/230	2	2259	2259	SPCP: Willis 345/230 kV xfmr-1 and xfmr-2. Given Amp Ratings are for High Voltage side.	
1125	NYPA	Willis	Willis	SUB	W	2025	230	230	N/A	N/A	N/A	SPCP: New Willis 345 kV Substation. New Shunt Capacitor Bank.	

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							Operating	Design		Summer	Winter		
1125	NYPA	Willis	Patnode	8.65	W	2025	230	230	2	2078	2440	SPCP: Two Willis - Patnode 230 kV Lines. 1 – 1272 kcmil ACSS 45/7 "Bittern"	
1125	NYPA	Willis	Ryan	6.59	W	2025	230	230	2	2078	2440	SPCP: Two Willis - Ryan 230 kV Lines. 1 – 1272 kcmil ACSS 45/7 "Bittern"	
1125	NYPA	Ryan	Ryan	SUB	W	2025	230	230	N/A	N/A	N/A	SPCP: Terminal Upgrades at Ryan 230 kV Substation.	
1125	NYPA	Patnode	Patnode	SUB	W	2025	230	230	N/A	N/A	N/A	SPCP: Terminal Upgrades at Patnode 230 kV Substation.	
1125	NYPA	Willis (Existing)	Willis (New)	0.4	W	2025	230	230	2	2078	2440	SPCP: Two Willis (existing) - Willis (New) 230 kV Lines. 1 – 1272 kcmil ACSS 45/7 "Bittern"	
1125	NYPA/NGRID	Adirondack	Austin Road	11.6	W	2025	345	345	1	3119	3660	SPCP: Adirondack - Austin Road Circuit-1 345 kV Line. 2 – 795 kcmil ACSS 26/7 "Drake"	
1125	NYPA/NGRID	Adirondack	Marcy	52.6	W	2025	345	345	1	3119	3660	SPCP: Adirondack - Marcy Circuit-1 345 kV Line. 2 – 795 kcmil ACSS 26/7 "Drake"	
1125	NGRID	Austin Road	Edic	42.5	W	2025	345	345	1	3119	3660	SPCP: Austin Road -Edic Circuit-1 345 kV Line. 2 – 795 kcmil ACSS 26/7 "Drake"	
1125	NGRID	Rector Road	Austin Road	1	W	2025	230	230	1	1089	1330	SPCP: Rector Road - Austin Road Circuit-1 230 kV Line. 1 – 795 kcmil ACSR 26/7 "Drake"	
1125	NGRID	Austin Road 230 kV	Austin Road 345 kV	Transformer	W	2025	230/345	230/345	1	753	753	SPCP: Austin Road 230/345 kV xfmr. Given Amp Ratings are for	

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							Operating	Design		Summer	Winter		
												High Voltage side of xfmr.	
1125	NGRID	Austin Road	Austin Road	Substation	W	2025	345	345	N/A	N/A	N/A	SPCP: Austin Road 345 kV Substation.	
1125	NGRID	Edic	Edic	Substation	W	2025	345	345	N/A	N/A	N/A	SPCP: Terminal Upgrades at Edic 345 kV Substation. New Shunt Capacitor Bank.	
1125	NGRID	Edic 345kV	Edic 230kV	Transformer	W	2025	345/230	345/230	1	N/A	N/A	SCSP: Remove Existing Transformer #2 345/230kV	
1125	NYPA	Marcy	Marcy	SUB	W	2025	345	345	N/A	N/A	N/A	SPCP: Terminal Upgrades at Marcy 345 kV Substation.	
1125	NGRID	Chases Lake	Chases Lake	Substation	W	2025	230	230	N/A	N/A	N/A	SPCP: Retire 230kV Substation.	
1125	NYPA	Moses	Massena	Series Reactor	W	2025	230	230	2	3840	4560	SPCP: Install Series Reactors on Moses - Massena 230 kV Lines	
1125	NYPA	Moses	Adirondack	-85.7	W	2025	230	230	2	N/A	N/A	SPCP: Retire Existing Moses - Adirondack MA1 and MA2 230 kV Lines	
1125	NYPA	Moses	Willis	-36.99	W	2025	230	230	2	N/A	N/A	SPCP: Retire Existing Moses - Willis MW1 and MW2 230 kV Line	
1125	NGRID	Adirondack	Porter	-54.41	W	2025	230	230	1	N/A	N/A	SPCP: Retire Existing Adirondack - Porter 230 kV Line	
1125	NGRID	Adirondack	Chases Lake	-11.05	W	2025	230	230	1	N/A	N/A	SPCP: Retire Existing Adirondack - Chases Lake 230 kV Line	
1125	NGRID	Chases Lake	Porter	-43.46	W	2025	230	230	1	N/A	N/A	SPCP: Retire Existing Chases Lake - Porter 230 kV Line	
1125	NYPA	Willis	Patnode	-8.65	W	2025	230	230	1	N/A	N/A	SPCP: Retire Existing Willis - Patnode WPN1 230 kV Line.	
1125	NYPA	Willis	Ryan	-6.59	W	2025	230	230	1	N/A	N/A	SPCP: Retire Existing Willis - Ryan WRY2 230 kV Line.	

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							Operating	Design		Summer	Winter		
1125	NGRID	Edic	Porter	-0.39	W	2025	230	230	1	N/A	N/A	SPCP: Retire Existing Edic-Porter #17 230kV Line	
1125	NGRID	Porter	Porter	Transformers	W	2025	230/115	230/115	2	N/A	N/A	SCSP: Remove Existing Transformers #1&2 230kV/115kV	
1125	NGRID	Porter	Porter	Substation	W	2025	230	230	N/A	N/A	N/A	SPCP: Retire Porter 230kV substation	
Firm Plans (5) (included in FERC 715 Base Case)													
3	CHGE	North Catskill	North Catskill	xfmr	In-Service	2021	115/69	115/69	1	560	726	Replace Transformer 5	-
14	CHGE	Hurley Avenue	Leeds	Static synchronous series compensator	W	2022	345	345	1	2336	2866	21% Compensation	-
	CHGE	Rock Tavern	Sugarloaf	12.10	W	2023	115	115	1	N/A	N/A	Retire SL Line	OH
	CHGE	Kerhonkson	Kerhonkson	xfmr	W	2023	115/69	115/69	1	564	728	Add Transformer 3	-
	CHGE	Kerhonkson	Kerhonkson	xfmr	W	2023	115/69	115/69	1	564	728	Add Transformer 4	-
	CHGE	Sugarloaf	NY/NJ State Line	10.30	W	2024	115	115	2	N/A	N/A	Retire SD/SJ Lines	OH
11	CHGE	St. Pool	High Falls	5.69	W	2024	115	115	1	1010	1245	1-795 ACSR	OH
11	CHGE	High Falls	Kerhonkson	10.03	W	2024	115	115	1	1010	1245	1-795 ACSR	OH
11	CHGE	Modena	Galeville	4.62	W	2024	115	115	1	1010	1245	1-795 ACSR	OH
11	CHGE	Galeville	Kerhonkson	8.96	W	2024	115	115	1	1010	1245	1-795 ACSR	OH
11	CHGE	Hurley Ave	Saugerties	11.50	W	2025	69	115	1	1114	1359	1-795 ACSR	OH
11	CHGE	Saugerties	North Catskill	12.46	W	2024	69	115	1	1114	1359	1-795 ACSR	OH
6	CHGE	Knapps Corners	Spackenkill	2.36	W	2024	115	115	1	1280	1563	1-1033 ACSR	OH
	ConEd	Hudson Ave East	New Vinegar Hill Distribution	xfmrs/PARs/Feeders	S	2022	138/27	138/27		N/A	N/A	New Vinegar Hill Distribution Switching Station	UG

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							Operating	Design		Summer	Winter		
			Switching Station										
	ConEd	Rainey	Rainey	xfmr	S	2023	345	345		N/A	N/A	Replacing xfmr 3W	-
	ConEd	Rainey	Corona	xfmr/PAR/Feeder	S	2023	345/138	345/138		N/A	N/A	New second PAR regulated feeder	UG
	ConEd	Gowanus	Greenwood	xfmr/PAR/Feeder	S	2025	345/138	345/138		N/A	N/A	New PAR regulated feeder	UG
	ConEd	Goethals	Fox Hills	xfmr/PAR/Feeder	S	2025	345/138	345/138		N/A	N/A	New PAR regulated feeder	UG
	ConEd	Buchanan North	Buchanan North	Reconfiguration	S	2025	345	345		N/A	N/A	Reconfiguration (bus work related to decommissioning of Indian Point 2)	-
	ConEd	Mott Haven	Parkview	-	S	2026	345/138/13	345/138/13		N/A	N/A	Spare 345/138 kV xfmr at Mott Haven and a spare 138/13.8 kV xfmr at Parkview	UG
6/7/3	LIPA	Amagansett	Montauk	-13.00	In-Service	2021	23	23	1	577	657	750 kcmil CU	UG
6/7/3	LIPA	Amagansett	Navy Road	12.74	In-Service	2021	23	23	1	577	657	750 kcmil CU	UG
6/7/3	LIPA	Navy Road	Montauk	0.26	In-Service	2021	23	23	1	577	657	750 kcmil CU	UG
9/3	LIPA	Riverhead	Wildwood	10.63	In-Service	2021	138	138	1	1355	1436	1192ACSR	
13/3	LIPA	Riverhead	Canal	15.89	In-Service	2021	138	138	1	945	945	2368 KCMIL (1200 mm²) Copper XLPE	
3	LIPA	Barrett	Barrett	-	In-Service	2021	34.5	34.5	1	N/A	N/A	Barrett 34.5kV Bus Tie Reconfiguration	-
	LIPA	Round Swamp	Round Swamp	-	S	2022	69	69		N/A	N/A	New Round Swamp Road substation	
	LIPA	Round Swamp	Plainview	1.93	S	2022	69	69	1	1217	1217	2500kcmil XLPE	UG
	LIPA	Round Swamp	Ruland Rd	3.81	S	2022	69	69	1	1217	1217	2500kcmil XLPE	UG
3	NGRID	Oswego	Oswego	-	In-Service	2020	115	115		N/A	N/A	Rebuild of Oswego 115kV Station	
6/3	NGRID	Clay	Dewitt	10.24	In-Service	2021	115	115	1	220MVA	268MVA	Reconductor 4/0 CU to 795ACSR	OH

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							Operating	Design		Summer	Winter		
6/3	NGRID	Clay	Teall	12.75	In-Service	2021	115	115	1	220 MVA	268MVA	Reconductor 4/0 CU to 795ACSR	OH
3	NGRID	Gardenville 230kV	Gardenville 115kV	xfmr	In-Service	2021	230/115	230/115	-	347 MVA	422 MVA	Replacement of 230/115kV TB#3 stepdown with larger unit	
3	NGRID	Huntley 115kV	Huntley 115kV	-	In-Service	2021	115	115	-	N/A	N/A	Rebuild of Huntley 115kV Station	
3	NGRID	Mortimer	Mortimer	xfmr	In-Service	2021	115	115		50MVA	50MVA	Replace Mortimer 115/69kV Transformer	
3	NGRID	Royal Ave	Royal Ave	-	In-Service	2021	115/13.2	115/13.2	-	-	-	Install new 115-13.2 kV distribution substation in Niagara Falls (Royal Ave)	-
3	NGRID	Niagara	Packard	3.4	In-Service	2021	115	115	1	344MVA	449MVA	Replace 3.4 miles of 192 line	OH
	NGRID	Volney	Clay	-	S	2022	115	115	1	1200 MVA	1474 MVA	Replace Terminal Equipment Line #6	OH
	NGRID	Mountain	Lockport	0.08	S	2022	115	115	2	174MVA	199MVA	Mountain-Lockport 103/104 Bypass	OH
	NGRID	South Oswego	Indeck (#6)	-	S	2022	115	115	1	-	-	Install High Speed Clearing on Line #6	
	NGRID	Porter	Porter	-	S	2022	230	230		N/A	N/A	Porter 230kV upgrades	
	NGRID	Watertown	Watertown		S	2022	115	115		N/A	N/A	New Distribution Station at Watertown	
	NGRID	Golah	Golah	xfmr	S	2022	69	69		50MVA	50MVA	Replace Golah 69/34.5kV Transformer	
	NGRID	Niagara	Packard	3.7	S	2022	115	115	1	344MVA	449MVA	Replace 3.7 miles of 191 line	OH
	NGRID	Wolf Rd	Menands	1.34	S	2022	115	115	1	182 MVA	222 MVA	Reconductor 1.34 miles betw Wolf Rd- Everett tap (per EHI)	OH
	NGRID	Volney	Clay	-	S	2022	115	115	1	1200 MVA	1474 MVA	Replace Terminal Equipment Line #6	OH
	NGRID	Dunkirk	Dunkirk	-	S	2022	115	115	-	-	-	Rebuild Dunkirk Station/ Asset Separation.	
	NGRID	Lockport	Mortimer	56.5	W	2022	115	115	3	-	-	Replace Cables Lockport-Mortimer #111, 113, 114	

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							Operating	Design	ckts	Summer	Winter		
6	NGRID	Niagara	Packard	3.7	W	2022	115	115	2	344MVA	449MVA	Replace 3.7 miles of 193 and 194 lines	OH
	NGRID	Gardenville	Big Tree	6.3	W	2022	115	115	1	221MVA	221MVA	Gardenville-Arcade #151 Loop-in-and-out of NYSEG Big Tree	OH
	NGRID	Big Tree	Arcade	28.6	W	2022	115	115	1	129MVA	156MVA	Gardenville-Arcade #151 Loop-in-and-out of NYSEG Big Tree	OH
	NGRID	Seneca	Seneca	xfmr	W	2022	115/22	115/22		40MVA	40MVA	Seneca #5 xfmr asset replacement	
	NGRID	Batavia	Batavia		W	2022	115	115				Batavia replace five OCB's	
	NGRID	Kensington Terminal	Kensington Terminal	-	W	2022	115/23	115/23	-	50MVA	50MVA	Replace TR4 and TR5	
	NGRID	Taylorville	Boonville	-	W	2022	115	115	1	584	708	Replace Station connections	
	NGRID	Taylorville	Boonville	-	W	2022	115	115	1	584	708	Replace Station connections	
	NGRID	Taylorville	Browns Falls	-	W	2022	115	115	1	569	708	Replace Station connections	
	NGRID	Taylorville	Browns Falls	-	W	2022	115	115	1	584	702	Replace Station connections	
	NGRID	Batavia	Batavia		W	2022	115	115				Batavia replace five OCB's.	
	NGRID	Albany Steam	Albany Steam	-	W	2022	115	115				Replace NG's 115kV Breakers.	
	NGRID	Mountain	Lockport		S	2023	115	115	2	847	1000	Reinsulating Mountain-Lockport 103/104	
	NGRID	Maplewood	Menands	3	S	2023	115	115	1	220 MVA	239 MVA	Reconductor approx 3 miles of 115kV Maplewood – Menands #19	
	NGRID	Maplewood	Reynolds	3	S	2023	115	115	1	217 MVA	265 MVA	Reconductor approx 3 miles of 115kV Maplewood – Reynolds Road #31	
	NGRID	Elm St	Elm St	-	S	2023	230/23	230/23	-	118MVA	133MVA	Replace TR2 as failure	
	NGRID	Ridge	Ridge		S	2023				N/A	N/A	Ridge substation 34.5kV rebuild	

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							Operating	Design		Summer	Winter		
	NGRID	Colton	Browns Falls	-	S	2023	115	115	1	629	764	Flat Rock station (mid-line) upgrades	
	NGRID	Mountain	Lockport		S	2023	115	115	2	847	1000	Reinsulating Mountain-Lockport 103/104. .	
	NGRID	Clay	Woodard		W	2023	115	115	1			Add 10.5mH reactor on line #17.	OH
	NGRID/NYSEG	Mortimer	Station 56		W	2023	115	115	1	649	788	Mortimer-Pannell #24 Loop in-and-out of NYSEG's Station 56	
	NGRID	Clay	Woodard		W	2023	115	115	1			Add 10.5mH reactor on line #17.	OH
	NGRID	Cortland	Clarks Corners	0.2	S	2024	115	115	1	147MVA	170MVA	Replace 0.2 miles of 1(716) line and series equipment	OH
	NGRID	Homer Hill	Homer Hill	-	S	2024	115	115	-	116MVA	141MVA	Homer Hill Replace five OCB	
	NGRID	Packard	Huntley	9.1	W	2024	115	115	1	262MVA	275MVA	Walck-Huntley #133, Packard-Huntley #130 Reconductor	OH
	NGRID	Walck	Huntley	9.1	W	2024	115	115	1	262MVA	275MVA	Walck-Huntley #133, Packard-Huntley #130 Reconductor	OH
	NGRID	Station 56	Pannell		W	2024	115	115	1	649	788	Mortimer-Pannell #24 Loop in-and-out of NYSEG's Station 56	
	NGRID	Clay	Wetzel	3.7	W	2024	115	115	1	220 MVA	220 MVA	Add a breaker at Clay and build approximately 2000 feet of 115kV to create radial line	
	NGRID	Golah	Golah		S	2025				N/A	N/A	Golah substation rebuild	
	NGRID	Malone	Malone	-	S	2025	115	115	-	753	753	Install PAR on Malone - Willis line 1-910	
	NGRID	Oswego	Oswego	-	S	2026	345	345		N/A	N/A	Rebuild of Oswego 345kV Station (asset separation).	
6	NGRID	Gardenville	Dunkirk	20.5	S	2026	115	115	2	1105	1346	Replace 20.5 miles of 141 and 142 lines	OH

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to		Nominal Voltage in kV		# of ckts	Thermal Ratings		Project Description / Conductor Size	Class Year / Type of Construction
							Operating	Design		Summer	Winter		
	NGRID	Niagara	Gardenville	26.3	S	2026	115	115	1	275MVA	350MVA	Packard-Erie / Niagara-Garenville Reconfiguration	OH
	NGRID	Packard	Gardenville	28.2	S	2026	115	115	2	168MVA	211 MVA	Packard-Gardenville Reactors, Packard-Erie / Niagara-Garenville Reconfiguration	OH
	NGRID/NYSEG	Erie St	Gardenville	5.5	S	2026	115	115	1	139MVA	179MVA	Packard-Erie / Niagara-Garenville Reconfiguration, Gardenville add breakers	OH
	NGRID	Lockport	Batavia	20	S	2026	115	115	1	646	784	Rebuild 20 miles of Lockport-Batavia 112	
	NGRID	Packard	Packard		S	2026	115	115				Packard replace three OCB's	
	NGRID	Oswego	Oswego	-	S	2026	345	345		N/A	N/A	Rebuild of Oswego 345kV Station (asset separation).	
	NGRID	Rotterdam	Rotterdam	-	S	2026	115/69	115/69	-	67	76	Rebuild Rotterdam 69kV substation and add a 2nd 115/69kV Transformer	-
	NGRID	Rotterdam	Schoharie	0.93	S	2026	69	115	1	77	93	Rebuild 0.93mi double circuit Rotterdam-Schoharie / Schenectady International-Rotterdam	OH
	NGRID	Schenectady International	Rotterdam	0.93	S	2026	69	115	1	69	84	Rebuild 0.93mi double circuit Rotterdam-Schoharie / Schenectady International-Rotterdam	OH
	NGRID	Tar Hill	Tar Hill		S	2026	115	115				New station to replace Lighthouse Hill.	
	NGRID	Inghams	Inghams	-	S	2026	115	115				Rebuild Inghams station, including rebuilding the PAR	
	NGRID	Huntley	Lockport	1.2	W	2026	115	115	2	747	934	Rebuild 1.2 miles of (2) single circuit taps on	

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to		Nominal Voltage in kV		# of	Thermal Ratings		Project Description / Conductor Size	Class Year / Type of Constructio n
							Operating	Design	ckt s	Summer	Winter		
												Huntley-Lockport 36/37 at Ayer Rd	
	NGRID	Oneida	Oneida	-	W	2026	115	115				115kV Oneida Station Rebuild & add Cap bank.	
	NGRID	Brockport	Brockport	3.5	S	2027	115	115	2	648	650	Refurbish 111/113 3.5 mile single circuit taps to Brockport Station.	
	NGRID	Brockport	Brockport	3.5	S	2027	115	115	2	648	650	Refurbish 111/113 3.5 mile single circuit taps to Brockport Station.	
	NGRID	Pannell	Geneva		W	2027	115	115	2	755	940	Critical Road crossings replace on Pannell-Geneva 4/4A	
	NGRID	Mortimer	Golah	9.7	W	2027	115	115	1	657	797	Refurbish 9.7 miles Single Circuit Wood H-Frames on Mortimer-Golah 110	
	NGRID	Lockport	Lockport		W	2027				N/A	N/A	Rebuild of Lockport Substation and control house	
	NGRID	Pannell	Geneva		W	2027	115	115	2	755	940	Critical Road crossings replace on Pannell-Geneva 4/4A.	
	NGRID	Mortimer	Golah	9.7	W	2027	115	115	1	657	797	Refurbish 9.7 miles Single Circuit Wood H-Frames on Mortimer-Golah 110.	
	NGRID	Mortimer	Mortimer	-	W	2027	115	115		N/A	N/A	Second 115kV Bus Tie Breaker at Mortimer Station	
	NGRID	Mortimer	Pannell	15.7	S	2028	115	115	2	221MVA	270MVA	Reconductor existing Mortimer – Pannell 24 and 25 lines with 795 ACSR	
	NGRID	SE Batavia	Golah	27.8	W	2028	115	115	1	648	846	Refurbish 27.8 miles Single Circuit Wood H-Frames on SE Batavia-Golah 119	
	NGRID	SE Batavia	Golah	27.8	W	2028	115	115	1	648	846	Refurbish 27.8 miles Single Circuit Wood H-	

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to		Nominal Voltage in kV		# of	Thermal Ratings		Project Description / Conductor Size	Class Year / Type of Constructio n
							Operating	Design	ckt s	Summer	Winter		
												Frames on SE Batavia-Golah 119.	
	NGRID	Gardenville	Homer Hill	37.5	S	2031	115	115	2	649	788	Refurbish 37.5 miles double circuit Gardenville-Homer Hill 151/152l	
	NGRID	Gardenville	Homer Hill	37.5	S	2031	115	115	2	649	788	Refurbish 37.5 miles double circuit Gardenville-Homer Hill 151/152l	
	NGRID	Huntley	Gardenville	23.4	W	2031	115	115	2	731	887	Refurbish 23.4 miles double circuit on Huntley-Gardenville 38/39.	
	NGRID	Huntley	Gardenville	23.4	W	2031	115	115	2	731	887	Refurbish 23.4 miles double circuit on Huntley-Gardenville 38/39.	
3	NYPA	East Garden City	East Garden City	Shunt Reactor	In-Service	2021	345	345	1	N/A	N/A	Swap with the spare unit	
580	NYPA/NGRID	STAMP	STAMP	Substation	W	2023	345/115	345/115		500 MVA	500 MVA	Load Interconnection.	
566/6	NYPA	Moses	Adirondack	78	S	2023	230	345	2	1088	1329	Replace 78 miles of both Moses-Adirondack 1&2	
	NYPA	Moses	Moses	Circuit Breakers Replacements	W	2025	115/230	115/230		N/A	N/A	St. Lawrence Breaker Replacement 115 and 230 kV	
3	NYSEG	Willet	Willet	xfmr	In-Service	2021	115/34.5	115/34.5	1	39 MVA	44 MVA	Transformer #2	-
	NYSEG	Big Tree Road	Big Tree Road	Rebuild	W	2022	115	115				Station Rebuild	
	NYSEG	Wood Street	Wood Street	xfmr	W	2022	345/115	345/115	1	327 MVA	378 MVA	Transformer #3	-
	NYSEG	Coddington	E. Ithaca (to Coddington)	8.07	S	2024	115	115	1	307 MVA	307 MVA	665 ACCR	OH
	NYSEG	Fraser	Fraser	xfmr	S	2024	345/115	345/115	1	305 MVA	364 MVA	Transformer #2 and Station Reconfiguration	-
	NYSEG	Fraser 115	Fraser 115	Rebuild	S	2024	115	115		N/A	N/A	Station Rebuild to 4 bay BAAH	-

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to		Nominal Voltage in kV		# of ckts	Thermal Ratings		Project Description / Conductor Size	Class Year / Type of Construction
							Operating	Design		Summer	Winter		
	NYSEG	Delhi	Delhi	Removal	S	2024	115	115		N/A	N/A	Remove 115 substation and terminate existing lines to Fraser 115 (short distance)	
	NYSEG	Erie Street Rebuild	Erie Street Rebuild	Rebuild	S	2026	115	115				Station Rebuild	
	NYSEG	Gardenville	Gardenville	xfmr	S	2026	230/115	230/115	1	316 MVA	370 MVA	NYSEG Transformer #3 and Station Reconfiguration	-
	NYSEG	Meyer	Meyer	xfmr	W	2026	115/34.5	115/34.5	2	59.2MVA	66.9MVA	Transformer #2	-
7	O & R/ConEd	Ladentown	Buchanan	-9.5	S	2023	345	345	1	3000	3211	2-2493 ACAR	
7	O & R/ConEd	Ladentown	Lovett 345 kV Station (New Station)	5.5	S	2023	345	345	1	3000	3211	2-2493 ACAR	
7	O & R/ConEd	Lovett 345 kV Station (New Station)	Buchanan	4	S	2024	345	345	1	3000	3211	2-2493 ACAR	
	O & R	Lovett 345 kV Station (New Station)	Lovett	xfmr	S	2024	345/138	345/138	1	562 MVA	562 MVA	Transformer	
3	RGE	Station 262	Station 23	1.46	In-Service	2021	115	115	1	2008	2008	Underground Cable	
3	RGE	Station 33	Station 262	2.97	In-Service	2021	115	115	1	2008	2008	Underground Cable	
3	RGE	Station 262	Station 262	xfmr	In-Service	2018	115/34.5	115/34.5	1	58.8MVA	58.8MVA	Transformer	-
7	RGE	Station 168	Mortimer (NG Trunk #2)	26.4	W	2023	115	115	1	145 MVA	176 MVA	Station 168 Reinforcement Project	OH
7	RGE	Station 168	Elbridge (NG Trunk # 6)	45.5	W	2023	115	115	1	145 MVA	176 MVA	Station 168 Reinforcement Project	OH
	RGE	Station 127	Station 127	xfmr	W	2024	115/34.5	115/34.5	1	75MVA	75MVA	Transformer #2	-
	RGE	Station 418	Station 48	7.6	S	2026	115	115	1	175 MVA	225 MVA	New 115kV Line	OH
	RGE	Station 33	Station 251 (Upgrade Line #942)		S	2026	115	115	1	400MVA	400MVA	Line Upgrade	

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to		Nominal Voltage in kV		# of ckts	Thermal Ratings		Project Description / Conductor Size	Class Year / Type of Construction
							Operating	Design		Summer	Winter		
	RGE	Station 33	Station 251 (Upgrade Line #943)		S	2026	115	115	1	400MVA	400MVA	Line Upgrade	
	RGE	Station 82	Station 251 (Upgrade Line #902)		S	2028	115	115	1	400MVA	400MVA	Line Upgrade	
	RGE	Mortimer	Station 251 (Upgrade Line #901)	1.00	S	2028	115	115	1	400MVA	400MVA	Line Upgrade	

Notes

Number	Note
1	Line Length Miles: Negative values indicate removal of Existing Circuit being tapped
2	S = Summer Peak Period W = Winter Peak Period
3	Equipment (Transformers & Capacitor Banks) is retained on this list for one year after it goes in In-Service, and then it is deleted. A Transmission Line is reflected in Table VI, when it goes In-Service
4	Thermal Ratings in Amperes, except where labeled otherwise
5	Firm projects are those which have been reported by TOs as being sufficiently firm, and either (i) have an Operating Committee approved System Impact Study (if applicable) and, for projects subject to Article VII, have a determination from New York Public Service Commission that the Article VII application is in compliance with Public Service Law § 122, or (ii) is under construction and is scheduled to be in-service prior to June 1 of the current year.
6	Reconductoring of Existing Line
7	Segmentation of Existing Circuit
8	Deleted
9	Upgrade of existing 69 kV to 138 kV operation
10	Deleted
11	Upgrade of existing 69 kV to 115 kV operation
12	Deleted
13	Contingent on future generation resources
14	This transmission upgrade was identified as a System Deliverability Upgrade (SDU) in the Class Year 2011 Study process required to make certain interconnection projects fully deliverable in the Rest of State Capacity Region. Upon the completion of Class Year 2011, the security posted for the SDU constituted greater than 60% of the total estimated costs for the SDUs and thereby "triggered" the SDU for construction.
15	The Class Year Transmission Project, Q#631, includes an elective System Upgrade Facility, an Astoria-Rainey 345kV cable. The Class Year Transmission Project, Q#887, is a 250 MW uprate of Q#631 project.
16	Deleted
17	Deleted
18	This project has a System Reliability Impact Study that has been approved by the NYISO Operating Committee, and therefore is a potential candidate to enter the next Open Class Year study
19	These transmission projects are included in the FERC 715 Report models. Please see FERC 715 report for an explanation of the inclusion criteria.
20	Deleted

Figure 18: Updates to Local Transmission Plans Not Included in 2022 Load and Capacity Data Report

From Bus	To Bus	ID	Voltage (kV)	Project Description	Planned In-Service Date
Lockport	Mortimer	103/104	115	Reconductor/Reconfigure 4 spans of Lockport/Mortimer 103/104	8/2022
Lockport	Lockport	R264	115	Install R264 at Lockport for Line 108 and operate as alternate breaker for Line 108 at Lockport	1/2023

Figure 19: Additional Non-LTP Transmission Projects Included in RNA Base Case Not Listed in 2022 Load and Capacity Data Report

NYISO Interconnection Queue #	Project Name/(Owner)	Zone	Point of Interconnection	Type	COD or I/S Date	Summer Peak MW
631	NS Power Express	J	Hertel 735 kV (Quebec) - Astoria Annex 345 kV (NYC)	HVDC Transmission	12/2025	1,000
887	CH Uprate					250

Appendix D: Resource Adequacy Assumptions

2022 Q3 STAR MARS Assumptions Matrix

#	Parameter	2022 RNA (2022 Gold Book) Study Period: y4 (2026)-y10 (2032)	2022 Q3 STAR (2022 Gold Book, 2022 RNA Base Cases + updates) Study Period: y1 (2023)-y5 (2027)
Key Assumptions and Reports			
1	Links to Key Assumptions Presentations and Final Reports	March 1 **TPAS/ESPWG:** preliminary schedule March 24 **LFTF/ESPWG/TPAS:** Load Forecast, New Load Shapes, Scenarios April 1 TPAS/ESPWG: resource adequacy assumptions matrix, including preliminary topology, Inclusion Rules application April 21 LFTF: load forecast uncertainty presentation (LFU) April 26 **ESPWG/TPAS:** updated inclusion rules, updated scenarios, updated schedule May 5 TPAS/ESPWG and May 23 ESPWG/TPAS: RPP Manual and modeling improvements June 23 OC: RPP Manual redline for OC approval **July 1 TPAS/ESPWG:** 2022 RNA 1st pass results presentation [link], assumptions matrix [link] [link] August 1 TPAS/ESPWG: 2022 RNA Scenarios Results, Base Case updated results, as available **August 23 ESPWG/TPAS:** Draft 1 Report, Policy Case Scenario S2 for 2030 resource adequacy results, transmission security updated conclusion **September 1 TPAS/ESPWG:** Draft 2 RNA Report and Draft 1 Appendices **September 19 ESPWG/TPAS:** Draft 3 RNA Report excerpts and Draft 2 Appendices **October 3 TPAS/ESPWG:** Draft 4 RNA Report, Draft 3 Appendices, and findings presentation October OC and MC: RNA for vote November: NYISO Board Approval	July 26, 2022 ESPWG: **Q3 STAR Key Assumptions** STAR Reports, Notices: https://www.nyiso.com/short-term-reliability-process
Load Parameters			

#	Parameter	2022 RNA (2022 Gold Book) Study Period: y4 (2026)-y10 (2032)	2022 Q3 STAR (2022 Gold Book, 2022 RNA Base Cases + updates) Study Period: y1 (2023)-y5 (2027)
1	**Peak** Load Forecast	Adjusted 2022 Gold Book NYCA baseline peak load forecast. It includes five large loads from the NYISO interconnection queue, with forecasted impacts. The GB 2022 baseline peak load forecast includes the impact (reduction) of behind-the-meter (BtM) solar at the time of NYCA peak. For the BtM Solar adjustment, gross load forecasts that include the impact of the BtM generation will be used for the 2022 RNA, as provided by the Demand Forecasting Team which then allows for a discrete modeling of the BtM solar resources using 5 years of inverter data.	Same
2	Load **Shapes** (Multiple Load Shapes)	New Load Shapes *(see March 24 LFTF/ESPWG):* Used Multiple Load Shape MARS Feature 8,760-hour historical gross load shapes were used as base shapes for LFU bins: Load Bins 1 and 2: 2013 Load Bins 3 and 4: 2018 Load Bins 5 to 7: 2017 Peak adjustments on a seasonal basis to meet peak forecasts, while maintaining the energy target. For the BtM Solar adjustment, gross load forecasts that include the impact of the BtM generation will be used for the 2022 RNA, as provided by the Demand Forecasting Team	Same
3	Load Forecast Uncertainty (LFU) The LFU model captures the impacts of weather conditions on future loads.	2020 LFU Updated via Load Forecast Task Force (LFTF) process. Updated LFU values, *(as presented at the April 21, 2022 LFTF [link])*	Same
Generation Parameters			

#	Parameter	2022 RNA (2022 Gold Book) Study Period: y4 (2026)-y10 (2032)	2022 Q3 STAR (2022 Gold Book, 2022 RNA Base Cases + updates) Study Period: y1 (2023)-y5 (2027)
1	**Existing** Generating Unit Capacities *(e.g., thermal units, large hydro)*	2022 Gold Book values. Summer is min of (DMNC, CRIS). Winter is min of (DMNC, CRIS). Adjusted for RNA inclusion rules.	Same
2	**Proposed New Units Inclusion** Determination	2022 Gold Book with Inclusion Rules applied *See April 26, 2022 TPAS/ESPWG*	Same method, see Key Assumptions presentation
3	Retirement, Mothballed Units, IIFO	2022 Gold Book with Inclusion Rules applied *See April 26, 2022 TPAS/ESPWG*	Same method, see Key Assumptions presentation
4	Forced and Partial Outage Rates *(e.g., thermal units, large hydro)*	Five-year (2017-2021) GADS data for each unit represented. Those units with less than five years – use representative data. Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period. For new units or units that are in service for less than three years, NERC 5-year class average EFORd data are used.	Same
5	Planned Outages	Based on schedules received by the NYISO and adjusted for history	Same
6	Fixed and Unplanned Maintenance	Scheduled maintenance from Operations. Unplanned maintenance based on GADS data average maintenance time – average time in weeks is modeled.	Same
7	Summer Maintenance	None	Same
8	Combustion Turbine Derates	Derate based on temperature correction curves For new units: used data for a unit of same type in same zone, or neighboring zone data.	Same

#	Parameter	2022 RNA (2022 Gold Book) Study Period: y4 (2026)-y10 (2032)	2022 Q3 STAR (2022 Gold Book, 2022 RNA Base Cases + updates) Study Period: y1 (2023)-y5 (2027)
8	Existing Landfill Gas (LFG) Plants	Actual hourly plant output over the last 5 years. Program randomly selects an LFG shape of hourly production over the last 5 years for each model replication. Probabilistic model is incorporated based on five years of input shapes, with one shape per replication randomly selected in the Monte Carlo process.	Same
9	Existing **Wind** Units (>5 years of data)	Actual hourly plant output over the last 5 years (2017-2021). Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process.	Same
10	Existing **Wind** Units (<5 years of data)	For existing data, the available actual hourly plant output is used. For missing data, the nameplate normalized average of units in the same load zone is scaled by the unit's nameplate rating.	Same
11a	Proposed **Land based Wind** Units	Inclusion Rules Applied to determine the generator status. The nameplate normalized average of units in the same load zone is scaled by the unit's nameplate rating.	Same
11b	Proposed **Offshore Wind** Units	Inclusion Rules Applied to determine the generator status. Power curves based on 2008-2012 NREL from 3 different sites: NY Harbor, LI Shore, LI East, and GE updates of the NREL curves reflecting derates.	Same
12a	Existing **Utility-scale Solar Resources**	Inclusion Rules Applied to determine the generator status. Probabilistic model chooses from the production data output shapes covering the last 5 years. One shape per replication is randomly selected in Monte Carlo process.	Same
12b	Proposed **Utility-scale Solar Resources**	Inclusion Rules Applied to determine the generator status. The nameplate normalized average of units in the same load zone is scaled by the unit's nameplate rating.	Same

#	Parameter	2022 RNA (2022 Gold Book) Study Period: y4 (2026)-y10 (2032)	2022 Q3 STAR (2022 Gold Book, 2022 RNA Base Cases + updates) Study Period: y1 (2023)-y5 (2027)
13	Projected **BtM Solar Resources**	**Supply side:** Five years of 8,760 hourly MW profiles based on sampled inverter data The MARS random shape mechanism is used: one 8,760 hourly shape (of five) is randomly picked for each replication year. Similar with the past planning modeling and aligns with the method used for wind, utility solar, landfill gas, and run-of-river facilities. **Load side:** Gross load forecasts will be used for the 2022 RNA, as provided by the forecasting group.	Same
14	Existing **BTM-NG Program**	These are former load modifiers to sell capacity into the ICAP market. Modeled as cogen type 1 (or type 2 as applicable) unit in MARS. Unit capacity set to CRIS value, load modeled with weekly pattern that can change monthly.	Same
15	Existing **Small Hydro** Resources (*e.g.*, run-of-river)	Actual hourly plant output over the past 5 years period. Program randomly selects a hydro shape of hourly production over the 5-year window for each model replication. The randomly selected shape is multiplied by their current nameplate rating.	Same
16	Existing **Large Hydro**	Probabilistic Model based on 5 years of GADS data. Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period. Methodology consistent with thermal unit transition rates.	Same
17	Proposed front-of-meter **Battery Storage**	GE MARS ES model is used. Units are given a maximum capacity, maximum stored energy, and a dispatch window.	

#	Parameter	2022 RNA (2022 Gold Book) Study Period: y4 (2026)-y10 (2032)	2022 Q3 STAR (2022 Gold Book, 2022 RNA Base Cases + updates) Study Period: y1 (2023)-y5 (2027)
18	Existing Energy Limited Resources (**ELRs**)	New method: GE developed MARS functionality to be used for ELRs. Resource output is aligned with the NYISO's peak load window when most loss-of-load events are expected to occur.	Same
Transaction – Imports/ Exports			
1	Capacity Purchases	Grandfathered Rights and other awarded long-term rights Modeled using MARS explicit contracts feature.	Same
2	Capacity Sales	These are long-term contracts filed with FERC. Modeled using MARS explicit contracts feature. Contracts sold from ROS (Zones: A-F). ROS ties to external pool are derated by sales MW amount	Same
3	FCM Sales	Model sales for known years Modeled using MARS explicit contracts feature. Contracts sold from ROS (Zones: A-F). ROS ties to external pool are derated by sales MW amount	Same
4	UDRs	Updated with most recent elections/awards information (VFT, HTP, Neptune, CSC) Added CHPE HTP (from Hydro Quebec into Zone J) at 1250 MW (summer) starting 2026	Same

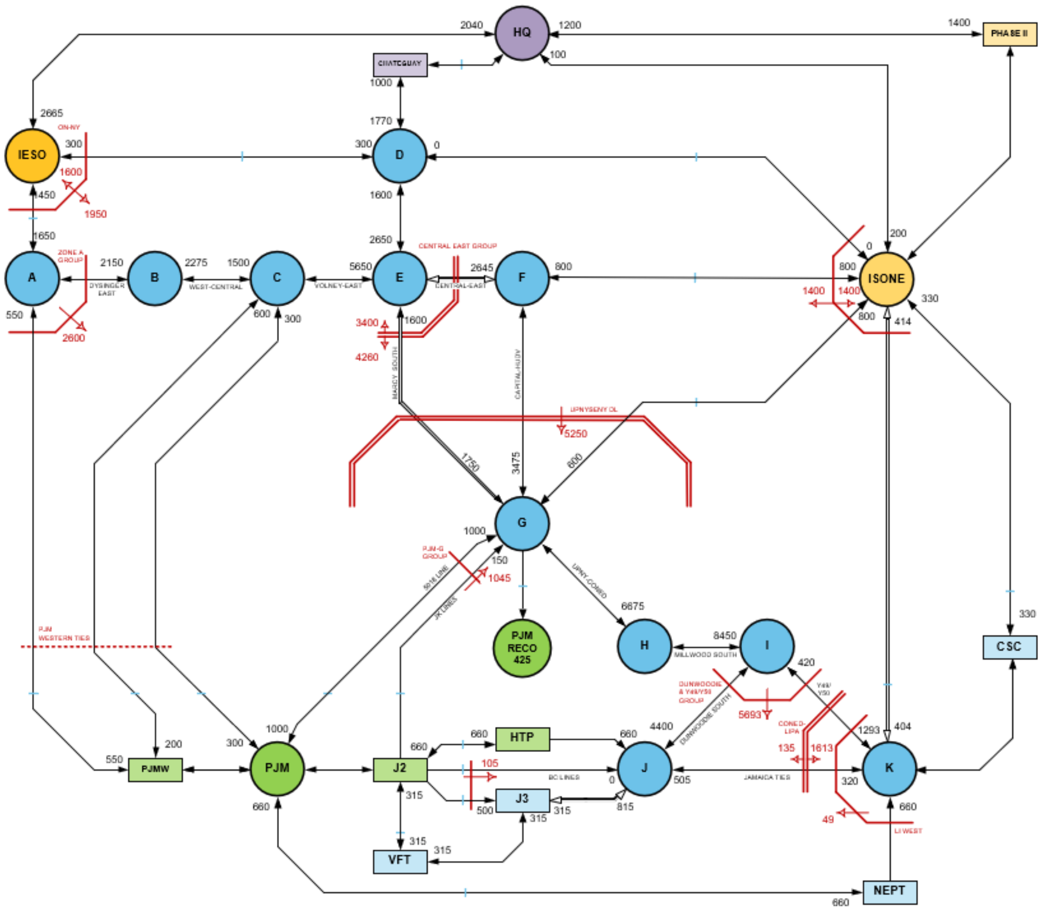
#	Parameter	2022 RNA (2022 Gold Book) Study Period: y4 (2026)-y10 (2032)	2022 Q3 STAR (2022 Gold Book, 2022 RNA Base Cases + updates) Study Period: y1 (2023)-y5 (2027)
5	External Deliverability Rights (EDRs)	**Cedars Uprate 80 MW**. Increased the HQ to D by 80 MW. Note: The Cedar bubble has been removed and its corresponding MW was reflected in HQ to D limit.	Same
6	Wheel-Through Contract	**300 MW HQ through NYISO to ISO-NE.** Modeled as firm contract. Reduced the transfer limit from HQ to NYISO by 300 MW and increased the transfer limit from NYISO to ISO-NE by 300 MW.	Same
MARS Topology: a simplified bubble-and-pipe representation of the transmission system			
1	Interface Limits	Developed by review of previous studies and specific analysis during the RNA study process.	Same
2	New Transmission	Based on TO- provided firm plans (via Gold Book 2020 process) and proposed merchant transmission; inclusion rules applied.	Same
3	AC Cable Forced Outage Rates	All existing cable transition rates updated with data received from ConEd and PSEG-LIPA to reflect most recent five-year history.	Same
4	UDR unavailability	Five-year history of forced outages	Same
5	Other	Topology changes summary, as compared with the 2021 -2030 CRP MARS topology: 1. Dysinger East and Group A limits decreased to reflect Large Loads in western NY (as forecasted in the 2022 Gold Book Table I-14 [link]	Same

#	Parameter	2022 RNA (2022 Gold Book) Study Period: y4 (2026)-y10 (2032)	2022 Q3 STAR (2022 Gold Book, 2022 RNA Base Cases + updates) Study Period: y1 (2023)-y5 (2027)
		2. West Central reverse emergency thermal limits increased mainly due to a rating increase on a limiting element – also as identified in the 2022 Operating Study 3. Ontario – NY updated per input from Ontario ISO 4. Added 1,250 MW (May through October) related with the HVDC from Quebec to New York City (Champlain Hudson project) starting 2026 5. Updated Long Island limits per PSEG-Long Island's input 6. Updated UPNY-ConEd to align with around 300 MW smaller delta associated in the 2021 Operations UPNY-ConEd Voltage Study with the status of the M51, M52, 71, 72 Series Rectors (assumed in service for this RNA)	
1	Special Case Resources (SCR)	SCRs sold for the program discounted to historic availability ("effective capacity"). Monthly variation based on historical experience. Summer values calculated from the latest available July registrations (July 2022 SCR enrollment) held constant for all years of study. Modeling 15 calls/year. Generation and load zonal MW are combined into one step.	Same
2	EDRP Resources	Not modeled: the values are less than 2 MW.	Same
3	Operating Reserves	655 MW 30-min reserve to zero 960 MW 10-min reserve to zero Note: the 10-min reserve modeling method is updated per NYISO's recommendation (approved at the May 4, 2022 NYSRC ICS [link]) to maintain (or no longer deplete/use) 350 MW of the 1,310 MW 10-min operating reserve at the applicable EOP step. Therefore, the 10-min operating reserve MARS EOP step will use, as needed each MARS replication: 960 MW (=1,310 MW–350 MW)	Same
4	Other EOPs *e.g., manual voltage reduction, voltage curtailments, public appeals, external assistance, as listed above*	Based on TO information, measured data, and NYISO forecasts. Used 2022 elections, as available	Same

#	Parameter	2022 RNA (2022 Gold Book) Study Period: y4 (2026)-y10 (2032)	2022 Q3 STAR (2022 Gold Book, 2022 RNA Base Cases + updates) Study Period: y1 (2023)-y5 (2027)
External Control Areas • The top three summer peak load days of an external Control Area is modeled as coincident with the NYCA top three peak load days. • Load and capacity fixed through the study years. • EOPs are not represented for the external Control Area capacity models. • External Areas adjusted to be between 0.1 and 0.15 days/year LOLE • Implemented a statewide emergency assistance (from the neighboring systems) limit of 3500 MW			
1	PJM	Simplified model: The 5 PJM MARS areas (bubbles) were consolidated into one starting 2020 RNA	Same
2	ISONE	Simplified model: The 8 ISO-NE MARS areas (bubbles) were consolidated into one starting 2020 RNA	Same
3	HQ	As per RNA Procedure External model (load, capacity, topology) provided by PJM/NPCC CP-8 WG. LOLE of pool adjusted to be between 0.10 and 0.15 days per year by adjusting capacity pro-rata in all areas.	
4	IESO	As per RNA procedure external model (load, capacity, topology) provided by PJM/NPCC CP-8 WG. LOLE of pool adjusted to be between 0.10 and 0.15 days per year by adjusting capacity pro-rata in all areas.	Same
5	Reserve Sharing	All NPCC Control Areas indicate that they will share reserves **equally** among all members before sharing with PJM.	Same
6	NYCA Emergency Assistance Limit	Implemented a statewide limit of **3,500 MW**	Same
Miscellaneous			
1	MARS Model Version	4.10.2035	Same

Resource Adequacy Topology from the 2022 Reliability Needs Assessment[22]

MARS Topology Study Year 1 (2023)



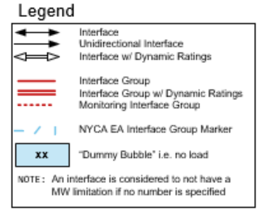
Notes

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

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

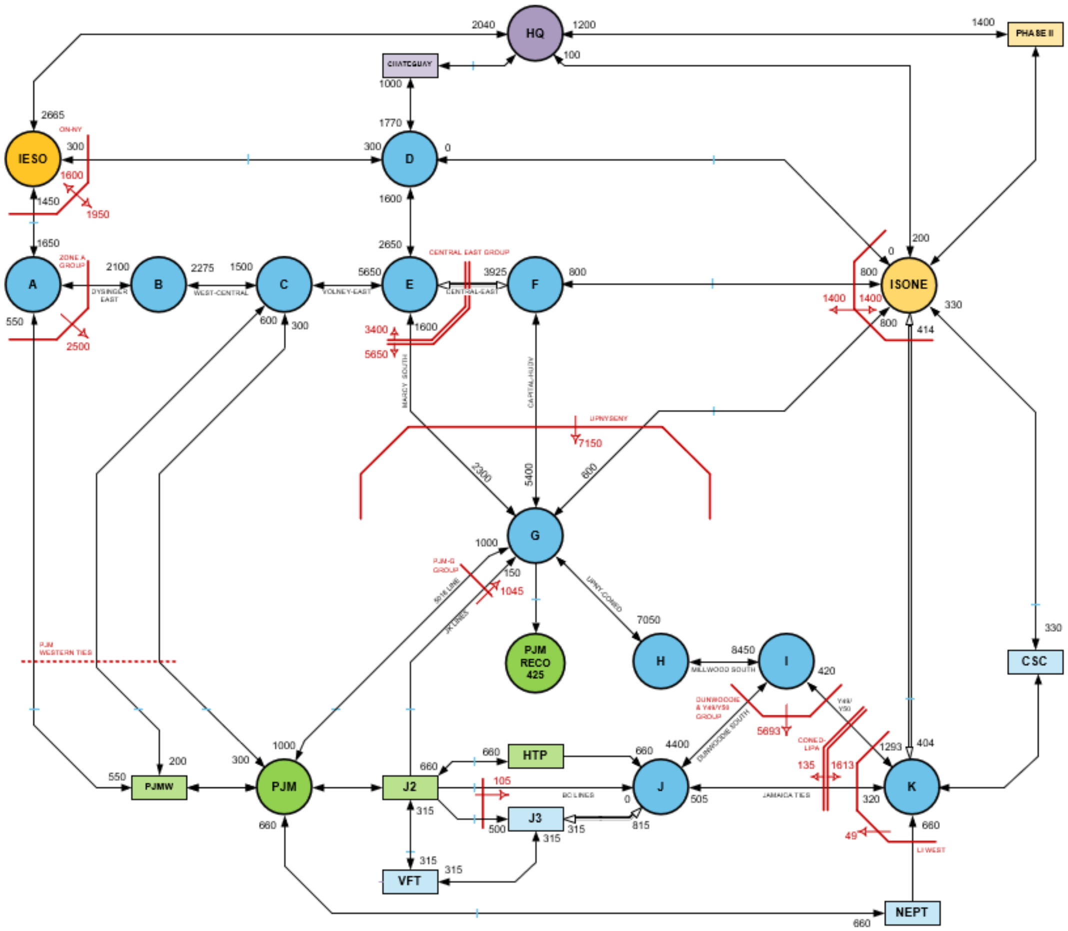
3. External areas representation based upon information received from the NPCC CP-8 WG

Legend



[22] This is the MARS topology used for 2022 Reliability Needs Assessment studies and is not fully re-evaluated for each quarterly STAR.

MARS Topology Study Year 2 (2024)



Notes

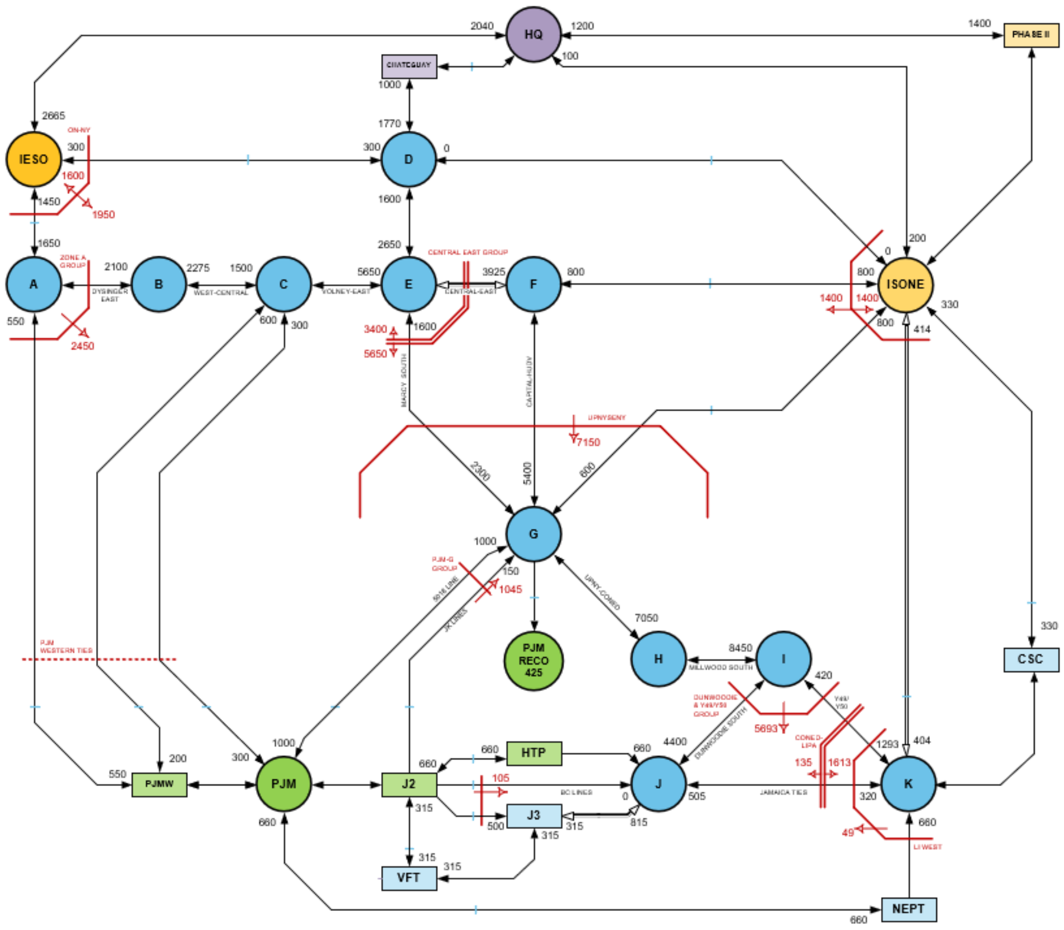
1. PJM to NY emergency assistance (EA) assumption for calculating the PJM-NY Western ties, PJM-G Group, and ABC Line Group flow distribution limit: 1500MW
2. NYCA EA simultaneous import limit: 3,500 MW
3. External areas representation based upon information received from the NPCC CP-8 WG

Legend

- Interface
- Unidirectional Interface
- Interface w/ Dynamic Ratings
- Interface Group
- Interface Group w/ Dynamic Ratings
- Monitoring Interface Group
- NYCA EA Interface Group Marker
- XX "Dummy Bubble" i.e. no load

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

MARS Topology Study Year 3 (2025)



Notes

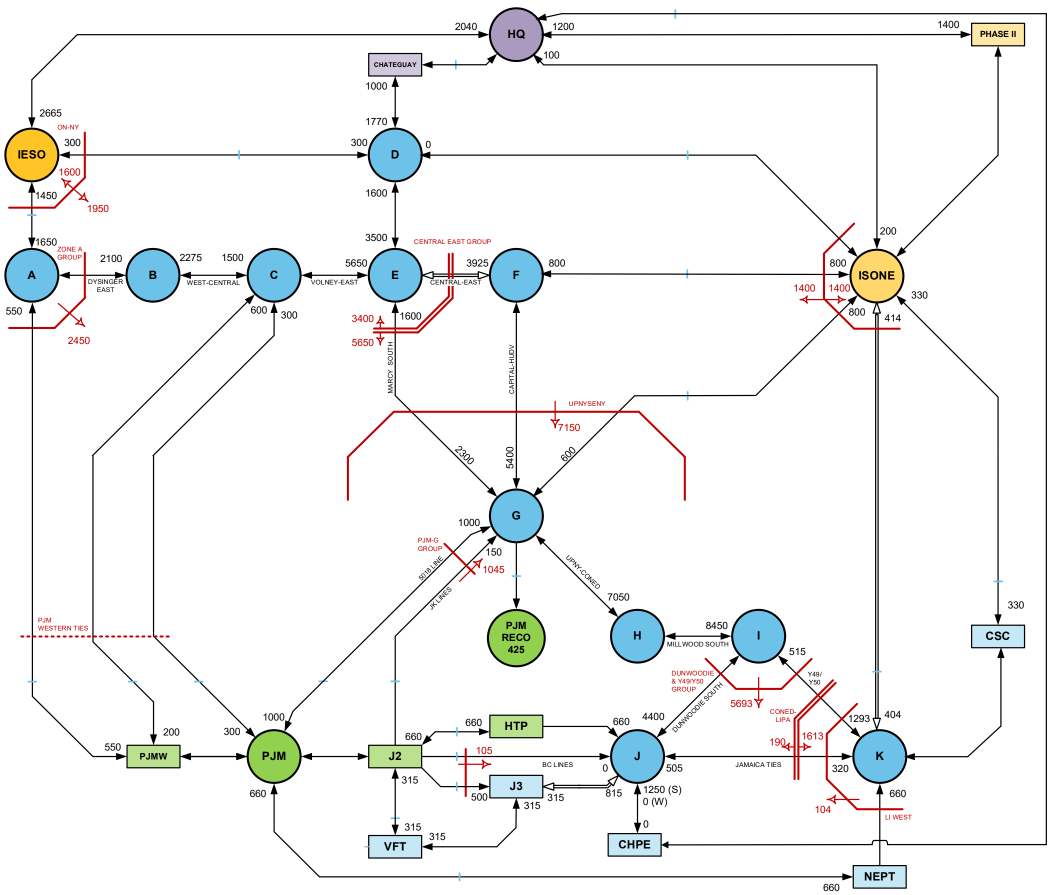
1. PJM to NY emergency assistance (EA) assumption for calculating the PJM-NY Western ties, PJM-G Group, and ABC Line Group flow distribution limit: 1500MW
2. NYCA EA simultaneous import limit: 3,500 MW
3. External areas representation based upon information received from the NPCC CP-8 WG

Legend

- Interface
- Unidirectional Interface
- Interface w/ Dynamic Ratings
- Interface Group
- Interface Group w/ Dynamic Ratings
- Monitoring Interface Group
- NYCA EA Interface Group Marker
- xx "Dummy Bubble" i.e. no load

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

MARS Topology Study Year 4-10 (2026-2032)



Notes

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

Legend

- Interface
- Unidirectional Interface
- Interface w/ Dynamic Ratings
- Interface Group
- Interface Group w/ Dynamic Ratings
- Monitoring Interface Group
- NYCA EA Interface Group Marker
- xx "Dummy Bubble" i.e. no load

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

Appendix E: Transmission Security Margins (Tipping Points)

Introduction

The purpose of this assessment is to identify plausible changes in conditions or assumptions that might adversely impact the reliability of the system. This assessment is performed using a deterministic approach through a spreadsheet-based method using input from the 2022 Load and Capacity Data Report (Gold Book) and the projects that meet the 2022 RNA base case inclusion rules with consideration of updates for the quarterly Short-Term Reliability Process. At the May 5, 2022[23] and May 23, 2022[24] joint meetings of the Transmission Planning Advisory Subcommittee and the Electric System Planning Working Group (TPAS/ESPWG), the NYISO discussed with stakeholders several enhancements to the reliability planning practices. The proposed changes to reliability planning practices include: (1) modeling intermittent resources according to their expected availability coincident with the represented system condition, (2) accounting for the availability of thermal generation based on NERC class average five-year outage rate data in transmission security assessments, (3) the ability to identify reliability needs through the spreadsheet-based method of calculating transmission security margins (a.k.a. "tipping points") within the Lower Hudson Valley (Zones G-J), New York City (Zone J), and Long Island (Zone K) localities, as well as other enhancements to reliability planning practices. At its June 23, 2022, meeting, the Operating Committee approved revisions to the Reliability Planning Process Manual that reflect these enhancements. For this assessment, the margins are evaluated statewide as well as Lower Hudson Valley, New York City, and Long Island localities.

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 are less than zero or when the statewide system margin is less than zero. Additional details regarding the impact of heatwave, extreme heatwave, or other scenario conditions are provided for informational purposes.

[23] https://www.nyiso.com/documents/20142/30451285/08_Reliability_Practices_TPAS-ESPWG_2022-05-05.pdf/

[24] https://www.nyiso.com/documents/20142/30860639/04%20Response%20to%20SHQuestions%20and%20Feedback%20on%202022%20RNA%202022%20Quarter%202%20STAR.pdf/

New York Control Area (NYCA) Statewide System Margins

The statewide system margin for the New York is evaluated under baseline expected weather for summer and winter conditions with normal transfer criteria. Under current applicable reliability rules and procedures, a Reliability Need would be identified when the statewide margin is negative for the base case assumptions (*i.e.*, baseline expected weather, normal transfer criteria). The statewide system margin is the ability to meet the forecasted load and largest loss-of-source contingency (*i.e.,* total capacity requirement) against the NYCA generation (including derates) and external area interchange. The NYCA generation (from line-item A) is comprised of the existing generation plus additions of future generation resources that meet the reliability planning process base case inclusion rules, as well as the removal of deactivating generation and peaker units. Consistent with current transmission planning practices for transmission security, the NYISO assumed the following for the summer capability period: (1) land-based wind generation is assumed at a 5% of nameplate output and off-shore wind is assumed at 10% of nameplate output, (2) run-of-river hydro is reduced consistent with its average capacity factor, and (3) wholesale solar generation is dispatched based on the ratio of behind-the-meter solar generation ("BtM-PV") BtM solar nameplate capacity and BtM-PV peak reductions stated in the 2022 Gold Book. For the winter capability period: (1) land-based wind generation is assumed at 10% of nameplate output and off-shore wind is 15% of nameplate output, (2) run-of-river hydro is reduced consistent with its average capacity factor, and (3) wholesale solar generation is dispatched at 0 MW for winter peak. Derates for thermal resources based on their NERC five-year class average EFORd are also included.[25] Additionally, the NYCA generation includes the Oswego export limit with all lines in service.

Transmission security analysis represents discrete snapshots in time of various credible combinations of system conditions. When reliability needs are identified, only the magnitude of the need is identified (*e.g.*, a thermal overload expressed in terms of percentage of the applicable rating) under the studied system conditions. Additional details are required to fully describe the nature of the need, such as evaluating the hourly load shape and its impact on the need. For example, in the 2020 Reliability Needs Assessment[26], there is information detailing various contingency combinations resulting in thermal overloads within New York City (*see, e.g.*, 2020 RNA Figure 26). To fully describe the nature of these needs, load-duration curves were developed for the transmission load areas in which needs were observed (*see, e.g.*, 2020 RNA Figure 27).

To describe the nature of the statewide system margins under expected summer peak, heatwave, and extreme heatwave conditions more fully, load shapes are developed to reflect the expected behavior of the

[25] NERC five-year class average EFORd data
[26] 2020 Reliability Needs Assessment

load over 24 hours on the summer peak day for the 10-year study horizon. Details of the load shapes are provided later in this appendix. For this assessment load shapes were not developed past 2032 and have only been developed for the summer condition.

Baseline peak forecasts and load shapes assume expected (approximately average) peak day weather. The heatwave and extreme heatwave conditions are defined by the 90th and 99th percentile summer peak forecasts documented in the Gold Book, respectively. The baseline and percentile summer peak forecasts utilize a cumulative temperature and humidity index, which reflects a weighted average of weather conditions on the peak day and the two preceding days and is based on the historical distribution of peak-day weather. The peak load forecasts incorporate the projected impacts of increasing temperature trends throughout the forecast horizon. In general, a heatwave (1-in-10-year or 90/10) has a statewide average maximum temperature of 95 degrees Fahrenheit. An extreme heatwave (1-in-100-year or 99/1) has a statewide average maximum temperature of 98 degrees Fahrenheit.

As shown in **Figure 20**, under summer peak baseline expected weather load, normal transfer criteria, the statewide system margin (line-item I) ranges between 952 MW in 2023 to 1,446 MW in 2032. The annual fluctuations are driven by the decreases in NYCA generation (line-item A) and in the load forecast (line-item F). An additional sensitivity evaluation shown in **Figure 20** is the impact of maintaining the full operating reserve within the NYCA (line-item K). The statewide system margin with full operating reserve is deficient in the first few years (2023 through 2025) under summer peak conditions until the CHPE project enters service by summer 2026.[27]

Utilizing the load shapes for the baseline expected weather summer peak day (**Figure 82**), the statewide system margin for each hour utilizing normal transfer criteria is shown in **Figure 21**. The statewide system margins for each hour are created by using the load forecast for each hour in the margin calculation (*e.g.*, **Figure 20** line-item F) with additional adjustments in NYCA generation to account for the appropriate derate for solar generation and energy limited resources in each hour (*e.g.*, **Figure 20** line-item B). All other values in the margin calculations are held constant. A graphical representation of the hourly margin for years 2023, 2025, 2027, and 2032 is shown in **Figure 22**. These years are selected due to the DEC Peaker Rule impacts in 2023 and 2025 along with the year 5 representation (2027) and the last year of the RNA study period (2032). For all years in the 10-year study horizon, there are no observed deficiencies considering the statewide coincident peak day load shape.

It is possible for other combinations of events, such as a 1-in-10-year heatwave[28] (“heatwave”) or 1-in-

[27] The CHPE project is currently planned to enter service in December 2025.

[28] The load forecast utilized for the heatwave condition is the 90th percentile (or 90/10) expected load forecast.

100-year extreme heatwave[29] ("extreme heatwave") to result in a deficient statewide system margin. **Figure 23** shows the statewide system margin for heatwave condition under the assumption that the system is using emergency transfer criteria. Although system transmission security is not currently designed under these conditions, **Figure 23** shows that insufficient margin exists for in the first few years (2023 through 2025) under summer peak conditions until the CHPE project is in-service (line-item J). In 2023, the system is deficient by 379 MW, which improves in 2024 to 52 MW. This reduction is primarily due to decreasing load forecast. In 2025, the margin decreases to 286 MW primarily due to the reduction in NYCA generation. In 2026, with CHPE in-service, the margin returns positive to 1,130 MW. However, by 2032 the margin narrows to 128 MW. Additionally, **Figure 23** also shows the statewide system margin with full operating reserve under heatwave conditions (line-item L). Under this sensitivity there is insufficient margin for all study years.

Utilizing the load shape for the 1-in-10-year heatwave (**Figure 87**), the statewide system margin for each hour utilizing emergency transfer criteria is shown in **Figure 24**. Under the 1-in-10-year heatwave conditions, the deficiency for the 1-in-10-year heatwave peak day in 2023 shown in **Figure 23** at the statewide coincident peak hour is 379 MW. **Figure 24** shows that the system is deficient in four hours with a total deficiency in the 24-hour period of 1,429 MWh. In 2024, the deficiency of 52 MW is only for one hour. In 2025, the deficiency lasts for three hours (604 MWh). For years 2026 through 2032 the margin curve for each hour remains sufficient. **Figure 25** provides a graphical representation of the statewide system margin curve for heatwave conditions for the heatwave peak day in summers 2023, 2025, 2027, and 2032.

For the statewide system margin in a 1-in-100-year extreme heatwave, **Figure 26** shows that there is insufficient statewide system margin as early as 2023 by 2,288 MW (line-item J). The margin improves in summer 2026 with CHPE in-service; however, the margins remain deficient. In 2026 the deficiency is 735 MW. By 2032, the deficiency increases to 1,775 MW. These issues are exacerbated with consideration of full operating reserve (line-item L).

Utilizing the load shape for the 1-in-100-year extreme heatwave (**Figure 92**), the statewide system margin for each hour utilizing emergency transfer criteria is shown in **Figure 27**. Under the 1-in-100-year extreme heatwave conditions, the deficiency for the extreme heatwave day in summer 2023 shown in **Figure 26** as 2,288 MW is seen over ten hours (14,438 MWh). With the in-service status of CHPE by summer 2026, the deficiency observed for the extreme heatwave day in summer 2026 improves to three hours (1,911 MWh). By 2032, the extreme heatwave days deficiency increases to seven hours (7,510

[29] The load forecast utilized for the extreme heatwave condition is the 99th percentile (or 99/1) expected load forecast.

MWh). **Figure 28** provides a graphical representation of the statewide system margin curve for heatwave conditions for the peak day in years 2023, 2025, 2027, and 2032.

Figure 29 shows the statewide system margin under winter peak baseline expected weather load condition using normal transfer criteria. For winter peak, the statewide system margin ranges from 9,916 MW in winter 2023-24 to 4,219 MW in winter 2032-33 (line-item J). Under the additional sensitivity evaluation of maintaining the full operating reserve in the NYCA shown in **Figure 29** all years are also shown to be sufficient.

Cold snap and extreme cold snap conditions are defined by the 90th and 99th percentile winter peak forecasts, respectively, which are documented in the 2022 Gold Book. The baseline and percentile winter peak forecasts utilize the historical distribution of winter peak day temperature. In general, a cold snap (1-in-10-year or 90/10) reflects a statewide daily average temperature of 6 degrees Fahrenheit. An extreme cold snap (1-in-100-year or 99/1) reflects a statewide daily average temperature of 0 degrees Fahrenheit.

Figure 30 shows the statewide system margin in a 1-in-10-year cold snap ("cold snap") utilizing emergency transfer criteria.[30] Under this condition the margin is sufficient for all study years (line-item J) and ranges from 9,154 MW in winter 2023-24 to 3,165 MW in winter 2032-33. Additionally, **Figure 30** shows the statewide system margin with full operating reserve which is also sufficient for all study years.

Figure 31 shows the statewide system margin in a 1-in-100-year extreme cold snap ("extreme cold snap") utilizing emergency transfer criteria.[31] Under this condition the margin is sufficient for all study years (line-item J) and ranges from 7,838 MW in winter 2023-24 to 1,541 MW in winter 2032-33. Additionally, **Figure 31** shows the statewide system margin with full operating reserve which is also sufficient for all study years (line-item L).

Figure 32 provides a summary of the summer peak statewide system margins under expected weather, heatwave, and extreme heatwave conditions. **Figure 33** provides a summary of the winter peak statewide system margins under expected weather, cold snap, and extreme cold snap conditions.

[30] The load forecast utilized for the cold snap condition is the winter 90th percentile (or 90/10) expected load forecast.
[31] The load forecast utilized for the extreme cold snap condition is the winter 99th percentile (or 99/1) expected load forecast.

Figure 20: Statewide System Margin (Summer Peak - Baseline Expected Weather, Normal Transfer Criteria)

Line	Item	Summer Peak - Baseline Expected Summer Weather, Normal Transfer Criteria (MW)									
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	NYCA Generation (1)	38,258	38,942	38,433	38,433	38,433	38,433	38,433	38,433	38,433	38,433
B	NYCA Generation Derates (2)	(5,822)	(6,438)	(6,463)	(6,476)	(6,490)	(6,503)	(6,516)	(6,530)	(6,543)	(6,557)
C	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
D	External Area Interchanges (3)	1,844	1,844	1,844	3,094	3,094	3,094	3,094	3,094	3,094	3,094
E	**Total Resources (A+B+C+D)**	34,280	34,348	33,814	35,051	35,038	35,024	35,011	34,997	34,984	34,970
F	Load Forecast	(32,018)	(31,778)	(31,505)	(31,339)	(31,292)	(31,317)	(31,468)	(31,684)	(31,946)	(32,214)
G	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
H	**Total Capability Requirement (F+G)**	(33,328)	(33,088)	(32,815)	(32,649)	(32,602)	(32,627)	(32,778)	(32,994)	(33,256)	(33,524)
I	**Statewide System Margin (E+H)**	952	1,260	999	2,402	2,436	2,397	2,233	2,003	1,728	1,446
J	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
K	**Statewide System Margin with Full Operating Reserve (I+J) (4)**	(358)	(50)	(311)	1,092	1,126	1,087	923	693	418	136

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Interchanges are based on ERAG MMWG values.
4. For informational purposes.

Figure 21: Statewide System Margin (Hourly) (Summer Peak - Baseline Expected Weather, Normal Transfer Criteria)

Summer Peak - Baseline Expected Summer Weather, Normal Transfer Criteria (MW)										
Statewide System Margin										
Hour	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
HB0	7,474	7,518	7,005	8,210	8,117	7,984	7,765	7,470	7,127	6,784
HB1	7,384	7,437	6,935	8,153	8,077	7,963	7,767	7,504	7,195	6,887
HB2	8,162	8,219	7,722	8,949	8,885	8,785	8,610	8,372	8,095	7,819
HB3	8,594	8,655	8,165	9,402	9,349	9,264	9,106	8,894	8,646	8,399
HB4	8,625	8,693	8,213	9,462	9,425	9,360	9,225	9,046	8,837	8,629
HB5	8,110	8,198	7,735	9,004	8,985	8,937	8,819	8,657	8,463	8,266
HB6	7,107	7,281	6,894	8,235	8,280	8,293	8,227	8,105	7,943	7,765
HB7	6,784	7,104	6,841	8,289	8,435	8,536	8,543	8,472	8,339	8,181
HB8	5,704	6,164	6,007	7,540	7,760	7,923	7,971	7,914	7,767	7,585
HB9	4,729	5,315	5,251	6,859	7,148	7,371	7,467	7,438	7,304	7,124
HB10	3,562	4,260	4,282	5,960	6,315	6,595	6,739	6,742	6,626	6,457
HB11	2,534	3,309	3,392	5,123	5,529	5,859	6,046	6,089	6,006	5,865
HB12	1,743	2,558	2,679	4,433	4,861	5,211	5,414	5,479	5,417	5,299
HB13	1,461	1,679	1,793	3,536	3,953	4,296	4,489	4,554	4,502	4,397
HB14	1,742	1,884	1,936	3,384	3,742	4,031	3,372	3,398	3,322	3,203
HB15	1,363	1,398	1,369	2,974	3,256	3,475	3,073	3,046	2,933	2,787
HB16	1,182	1,672	967	2,492	2,693	2,837	2,255	2,173	2,021	1,845
HB17	952	1,260	999	2,402	2,485	2,516	2,414	2,347	2,130	1,899
HB18	535	1,342	1,008	2,347	2,436	2,397	2,233	2,003	1,728	1,446
HB19	464	1,772	1,364	2,646	2,616	2,543	2,355	2,106	1,815	1,522
HB20	910	1,013	1,160	2,657	2,610	2,523	2,912	2,655	2,354	2,054
HB21	1,747	1,842	1,390	2,645	2,594	2,502	2,784	2,524	2,220	1,913
HB22	2,807	2,882	2,405	3,639	3,567	3,453	4,044	3,759	3,423	3,086
HB23	4,513	4,575	4,075	5,293	5,211	5,087	4,873	4,578	4,233	3,886

Figure 22: Statewide System Margin Hourly Curve (Summer Peak - Baseline Expected Weather, Normal Transfer Criteria)

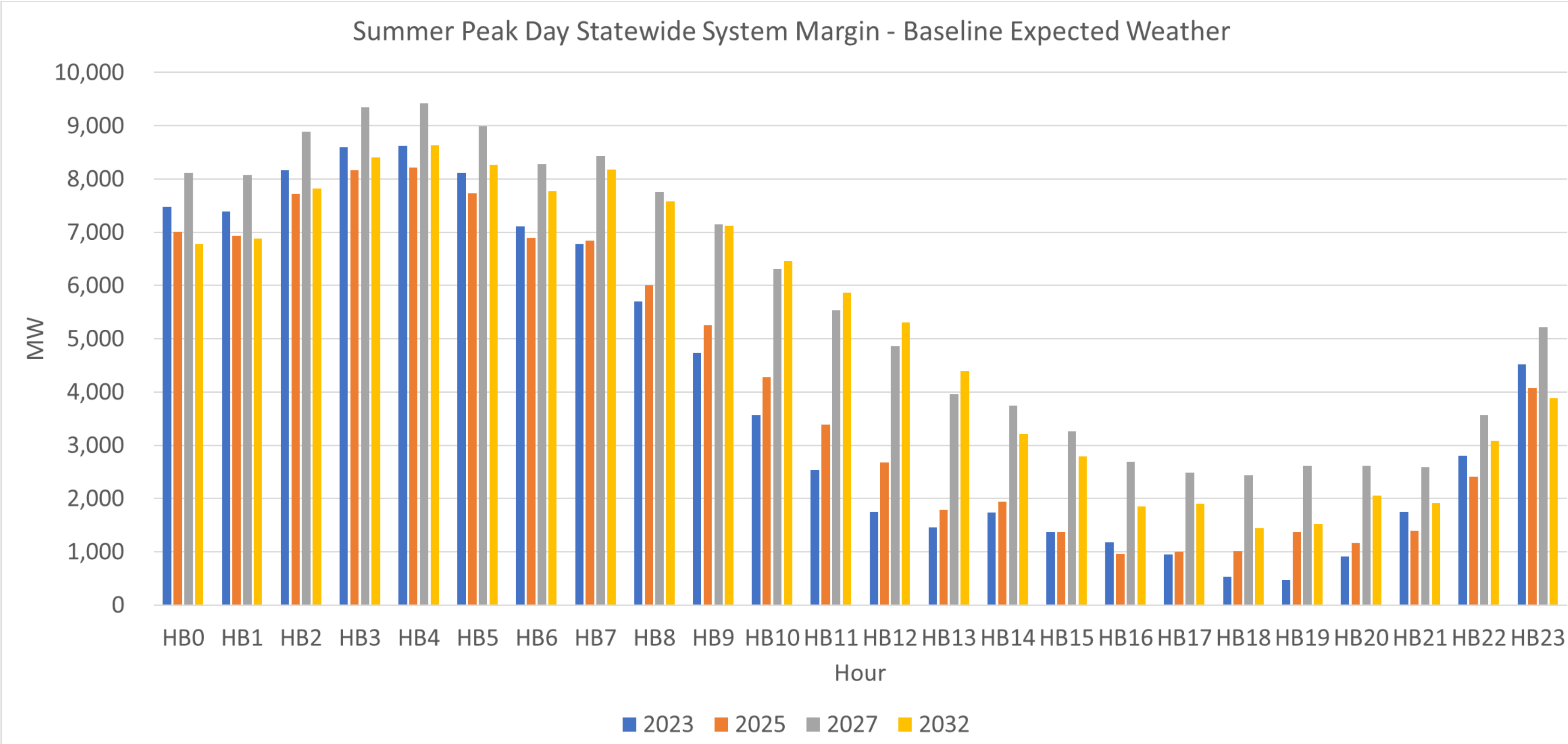


Figure 23: Statewide System Margin (1-in-10-Year Heatwave, Emergency Transfer Criteria)

Line	Item	Summer Peak - 1-in-10-Year Heatwave, Emergency Transfer Criteria (MW)									
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	NYCA Generation (1)	38,258	38,942	38,433	38,433	38,433	38,433	38,433	38,433	38,433	38,433
B	NYCA Generation Derates (2)	(5,822)	(6,438)	(6,463)	(6,476)	(6,490)	(6,503)	(6,516)	(6,530)	(6,543)	(6,557)
C	Temperature Based Generation Derates	(193)	(193)	(184)	(184)	(184)	(184)	(184)	(184)	(184)	(184)
D	External Area Interchanges (3)	1,844	1,844	1,844	3,094	3,094	3,094	3,094	3,094	3,094	3,094
E	SCRs (4), (5)	860	860	860	860	860	860	860	860	860	860
F	**Total Resources (A+B+C+D+E)**	34,947	35,016	34,491	35,728	35,714	35,701	35,687	35,674	35,660	35,647
G	Load Forecast	(34,016)	(33,758)	(33,467)	(33,288)	(33,238)	(33,263)	(33,422)	(33,649)	(33,926)	(34,209)
H	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
I	**Total Capability Requirement (G+H)**	(35,326)	(35,068)	(34,777)	(34,598)	(34,548)	(34,573)	(34,732)	(34,959)	(35,236)	(35,519)
J	**Statewide System Margin (F+I)**	(379)	(52)	(286)	1,130	1,166	1,128	955	715	424	128
K	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
L	**Statewide System Margin with Full Operating Reserve (J+K)**	(1,689)	(1,362)	(1,596)	(180)	(144)	(182)	(355)	(595)	(886)	(1,182)

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Interchanges are based on ERAG MMWG values.
4. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
5. Includes a de-rate of 364 MW for SCRs.

Figure 24: Statewide System Margin (Hourly) (1-in-10-Year Heatwave, Emergency Transfer Criteria)

Summer Peak - Heatwave, Emergency Transfer Criteria (MW)										
Statewide System Margin										
Hour	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
HB0	5,254	5,306	4,808	6,017	5,899	5,729	5,473	5,157	4,804	4,452
HB1	5,287	5,347	4,859	6,081	5,980	5,828	5,595	5,309	4,991	4,674
HB2	6,108	6,176	5,698	6,932	6,846	6,713	6,503	6,247	5,965	5,683
HB3	6,588	6,661	6,190	7,435	7,360	7,242	7,050	6,821	6,568	6,316
HB4	6,655	6,736	6,273	7,530	7,470	7,371	7,202	7,005	6,791	6,577
HB5	6,105	6,211	5,772	7,055	7,019	6,944	6,797	6,623	6,431	6,234
HB6	5,007	5,197	4,834	6,189	6,218	6,203	6,107	5,974	5,811	5,634
HB7	4,671	4,988	4,729	6,171	6,279	6,333	6,290	6,188	6,035	5,856
HB8	3,697	4,150	3,994	5,516	5,696	5,806	5,802	5,709	5,539	5,333
HB9	2,821	3,399	3,335	4,931	5,179	5,349	5,392	5,326	5,167	4,963
HB10	1,829	2,513	2,532	4,194	4,504	4,728	4,814	4,777	4,632	4,435
HB11	1,198	1,956	2,030	3,739	4,094	4,361	4,486	4,482	4,365	4,190
HB12	648	1,444	1,552	3,283	3,652	3,930	4,059	4,068	3,967	3,810
HB13	567	767	873	2,595	2,950	3,214	3,328	3,335	3,244	3,101
HB14	714	846	898	2,333	2,629	2,839	2,099	2,070	1,958	1,804
HB15	139	174	153	1,754	1,978	2,118	1,636	1,560	1,418	1,244
HB16	(58)	436	(257)	1,266	1,406	1,466	797	662	481	277
HB17	(379)	(52)	(286)	1,130	1,166	1,128	955	850	619	375
HB18	(576)	248	(61)	1,289	1,330	1,221	984	715	424	128
HB19	(416)	905	521	1,813	1,740	1,602	1,349	1,063	757	450
HB20	158	275	441	1,946	1,860	1,714	2,045	1,754	1,441	1,126
HB21	1,138	1,231	783	2,029	1,929	1,771	1,987	1,683	1,353	1,020
HB22	2,389	2,456	1,975	3,194	3,073	2,895	3,421	3,091	2,726	2,359
HB23	4,281	4,327	3,819	5,018	4,887	4,702	4,427	4,088	3,710	3,331

Figure 25: Statewide System Margin Hourly Curve (1-in-10-Year Heatwave, Emergency Transfer Criteria)

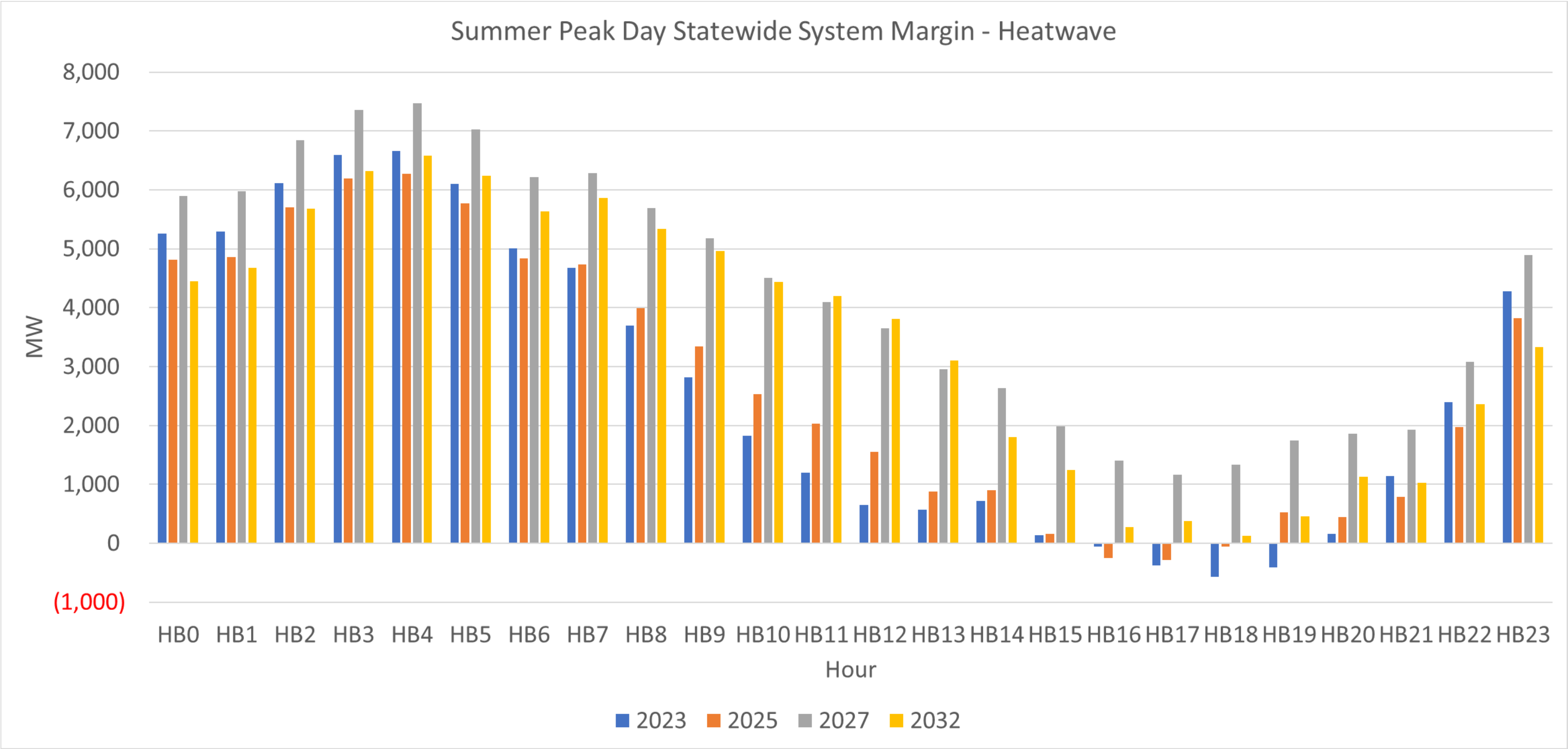


Figure 26: Statewide System Margin (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

Line	Item	Summer Peak - 1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria (MW)									
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	NYCA Generation (1)	38,258	38,942	38,433	38,433	38,433	38,433	38,433	38,433	38,433	38,433
B	NYCA Generation Derates (2)	(5,822)	(6,438)	(6,463)	(6,476)	(6,490)	(6,503)	(6,516)	(6,530)	(6,543)	(6,557)
C	Temperature Based Generation Derates	(405)	(405)	(386)	(386)	(386)	(386)	(386)	(386)	(386)	(386)
D	External Area Interchanges (3)	1,844	1,844	1,844	3,094	3,094	3,094	3,094	3,094	3,094	3,094
E	SCRs (4), (5)	860	860	860	860	860	860	860	860	860	860
F	**Total Resources (A+B+C+D+E)**	34,735	34,804	34,289	35,526	35,512	35,499	35,485	35,472	35,458	35,445
G	Load Forecast	(35,713)	(35,443)	(35,138)	(34,951)	(34,897)	(34,921)	(35,088)	(35,326)	(35,617)	(35,910)
H	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
I	**Total Capability Requirement (G+H)**	(37,023)	(36,753)	(36,448)	(36,261)	(36,207)	(36,231)	(36,398)	(36,636)	(36,927)	(37,220)
J	**Statewide System Margin (F+I)**	(2,288)	(1,949)	(2,159)	(735)	(695)	(732)	(913)	(1,164)	(1,469)	(1,775)
K	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
L	**Statewide System Margin with Full Operating Reserve (J+K)**	(3,598)	(3,259)	(3,469)	(2,045)	(2,005)	(2,042)	(2,223)	(2,474)	(2,779)	(3,085)

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Interchanges are based on ERAG MMWG values.
4. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
5. Includes a de-rate of 364 MW for SCRs.

Figure 27: Statewide System Margin (Hourly) (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

Summer Peak - 1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria (MW)										
Statewide System Margin										
Hour	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
HB0	4,193	4,251	3,770	4,983	4,868	4,698	4,438	4,117	3,756	3,399
HB1	4,226	4,292	3,821	5,047	4,949	4,797	4,560	4,269	3,943	3,621
HB2	5,047	5,121	4,660	5,898	5,815	5,682	5,468	5,207	4,917	4,630
HB3	5,527	5,606	5,152	6,401	6,329	6,211	6,015	5,781	5,520	5,263
HB4	5,594	5,681	5,235	6,496	6,439	6,340	6,167	5,965	5,743	5,524
HB5	5,044	5,156	4,734	6,021	5,988	5,913	5,762	5,583	5,383	5,181
HB6	3,946	4,142	3,796	5,155	5,187	5,172	5,072	4,934	4,763	4,581
HB7	3,610	3,933	3,691	5,137	5,248	5,302	5,255	5,148	4,987	4,803
HB8	2,636	3,095	2,956	4,482	4,665	4,775	4,767	4,669	4,491	4,280
HB9	1,760	2,344	2,297	3,897	4,148	4,318	4,357	4,286	4,119	3,910
HB10	768	1,458	1,494	3,160	3,473	3,697	3,779	3,737	3,584	3,382
HB11	137	901	992	2,705	3,063	3,330	3,451	3,442	3,317	3,137
HB12	(582)	221	347	2,083	2,455	2,733	2,858	2,860	2,750	2,587
HB13	(833)	(625)	(499)	1,229	1,587	1,851	1,960	1,959	1,858	1,708
HB14	(855)	(714)	(640)	800	1,100	1,310	564	527	404	242
HB15	(1,600)	(1,555)	(1,553)	56	283	424	(65)	(152)	(306)	(489)
HB16	(1,967)	(1,461)	(2,130)	(599)	(455)	(394)	(1,071)	(1,217)	(1,412)	(1,626)
HB17	(2,288)	(1,949)	(2,159)	(735)	(695)	(732)	(913)	(1,029)	(1,274)	(1,528)
HB18	(2,485)	(1,649)	(1,934)	(576)	(531)	(639)	(884)	(1,164)	(1,469)	(1,775)
HB19	(2,155)	(824)	(1,185)	115	45	(92)	(352)	(649)	(967)	(1,283)
HB20	(1,411)	(1,285)	(1,097)	413	331	185	510	211	(113)	(436)
HB21	(262)	(161)	(589)	663	566	408	619	307	(33)	(373)
HB22	1,159	1,233	770	1,994	1,876	1,698	2,220	1,883	1,509	1,136
HB23	3,220	3,272	2,781	3,984	3,856	3,671	3,392	3,048	2,662	2,278

Figure 28: Statewide System Margin Hourly Curve (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

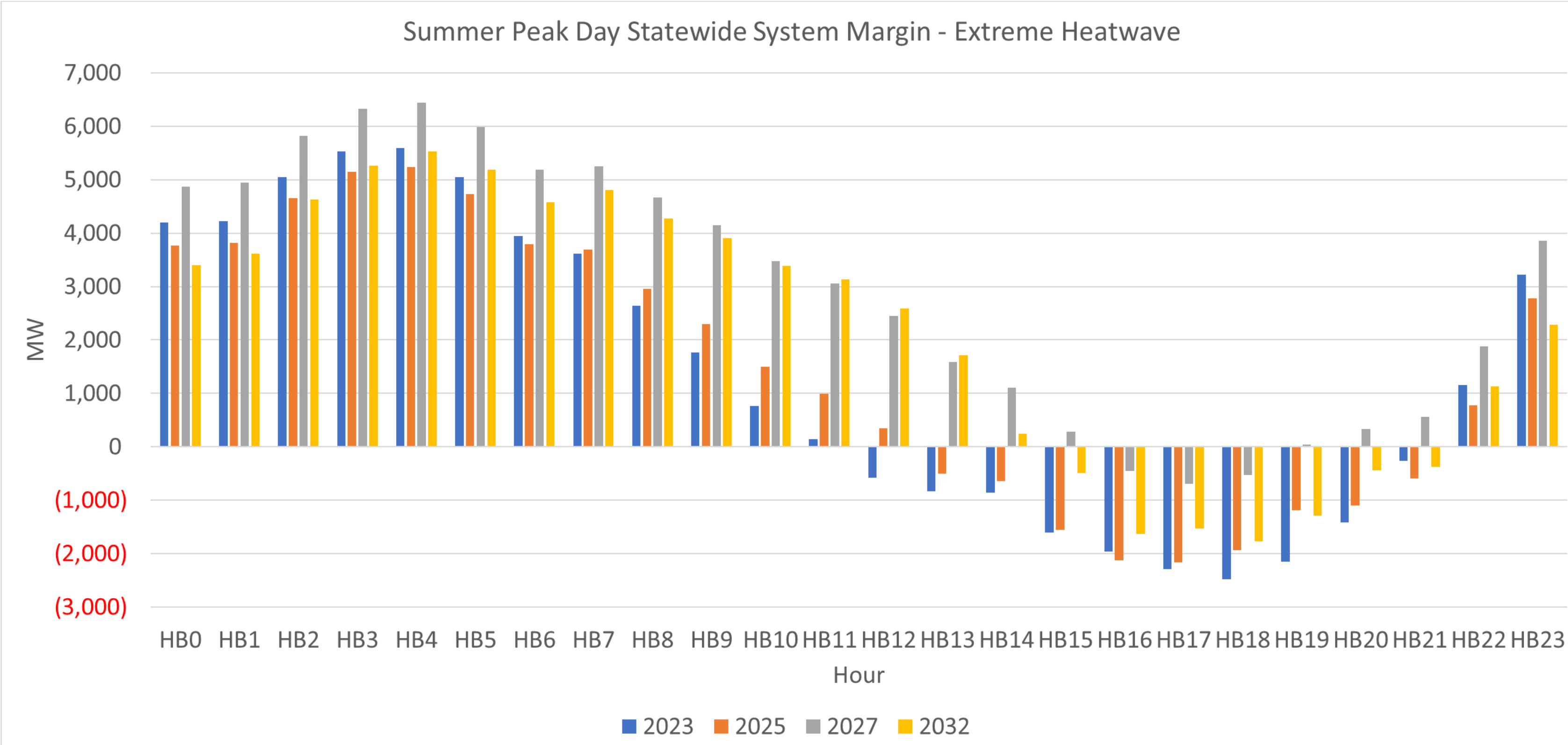


Figure 29: Statewide System Margin (Winter Peak - Baseline Expected Weather, Normal Transfer Criteria)

Line	Item	Winter Peak - Baseline Expected Winter Weather, Normal Transfer Criteria (MW)									
		2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33
A	NYCA Generation (1)	41,224	41,314	41,280	41,280	41,280	41,280	41,280	41,280	41,280	41,280
B	NYCA Generation Derates (2)	(6,978)	(7,069)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)
C	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
D	External Area Interchanges (3)	1,268	1,268	1,268	1,268	1,268	1,268	1,268	1,268	1,268	1,268
E	**Total Resources (A+B+C+D)**	35,513	35,513	35,483	35,483	35,483	35,483	35,483	35,483	35,483	35,483
F	Load Forecast	(24,287)	(24,481)	(24,735)	(25,098)	(25,575)	(26,171)	(26,884)	(27,719)	(28,756)	(29,954)
G	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
H	**Total Capability Requirement (F+G)**	(25,597)	(25,791)	(26,045)	(26,408)	(26,885)	(27,481)	(28,194)	(29,029)	(30,066)	(31,264)
I	**Statewide System Margin (E+H)**	9,916	9,722	9,438	9,075	8,598	8,002	7,289	6,454	5,417	4,219
J	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
K	**Statewide System Margin with Full Operating Reserve (I+J) (4)**	8,606	8,412	8,128	7,765	7,288	6,692	5,979	5,144	4,107	2,909

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Interchanges are based on ERAG MMWG values.
4. For informational purposes.

Figure 30: Statewide System Margin (1-in-10-Year Cold Snap, Emergency Transfer Criteria)

Line	Item	Winter Peak - 1-in-10-Year Cold Snap, Emergency Transfer Criteria (MW)									
		2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33
A	NYCA Generation (1)	41,224	41,314	41,280	41,280	41,280	41,280	41,280	41,280	41,280	41,280
B	NYCA Generation Derates (2)	(6,978)	(7,069)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)
C	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
D	External Area Interchanges (3)	1,268	1,268	1,268	1,268	1,268	1,268	1,268	1,268	1,268	1,268
E	SCRs (4), (5)	486	486	486	486	486	486	486	486	486	486
F	**Total Resources (A+B+C+D+E)**	35,999	35,999	35,969	35,969	35,969	35,969	35,969	35,969	35,969	35,969
G	Load Forecast	(25,535)	(25,739)	(26,007)	(26,388)	(26,891)	(27,518)	(28,266)	(29,144)	(30,237)	(31,494)
H	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
I	**Total Capability Requirement (G+H)**	(26,845)	(27,049)	(27,317)	(27,698)	(28,201)	(28,828)	(29,576)	(30,454)	(31,547)	(32,804)
J	**Statewide System Margin (F+I)**	9,154	8,950	8,652	8,271	7,768	7,141	6,393	5,515	4,422	3,165
K	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
L	**Statewide System Margin with Full Operating Reserve (J+K)**	7,844	7,640	7,342	6,961	6,458	5,831	5,083	4,205	3,112	1,855

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Interchanges are based on ERAG MMWG values.
4. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
5. Includes a de-rate of 211 MW for SCRs.

Figure 31: Statewide System Margin (1-in-100-Year Extreme Cold Snap, Emergency Transfer Criteria)

Line	Item	Winter Peak - 1-in-100-Year Extreme Cold Snap, Emergency Transfer Criteria (MW)									
		2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33
A	NYCA Generation (1)	41,224	41,314	41,280	41,280	41,280	41,280	41,280	41,280	41,280	41,280
B	NYCA Generation Derates (2)	(6,978)	(7,069)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)	(7,065)
C	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
D	External Area Interchanges (3)	1,268	1,268	1,268	1,268	1,268	1,268	1,268	1,268	1,268	1,268
E	SCRs (4), (5)	486	486	486	486	486	486	486	486	486	486
F	**Total Resources (A+B+C+D+E)**	35,999	35,999	35,969	35,969	35,969	35,969	35,969	35,969	35,969	35,969
G	Load Forecast	(26,851)	(27,069)	(27,351)	(27,750)	(28,276)	(28,936)	(29,723)	(30,647)	(31,794)	(33,118)
H	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
I	**Total Capability Requirement (G+H)**	(28,161)	(28,379)	(28,661)	(29,060)	(29,586)	(30,246)	(31,033)	(31,957)	(33,104)	(34,428)
J	**Statewide System Margin (F+I)**	7,838	7,620	7,308	6,909	6,383	5,723	4,936	4,012	2,865	1,541
K	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
L	**Statewide System Margin with Full Operating Reserve (J+K)**	6,528	6,310	5,998	5,599	5,073	4,413	3,626	2,702	1,555	231

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Interchanges are based on ERAG MMWG values.
4. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
5. Includes a de-rate of 211 MW for SCRs.

Figure 32: Summary of Statewide System Margin – Summer

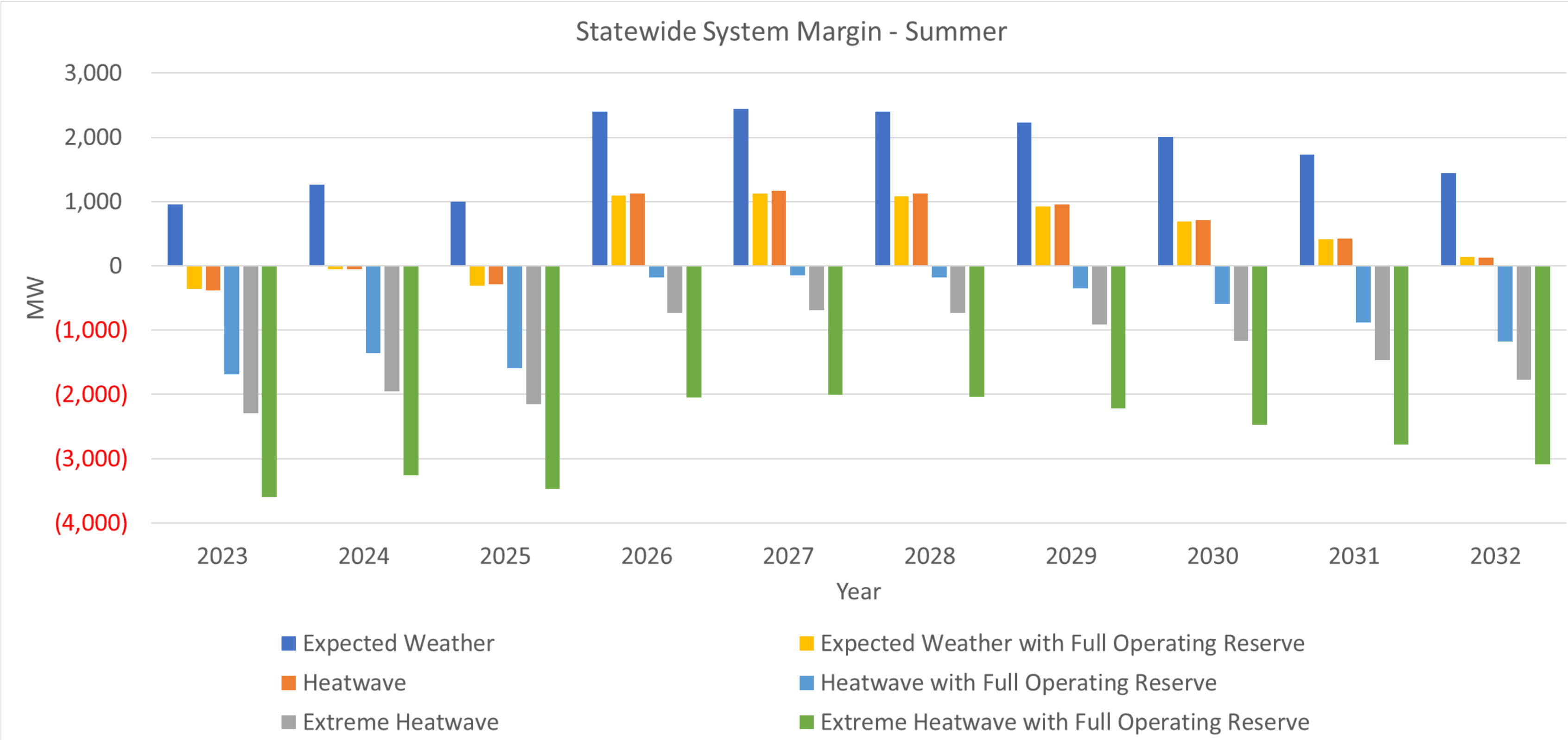
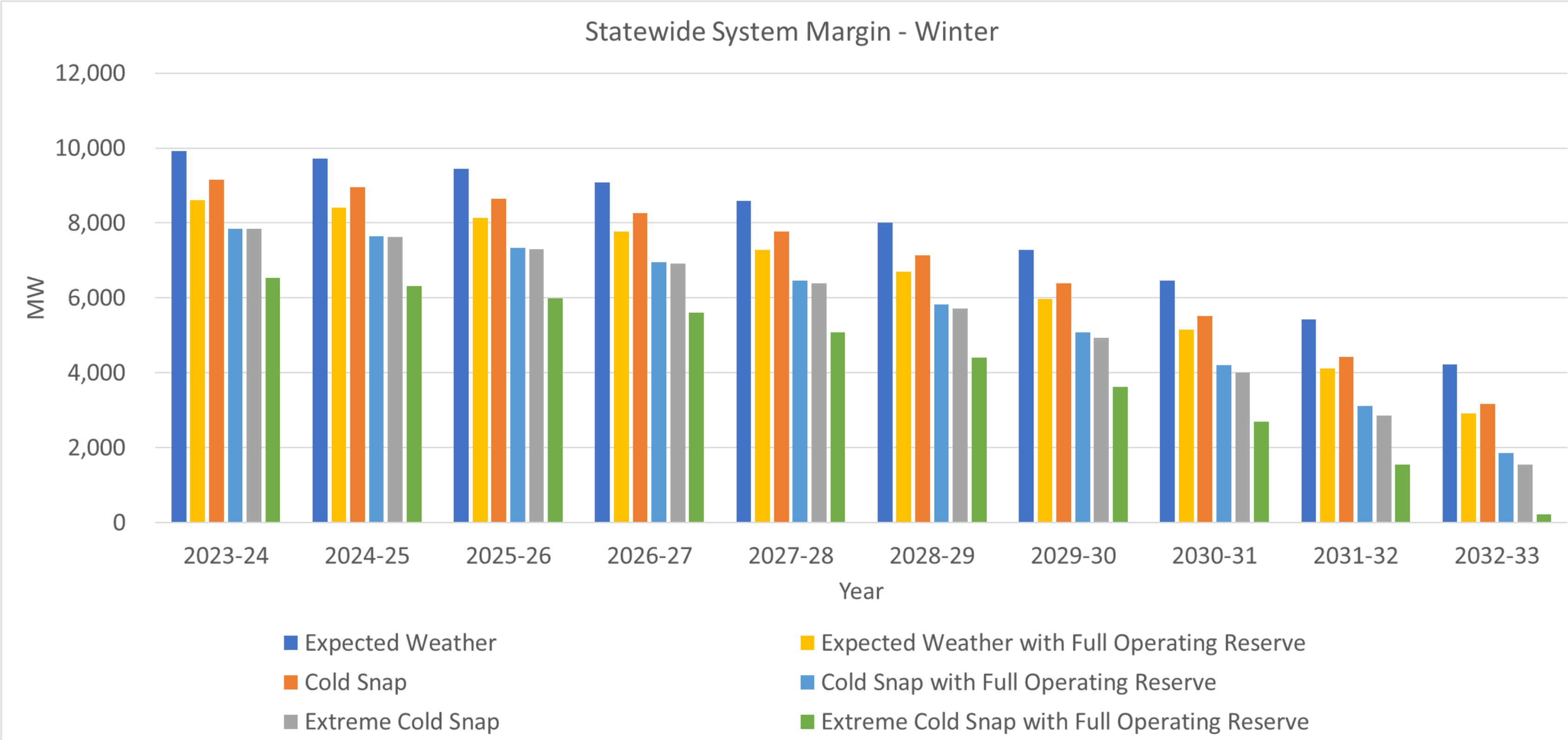


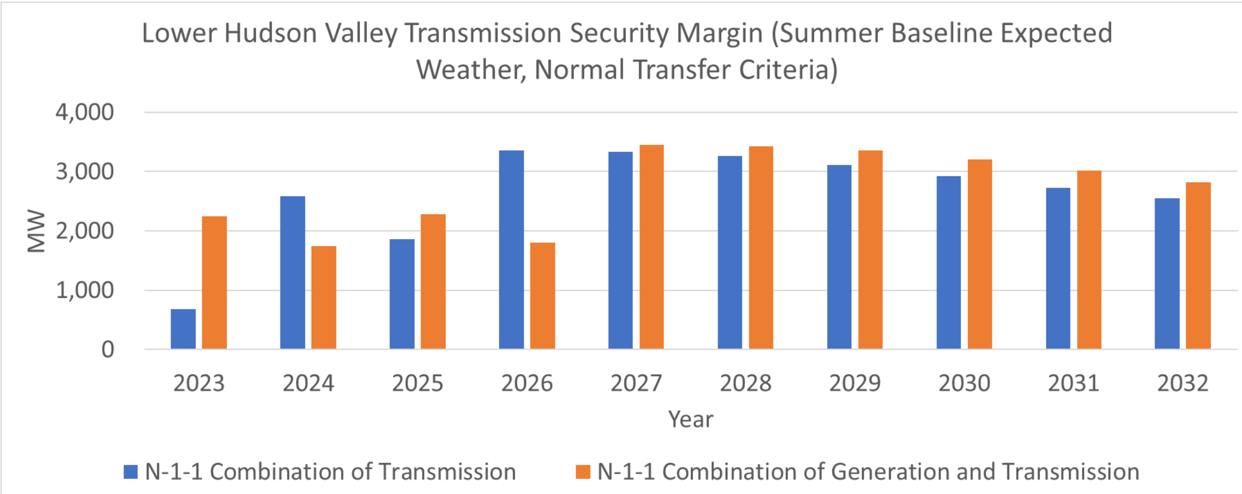
Figure 33: Summary of Statewide System Margin – Winter



Lower Hudson Valley (Zones G-J) Transmission Security Margins

The Lower Hudson Valley, or southeastern New York (SENY) region, is comprised of Zones G-J and includes the electrical connections to the RECO load in PJM. To determine the transmission security margin for this area, the most limiting combination of two non-simultaneous contingency events (N-1-1) to the transmission security margin was determined. Design criteria N-1-1 combinations include various combinations of losses of generation and transmission. As the system changes the limiting contingency combination may also change. **Figure 34** shows how the summer transmission security margin changes through time in consideration of the planned transmission system changes which impact the most limiting contingency combination for the year being evaluated. In summer 2023 (prior to the completion of the Segment B public policy project) the most limiting contingency combination to the transmission security margin under peak load conditions is the loss of Leeds-Pleasant Valley (92) 345 kV followed by the loss of Dolson — Rock Tavern (DART44) 345 kV and Coopers Corners – Rock Tavern (CCRT34). In summer 2024 and 2025 the contingency combination changes to the loss of Ravenswood 3 followed by the loss of Pleasant Valley-Wood St. 345 kV (F30/F31). Starting in summer 2026 (following the inclusion of the CHPE project in winter 2025), the limiting contingency combination changes again to the loss of Knickerbocker – Pleasant Valley 345 kV followed by the loss of Athens-Van Wagner 345 kV and one of the Athens gas/steam combinations. The limiting contingency combination for winter also changes through time in consideration of the planned transmission system changes. In winter 2023-24, the limiting contingency combination is the loss of Pleasant Valley-Millwood (F31/W81) 345 kV followed by the loss of E. Fishkill-Wood St. (F38/F39) 345 kV. Starting in winter 2024-25 and for the remainder of the 10-year horizon, the limiting contingency combination is the loss of Ravenswood 3 followed by the loss of Pleasant Valley-Wood St. 345 kV (F30/F31).

Figure 34: Lower Hudson Valley Transmission Security Margin (Summer Baseline Peak Forecast – Expected Weather)



As transmission security analysis represents discrete snapshots in time of various credible combinations of system conditions, when reliability needs are identified only the magnitude of the need can be identified under those system conditions. Additional details are required to fully describe the nature of the need such as evaluating the hourly load shape and its impact on the need. To describe the nature of the Lower Hudson Valley transmission security margin, load shapes are developed the Zone G, H, I, and J components of the statewide load shape. Details of the load shapes are provided later in this appendix. For this assessment load shapes were not developed past 2032 and limited to the summer conditions.

Figure 35 shows the calculation of the Lower Hudson Valley transmission security margin for baseline expected weather, expected load conditions for summer for the statewide coincident peak hour with normal transfer criteria. The Lower Hudson Valley transmission security margin is sufficient for the 10-year horizon (line-item O). The transmission security margin coincident with the statewide system peak ranges from 676 MW in summer 2023 to 2,546 MW in summer 2032. Considering the summer baseline peak load transmission security margin, the lower Hudson Valley would require several additional outages beyond design criteria to have a deficient transmission security margin.

The load shapes for the Lower Hudson Valley show the contributions of Zones G, H, I, (**Figure 84**) and J (**Figure 85**) towards the statewide curve (which represents the statewide coincident peak) for each hour of the day. Utilizing the load shapes for the baseline expected weather summer peak day, the Lower Hudson Valley transmission security margin for each hour utilizing normal transfer criteria is shown in **Figure 36**. The Lower Hudson Valley transmission security margins for each hour are created by using the load forecast for each hour in the margin calculation (*i.e.*, **Figure 35** line-item A) with additional adjustments to account for the appropriate derate for solar generation and energy limited resources in each hour (*i.e.*, **Figure 35** line-item K). All other values in the margin calculations are held constant. A graphical representation of the hourly margin for the Lower Hudson Valley for the peak day in years 2023, 2025, 2027, and 2032 is provided in **Figure 37**. For all years in the 10-year study horizon, there are no observed deficiencies considering the load shapes under baseline expected load, normal transfer criteria for the Lower Hudson Valley.

It is possible for other combinations of events, such as a 1-in-10-year heatwave or 1-in-100-year extreme heatwave to result in a deficient transmission security margin. **Figure 38** shows that the Lower Hudson Valley transmission security margin for the statewide coincident peak hour under the 1-in-10-year heatwave condition with the assumption that the system is using emergency transfer criteria. The transmission security margin under 1-in-10-year heatwave condition is sufficient for all years. The margins range from 864 MW in summer 2023 to 2,611 MW in summer 2032. The load shapes for the Lower Hudson Valley under heatwave conditions are shown in **Figure 89** (Zones G, H, and I) and **Figure 90** (Zone J). Utilizing the Lower Hudson Valley load-duration heatwave curves, the transmission security margin for each hour utilizing emergency transfer criteria is shown in **Figure 39**. For all years in the 10-year horizon, there are no observed transmission security margin deficiencies in consideration the heatwave load duration curves for the Lower Hudson Valley with emergency transfer criteria. A graphical representation of the hourly margin for the Lower Hudson Valley for the peak day in years 2023, 2025, 2027, and 2032 heatwave, emergency transfer criteria conditions is provided in **Figure 40**.

Under a 1-in-100-year extreme heatwave, which also assumes the use of emergency transfer criteria, the margin is sufficient at the statewide coincident peak hour. **Figure 41** shows that the margin is sufficient and ranges from 23 MW in summer 2023 to 1,750 MW in summer 2032. The load shapes for the Lower Hudson Valley under extreme heatwave conditions are shown in **Figure 94** (Zones G, H, I, and J) and **Figure 95** (Zone J). Utilizing the Lower Hudson Valley load-duration extreme heatwave curves, the transmission security margin for each hour utilizing emergency transfer criteria is shown in **Figure 42**. In summer 2023, the hourly load of the Lower Hudson Valley does not peak coincident with the statewide coincident peak. The contributions of Zones G-J towards the statewide coincident peak are the largest in hour beginning 16, while the statewide coincident peak occurs in hour beginning 17. As such, under extreme heatwave conditions, **Figure 42** shows that the system would be deficient in summer 2023 by 18 MW for 1 hour during the extreme heatwave day. All other hours of the 10-year horizon for the peak day are shown to be sufficient. **Figure 43** provides a graphical representation of the hourly transmission security margin for the peak day in years 2023, 2025, 2027, and 2032.

Figure 44 shows the Lower Hudson Valley transmission security margin under winter peak baseline expected weather load conditions. For winter peak, the margin is sufficient for all years and ranges from 8,307 MW in winter 2023-24 to 4,847 MW in winter 2032-33 (line-item O). Considering the winter baseline peak load transmission security margin, multiple outages in the lower Hudson Valley would be required to show a deficient transmission security margin.

Figure 45 shows the Lower Hudson Valley transmission security margin in a 1-in-10-year cold snap with emergency transfer criteria. Under this condition the margin is sufficient for all study years and ranges from 8,385 MW in winter 2023-24 to 5,079 MW in winter 2032-33 (line-item P). The 1-in-100-year extreme cold snap shown in **Figure 46** (also assuming emergency transfer criteria) shows sufficient margin for all study years ranging from 7,813 MW in winter 2023-24 to 4,338 in winter 2032-33 (line-item P).

Figure 47 provides are summary of the summer peak Lower Hudson Valley transmission security margins under expected summer weather, heatwave, and extreme heatwave conditions. **Figure 48** provides a summary of the winter peak Lower Hudson Valley transmission security margins under expected winter weather, cold snap, and extreme cold snap conditions.

Figure 35: Lower Hudson Valley Transmission Security Margin (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

Summer Peak - Baseline Expected Weather, Normal Transfer Criteria (MW)											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	G-J Load Forecast	(15,061)	(15,026)	(14,957)	(14,936)	(14,959)	(15,027)	(15,173)	(15,360)	(15,560)	(15,735)
B	RECO Load	(394)	(394)	(394)	(394)	(394)	(394)	(394)	(394)	(397)	(397)
C	**Total Load (A+B)**	(15,455)	(15,420)	(15,351)	(15,330)	(15,353)	(15,421)	(15,567)	(15,754)	(15,957)	(16,132)
D	UPNY-SENY Limit (3)	3,200	5,725	5,725	5,025	5,025	5,025	5,025	5,025	5,025	5,025
E	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
F	K - SENY	95	95	95	95	95	95	95	95	95	95
G	**Total SENY AC Import (D+E+F)**	3,284	5,809	5,809	5,109	5,109	5,109	5,109	5,109	5,109	5,109
H	Loss of Source Contingency	0	(980)	(980)	0	0	0	0	0	0	0
I	**Resource Need (C+G+H)**	(12,171)	(10,591)	(10,522)	(10,221)	(10,244)	(10,312)	(10,458)	(10,645)	(10,848)	(11,023)
J	G-J Generation (1)	13,584	13,684	13,084	13,084	13,084	13,084	13,084	13,084	13,084	13,084
K	G-J Generation Derates (2)	(1,051)	(1,131)	(1,071)	(1,072)	(1,074)	(1,076)	(1,077)	(1,079)	(1,080)	(1,080)
L	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
M	Net ICAP External Imports	315	315	315	1,565	1,565	1,565	1,565	1,565	1,565	1,565
N	**Total Resources Available (J+K+L+M)**	12,847	12,868	12,328	13,577	13,575	13,573	13,571	13,570	13,569	13,569
O	**Transmission Security Margin (I+N)**	676	2,277	1,806	3,356	3,331	3,261	3,113	2,925	2,721	2,546

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based on the summer peak 2032 represenations evalauted in the 2022 RNA.

Figure 36: Lower Hudson Valley Transmission Security Margin (Hourly) (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

Summer Peak - Baseline Expected Summer Weather, Normal Transfer Criteria (MW)										
G-J Transmission Security Margin										
Hour	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
HB0	5,152	6,703	6,204	7,714	7,558	7,464	7,295	7,077	6,840	6,637
HB1	5,679	7,232	6,740	8,256	8,109	8,024	7,863	7,662	7,440	7,251
HB2	6,061	7,619	7,129	8,648	8,506	8,427	8,274	8,084	7,877	7,702
HB3	6,293	7,852	7,363	8,888	8,750	8,680	8,535	8,355	8,159	7,994
HB4	6,332	7,894	7,412	8,942	8,810	8,748	8,612	8,449	8,268	8,116
HB5	6,082	7,646	7,162	8,696	8,567	8,504	8,372	8,209	8,031	7,881
HB6	5,494	7,071	6,600	8,148	8,028	7,977	7,855	7,698	7,526	7,378
HB7	4,632	6,238	5,792	7,364	7,265	7,236	7,127	6,980	6,814	6,669
HB8	3,826	5,461	5,027	6,611	6,523	6,500	6,392	6,239	6,060	5,902
HB9	3,146	4,804	4,384	5,980	5,904	5,888	5,787	5,636	5,456	5,294
HB10	2,547	4,229	3,819	5,431	5,367	5,362	5,271	5,124	4,944	4,785
HB11	2,066	3,766	3,369	4,992	4,939	4,949	4,870	4,735	4,568	4,416
HB12	1,656	3,365	2,974	4,604	4,559	4,575	4,504	4,380	4,222	4,084
HB13	1,317	3,023	2,629	4,257	4,213	4,227	4,160	4,042	3,891	3,760
HB14	1,102	2,794	2,388	4,001	3,942	3,947	3,871	3,745	3,593	3,460
HB15	895	2,563	2,137	3,732	3,657	3,645	3,553	3,417	3,257	3,116
HB16	654	2,294	1,851	3,428	3,336	3,308	3,202	3,054	2,886	2,738
HB17	676	2,277	1,806	3,356	3,233	3,179	3,047	2,874	2,684	2,517
HB18	828	2,409	1,928	3,461	3,331	3,261	3,113	2,925	2,721	2,546
HB19	1,129	2,691	2,202	3,722	3,577	3,497	3,340	3,143	2,932	2,745
HB20	1,474	3,029	2,537	4,056	3,907	3,823	3,663	3,464	3,244	3,056
HB21	1,917	3,477	2,985	4,508	4,362	4,279	4,120	3,918	3,697	3,508
HB22	2,649	4,208	3,715	5,235	5,083	4,997	4,829	4,616	4,382	4,181
HB23	3,503	5,062	4,570	6,088	5,937	5,847	5,679	5,462	5,227	5,022

Figure 37: Lower Hudson Valley Transmission Security Margin Hourly Curve (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

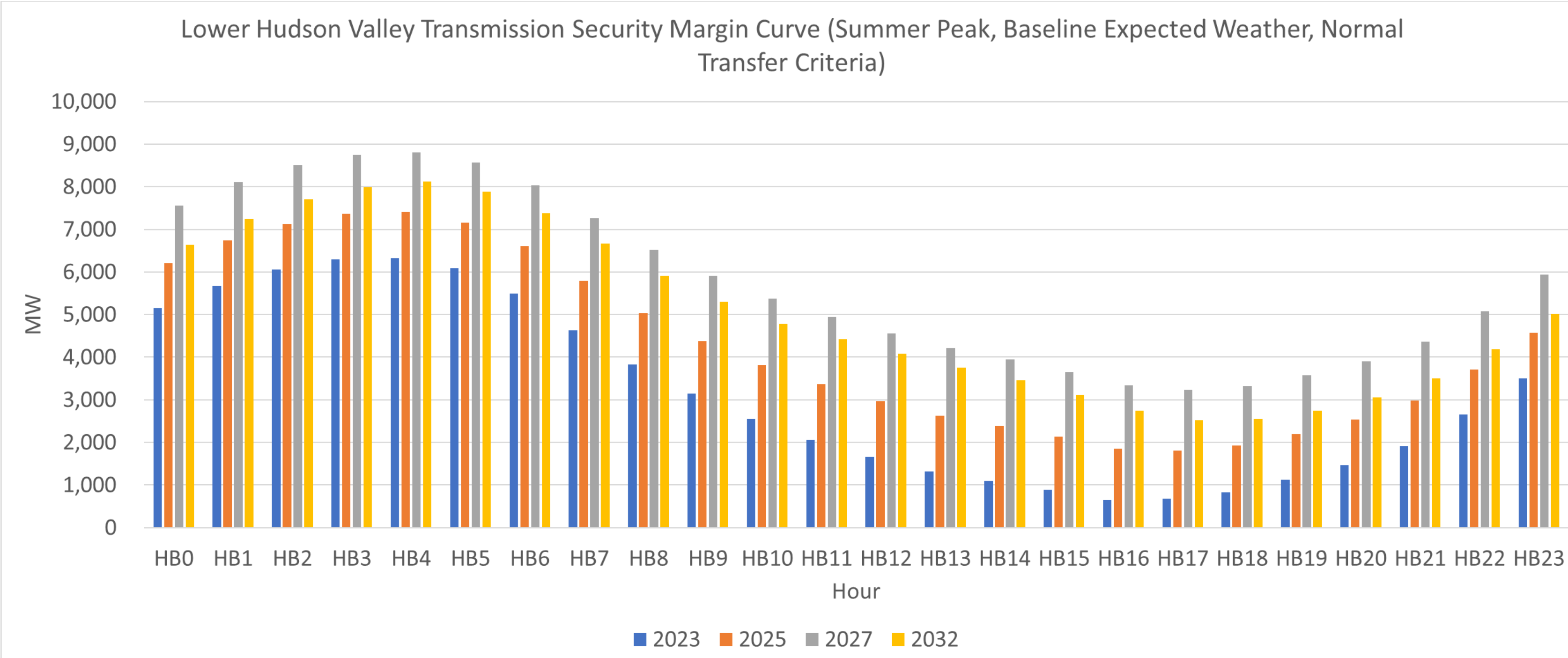


Figure 38: Lower Hudson Valley Transmission Security Margin (1-in-10-Year Heatwave, Emergency Transfer Criteria)

Summer Peak - 1-in-10-Year Heatwave, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	G-J Load Forecast	(15,813)	(15,776)	(15,703)	(15,681)	(15,705)	(15,776)	(15,929)	(16,125)	(16,335)	(16,518)
B	RECO Load	(424)	(424)	(424)	(424)	(424)	(424)	(424)	(424)	(427)	(427)
C	**Total Load (A+B)**	(16,237)	(16,200)	(16,127)	(16,105)	(16,129)	(16,200)	(16,353)	(16,549)	(16,762)	(16,945)
D	UPNY-SENY Limit (5)	3,925	5,450	5,450	5,650	5,650	5,650	5,650	5,650	5,650	5,650
E	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
F	K - SENY	155	155	155	155	155	155	155	155	155	155
G	**Total SENY AC Import (D+E+F)**	4,069	5,594	5,594	5,794	5,794	5,794	5,794	5,794	5,794	5,794
H	Loss of Source Contingency	0	0	0	0	0	0	0	0	0	0
I	**Resource Need (C+G+H)**	(12,168)	(10,606)	(10,533)	(10,311)	(10,335)	(10,406)	(10,559)	(10,755)	(10,968)	(11,151)
J	G-J Generation (1)	13,584	13,684	13,084	13,084	13,084	13,084	13,084	13,084	13,084	13,084
K	G-J Generation Derates (2)	(1,051)	(1,131)	(1,071)	(1,072)	(1,074)	(1,076)	(1,077)	(1,079)	(1,080)	(1,080)
L	Temperature Based Generation Derates	(87)	(87)	(78)	(78)	(78)	(78)	(78)	(78)	(78)	(78)
M	Net ICAP External Imports	315	315	315	1,565	1,565	1,565	1,565	1,565	1,565	1,565
N	SCRs (3), (4)	271	271	271	271	271	271	271	271	271	271
O	**Total Resources Available (J+K+L+M+N)**	13,031	13,052	12,521	13,769	13,768	13,766	13,764	13,763	13,762	13,762
P	**Transmission Security Margin (I+O)**	864	2,446	1,988	3,459	3,434	3,360	3,206	3,008	2,794	2,611

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 226 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based on the summer peak 2032 represenations evalauted in the 2022 RNA.

Figure 39: Lower Hudson Valley Transmission Security Margin (Hourly) (1-in-10-Year Heatwave, Emergency Transfer Criteria)

Summer Peak - Heatwave, Emergency Transfer Criteria (MW)										
G-J Transmission Security Margin										
Hour	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
HB0	4,722	6,256	5,773	7,205	7,022	6,907	6,712	6,474	6,223	6,011
HB1	5,309	6,844	6,368	7,806	7,633	7,526	7,338	7,116	6,881	6,682
HB2	5,713	7,256	6,784	8,226	8,059	7,960	7,781	7,572	7,354	7,170
HB3	5,972	7,515	7,044	8,493	8,330	8,240	8,069	7,871	7,663	7,489
HB4	6,031	7,578	7,113	8,567	8,409	8,327	8,165	7,983	7,789	7,628
HB5	5,763	7,314	6,849	8,309	8,156	8,075	7,919	7,740	7,552	7,395
HB6	5,118	6,678	6,222	7,693	7,547	7,475	7,327	7,151	6,967	6,812
HB7	4,235	5,810	5,367	6,849	6,710	6,648	6,499	6,321	6,132	5,968
HB8	3,471	5,071	4,633	6,122	5,991	5,929	5,778	5,591	5,388	5,209
HB9	2,836	4,455	4,029	5,528	5,407	5,350	5,205	5,019	4,813	4,631
HB10	2,322	3,962	3,544	5,056	4,946	4,897	4,759	4,575	4,367	4,186
HB11	2,037	3,696	3,290	4,811	4,712	4,677	4,550	4,377	4,180	4,003
HB12	1,749	3,417	3,013	4,542	4,450	4,418	4,295	4,130	3,941	3,776
HB13	1,548	3,215	2,812	4,342	4,278	4,246	4,131	3,941	3,761	3,605
HB14	1,310	2,967	2,557	4,076	4,023	3,987	3,867	3,639	3,461	3,305
HB15	1,049	2,688	2,264	3,769	3,730	3,683	3,552	3,285	3,102	2,944
HB16	842	2,456	2,017	3,506	3,476	3,416	3,275	2,963	2,775	2,611
HB17	864	2,446	1,988	3,459	3,434	3,360	3,206	2,845	2,644	2,469
HB18	1,121	2,685	2,217	3,672	3,641	3,553	3,384	3,008	2,794	2,611
HB19	1,493	3,039	2,564	4,006	3,937	3,840	3,662	3,314	3,093	2,898
HB20	1,862	3,400	2,922	4,363	4,267	4,165	3,984	3,668	3,438	3,243
HB21	2,331	3,868	3,383	4,821	4,698	4,590	4,403	4,111	3,875	3,671
HB22	3,110	4,643	4,154	5,587	5,433	5,319	5,119	4,849	4,598	4,380
HB23	4,011	5,542	5,052	6,481	6,302	6,182	5,981	5,740	5,486	5,263

Figure 40: Lower Hudson Valley Transmission Security Margin Hourly Curve (1-in-10-Year Heatwave, Emergency Transfer Criteria)

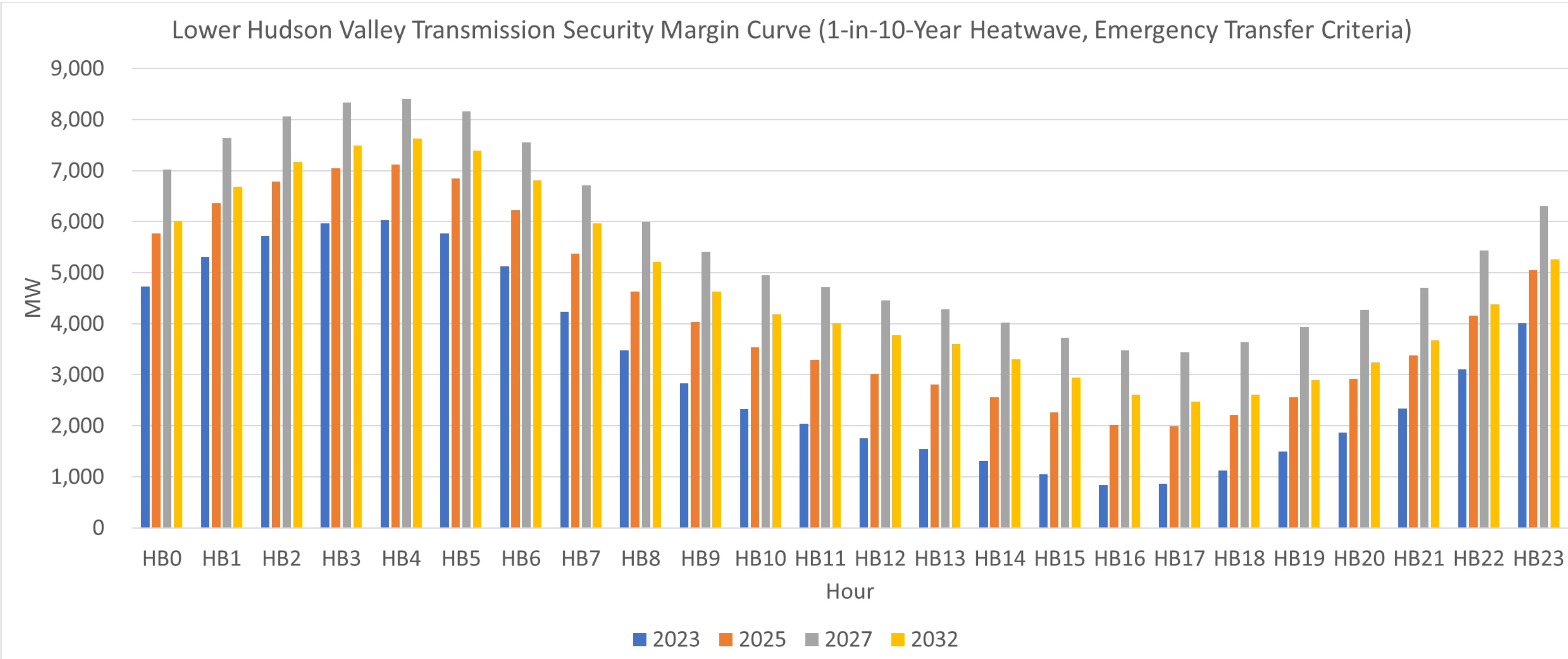


Figure 41: Lower Hudson Valley Transmission Security Margin (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

Summer Peak - 1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	G-J Load Forecast	(16,532)	(16,493)	(16,418)	(16,395)	(16,420)	(16,493)	(16,653)	(16,857)	(17,077)	(17,267)
B	RECO Load	(448)	(448)	(448)	(448)	(448)	(448)	(448)	(448)	(451)	(451)
C	**Total Load (A+B)**	(16,980)	(16,941)	(16,866)	(16,843)	(16,868)	(16,941)	(17,101)	(17,305)	(17,528)	(17,718)
D	UPNY-SENY Limit (5)	3,925	5,450	5,450	5,650	5,650	5,650	5,650	5,650	5,650	5,650
E	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
F	K - SENY	155	155	155	155	155	155	155	155	155	155
G	**Total SENY AC Import (D+E+F)**	4,069	5,594	5,594	5,794	5,794	5,794	5,794	5,794	5,794	5,794
H	Loss of Source Contingency	0	0	0	0	0	0	0	0	0	0
I	**Resource Need (C+G+H)**	(12,911)	(11,347)	(11,272)	(11,049)	(11,074)	(11,147)	(11,307)	(11,511)	(11,734)	(11,924)
J	G-J Generation (1)	13,584	13,684	13,084	13,084	13,084	13,084	13,084	13,084	13,084	13,084
K	G-J Generation Derates (2)	(1,051)	(1,131)	(1,071)	(1,072)	(1,074)	(1,076)	(1,077)	(1,079)	(1,080)	(1,080)
L	Temperature Based Generation Derates	(184)	(184)	(165)	(165)	(165)	(165)	(165)	(165)	(165)	(165)
M	Net ICAP External Imports	315	315	315	1,565	1,565	1,565	1,565	1,565	1,565	1,565
N	SCRs (3), (4)	271	271	271	271	271	271	271	271	271	271
O	**Total Resources Available (J+K+L+M+N)**	12,934	12,955	12,434	13,682	13,681	13,679	13,677	13,676	13,675	13,675
P	**Transmission Security Margin (I+O)**	23	1,608	1,162	2,634	2,607	2,532	2,370	2,165	1,940	1,750

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 226 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based on the summer peak 2032 represenations evalauted in the 2022 RNA.

Figure 42: Lower Hudson Valley Transmission Security Margin (Hourly) (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

Summer Peak - 1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria (MW)										
G-J Transmission Security Margin										
Hour	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
HB0	4,198	5,735	5,266	6,700	6,515	6,398	6,199	5,956	5,699	5,483
HB1	4,786	6,324	5,862	7,302	7,126	7,017	6,825	6,598	6,356	6,154
HB2	5,191	6,736	6,279	7,723	7,552	7,452	7,268	7,054	6,829	6,642
HB3	5,450	6,997	6,540	7,991	7,824	7,733	7,558	7,354	7,139	6,961
HB4	5,511	7,060	6,610	8,066	7,905	7,821	7,654	7,467	7,266	7,100
HB5	5,243	6,796	6,345	7,807	7,650	7,568	7,407	7,221	7,027	6,865
HB6	4,592	6,154	5,712	7,184	7,034	6,960	6,806	6,624	6,432	6,272
HB7	3,706	5,282	4,850	6,333	6,188	6,123	5,968	5,784	5,586	5,417
HB8	2,938	4,537	4,111	5,599	5,462	5,396	5,239	5,045	4,833	4,650
HB9	2,302	3,919	3,505	5,001	4,875	4,813	4,660	4,467	4,253	4,065
HB10	1,789	3,427	3,018	4,528	4,411	4,358	4,212	4,021	3,805	3,619
HB11	1,506	3,162	2,764	4,283	4,177	4,137	4,003	3,822	3,618	3,435
HB12	1,137	2,802	2,408	3,934	3,834	3,796	3,665	3,489	3,291	3,120
HB13	873	2,537	2,145	3,670	3,600	3,561	3,437	3,235	3,043	2,881
HB14	573	2,227	1,828	3,343	3,284	3,243	3,114	2,872	2,682	2,519
HB15	250	1,888	1,473	2,977	2,932	2,880	2,740	2,457	2,266	2,099
HB16	(18)	1,597	1,168	2,657	2,624	2,560	2,410	2,082	1,883	1,709
HB17	23	1,608	1,162	2,634	2,607	2,532	2,370	1,993	1,781	1,598
HB18	281	1,849	1,396	2,851	2,821	2,732	2,556	2,165	1,940	1,750
HB19	720	2,269	1,809	3,254	3,185	3,087	2,904	2,541	2,312	2,110
HB20	1,152	2,695	2,231	3,673	3,578	3,475	3,288	2,961	2,725	2,523
HB21	1,683	3,223	2,753	4,193	4,069	3,960	3,768	3,468	3,223	3,015
HB22	2,520	4,057	3,583	5,017	4,862	4,746	4,543	4,265	4,007	3,786
HB23	3,483	5,016	4,541	5,972	5,791	5,670	5,465	5,219	4,959	4,733

Figure 43: Lower Hudson Valley Transmission Security Margin Hourly Curve (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

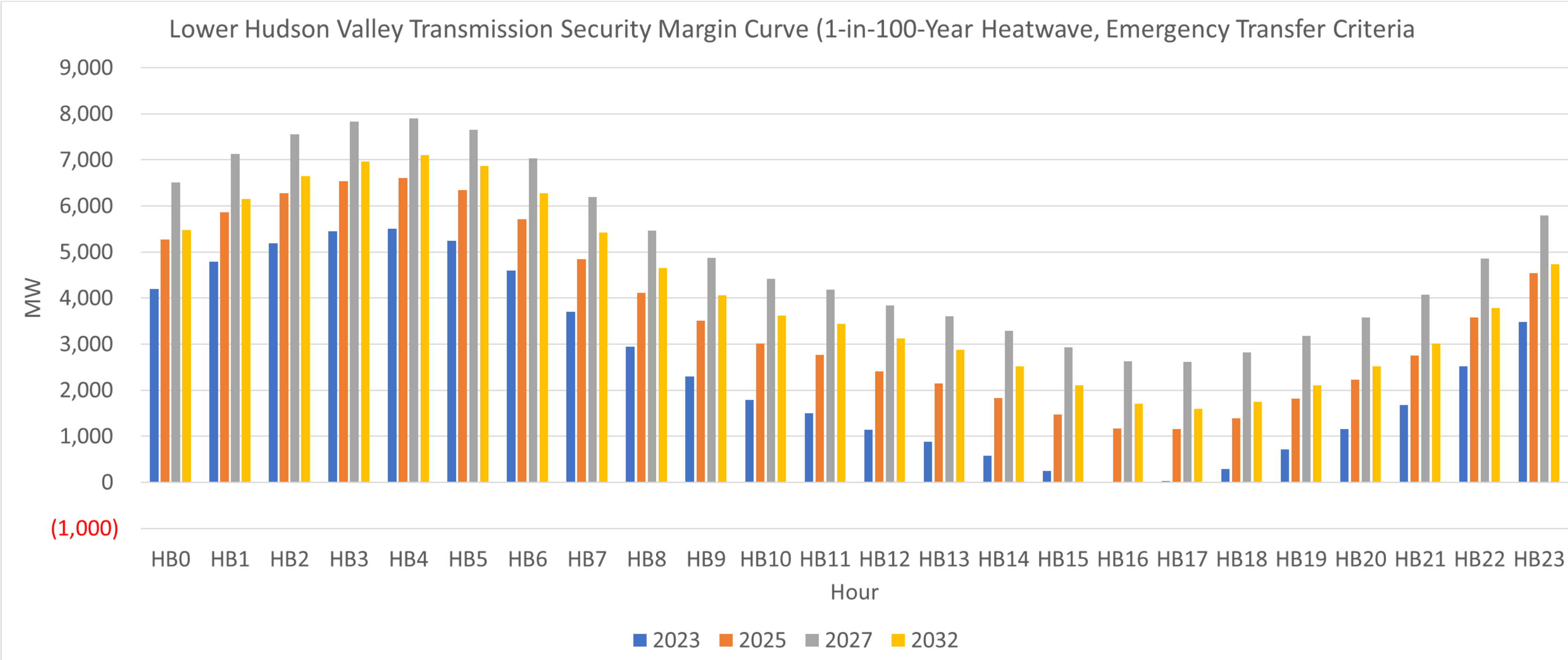


Figure 44: Lower Hudson Valley Transmission Security Margin (Winter Peak – Baseline Expected Weather, Normal Transfer Criteria)

Winter Peak - Baseline Expected Weather, Normal Transfer Criteria (MW)											
Line	**Item**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**	**2031-32**	**2032-33**
A	G-J Load Forecast	(10,333)	(10,412)	(10,527)	(10,716)	(10,979)	(11,320)	(11,726)	(12,186)	(12,764)	(13,450)
B	RECO Load	(219)	(219)	(219)	(219)	(219)	(219)	(219)	(219)	(216)	(216)
C	**Total Load (A+B)**	(10,552)	(10,631)	(10,746)	(10,935)	(11,198)	(11,539)	(11,945)	(12,405)	(12,980)	(13,666)
D	UPNY-SENY Limit (3), (4)	5,050	5,725	5,725	5,725	5,725	5,725	5,725	5,725	5,725	5,725
E	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
F	K - SENY (4)	95	95	95	95	95	95	95	95	95	95
G	**Total SENY AC Import (D+E+F)**	5,134	5,809	5,809	5,809	5,809	5,809	5,809	5,809	5,809	5,809
H	Loss of Source Contingency	0	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)
I	**Resource Need (C+G+H)**	(5,418)	(5,812)	(5,927)	(6,116)	(6,379)	(6,720)	(7,126)	(7,586)	(8,161)	(8,847)
J	G-J Generation (1)	14,622	14,622	14,588	14,588	14,588	14,588	14,588	14,588	14,588	14,588
K	G-J Generation Derates (2)	(1,212)	(1,212)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)
L	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
M	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
N	**Total Resources Available (J+K+L+M)**	13,725	13,725	13,694	13,694	13,694	13,694	13,694	13,694	13,694	13,694
O	**Transmission Security Margin (I+N)**	8,307	7,913	7,767	7,578	7,315	6,974	6,568	6,108	5,533	4,847

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based also based on the summer peak 2025 representations evaluated in the post-2020 RNA analysis which does not include the impact of CHPE.
4. As a conservative winter peak assumption these limits utilize the summer values.

Figure 45: Lower Hudson Valley Transmission Security Margin (1-in-10-Year Cold Snap, Emergency Transfer Criteria)

Winter Peak - 1-in-10-Year Cold Snap, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**	**2031-32**	**2032-33**
A	G-J Load Forecast	(10,864)	(10,947)	(11,068)	(11,267)	(11,543)	(11,903)	(12,329)	(12,812)	(13,421)	(14,142)
B	RECO Load	(230)	(230)	(230)	(230)	(230)	(230)	(230)	(230)	(227)	(227)
C	**Total Load (A+B)**	(11,094)	(11,177)	(11,298)	(11,497)	(11,773)	(12,133)	(12,559)	(13,042)	(13,648)	(14,369)
D	UPNY-SENY Limit (5), (6)	5,450	5,450	5,450	5,450	5,450	5,450	5,450	5,450	5,450	5,450
E	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
F	K - SENY (6)	155	155	155	155	155	155	155	155	155	155
G	**Total SENY AC Import (D+E+F)**	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594
H	Loss of Source Contingency	0	0	0	0	0	0	0	0	0	0
I	**Resource Need (C+G+H)**	(5,500)	(5,583)	(5,704)	(5,903)	(6,179)	(6,539)	(6,965)	(7,448)	(8,054)	(8,775)
J	G-J Generation (1)	14,622	14,622	14,588	14,588	14,588	14,588	14,588	14,588	14,588	14,588
K	G-J Generation Derates (2)	(1,212)	(1,212)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)
L	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
M	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
N	SCRs (3), (4)	160	160	160	160	160	160	160	160	160	160
O	**Total Resources Available (J+K+L+M+N)**	13,885	13,885	13,854	13,854	13,854	13,854	13,854	13,854	13,854	13,854
P	**Transmission Security Margin (I+O)**	8,385	8,302	8,150	7,951	7,675	7,315	6,889	6,406	5,800	5,079

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 133 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based also based on the summer peak 2025 representations evaluated in the post-2020 RNA analysis which does not include the impact of CHPE.
6. As a conservative winter peak assumption these limits utilize the summer values.

Figure 46: Lower Hudson Valley Transmission Security Margin (1-in-100-year Extreme Cold Snap, Emergency Transfer Criteria)

Winter Peak - 1-in-100-Year Extreme Cold Snap, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**	**2031-32**	**2032-33**
A	G-J Load Forecast	(11,424)	(11,513)	(11,640)	(11,848)	(12,139)	(12,516)	(12,964)	(13,473)	(14,113)	(14,871)
B	RECO Load	(242)	(242)	(242)	(242)	(242)	(242)	(242)	(242)	(239)	(239)
C	**Total Load (A+B)**	(11,666)	(11,755)	(11,882)	(12,090)	(12,381)	(12,758)	(13,206)	(13,715)	(14,352)	(15,110)
D	UPNY-SENY Limit (5), (6)	5,450	5,450	5,450	5,450	5,450	5,450	5,450	5,450	5,450	5,450
E	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
F	K - SENY (6)	155	155	155	155	155	155	155	155	155	155
G	**Total SENY AC Import (D+E+F)**	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594
H	Loss of Source Contingency	0	0	0	0	0	0	0	0	0	0
I	**Resource Need (C+G+H)**	(6,072)	(6,161)	(6,288)	(6,496)	(6,787)	(7,164)	(7,612)	(8,121)	(8,758)	(9,516)
J	G-J Generation (1)	14,622	14,622	14,588	14,588	14,588	14,588	14,588	14,588	14,588	14,588
K	G-J Generation Derates (2)	(1,212)	(1,212)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)	(1,209)
L	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
M	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
N	SCRs (3), (4)	160	160	160	160	160	160	160	160	160	160
O	**Total Resources Available (J+K+L+M+N)**	13,885	13,885	13,854	13,854	13,854	13,854	13,854	13,854	13,854	13,854
P	**Transmission Security Margin (I+O)**	7,813	7,724	7,566	7,358	7,067	6,690	6,242	5,733	5,096	4,338

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 133 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based also based on the summer peak 2025 representations evaluated in the post-2020 RNA analysis which does not include the impact of CHPE.
6. As a conservative winter peak assumption these limits utilize the summer values.

Figure 47: Summary of Lower Hudson Valley Summer Transmission Security Margin – Summer

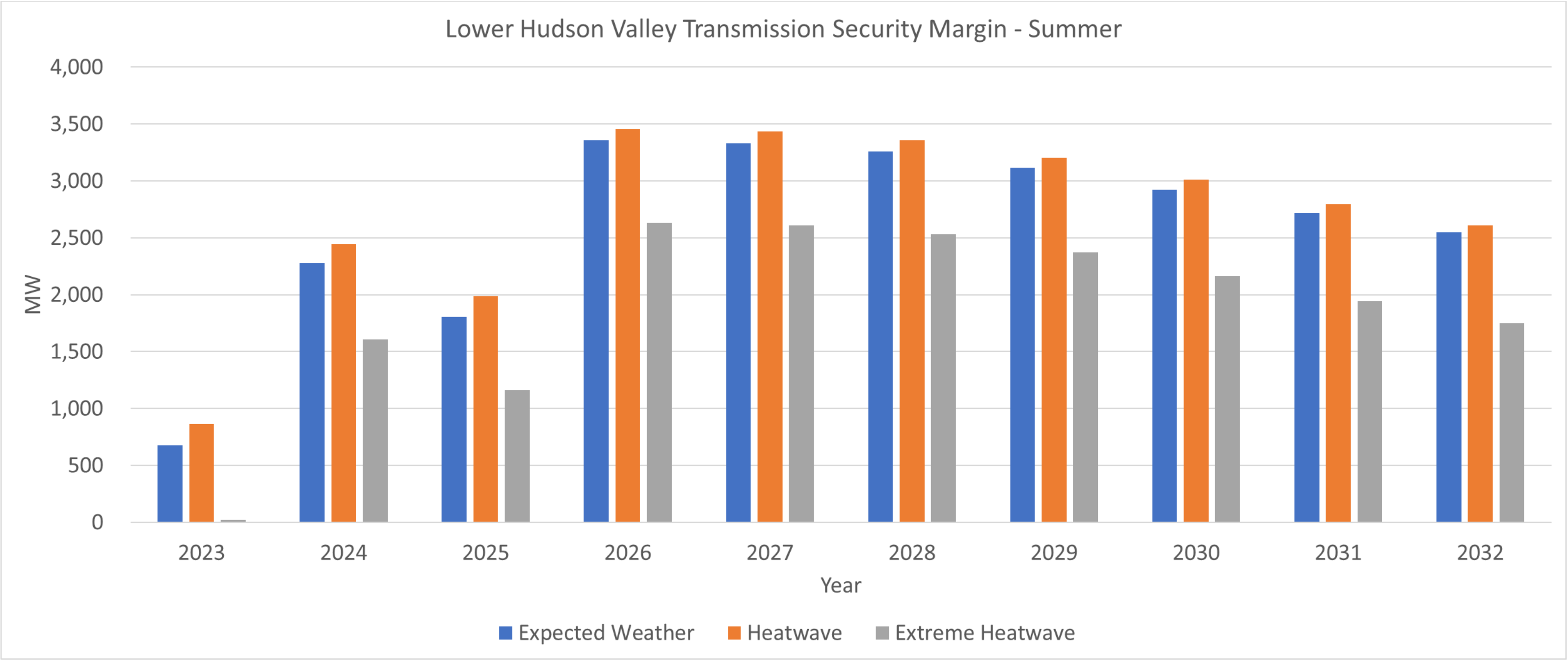
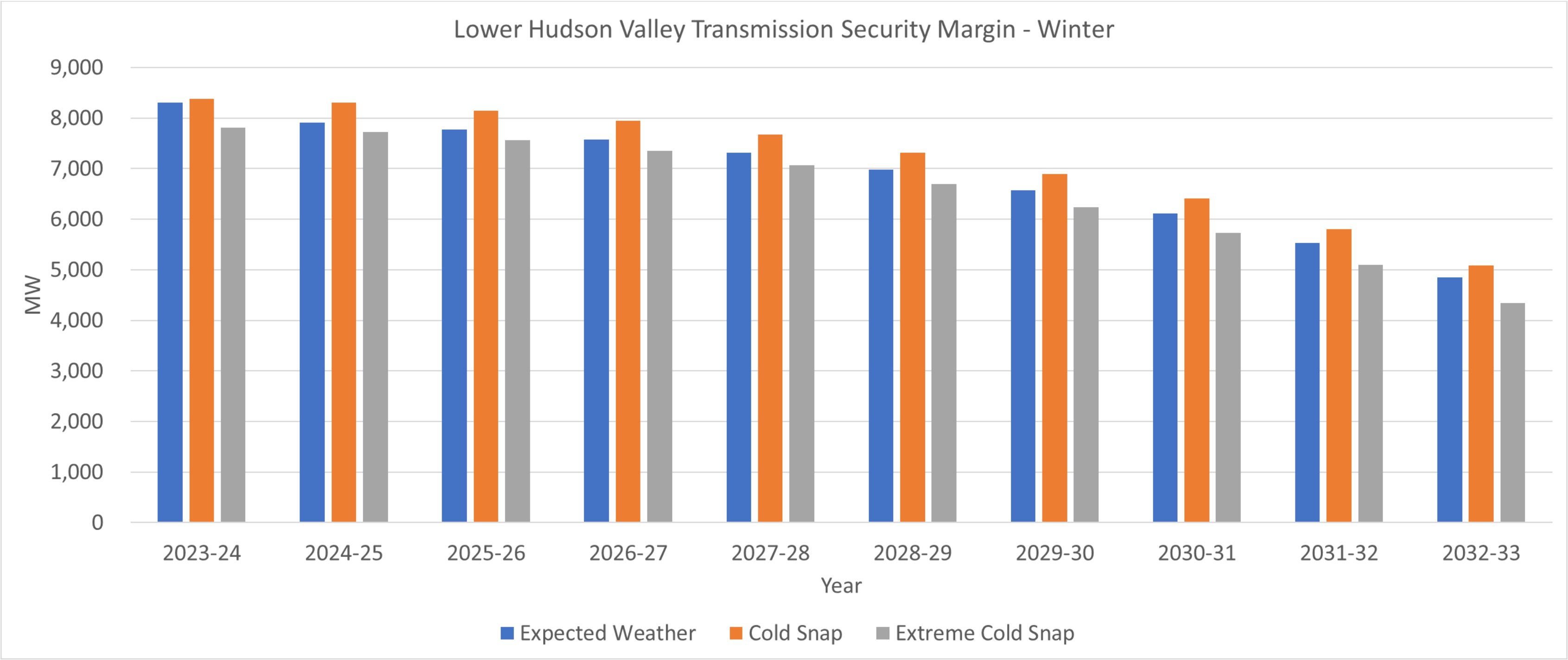


Figure 48: Summary of Lower Hudson Valley Summer Transmission Security Margin – Winter

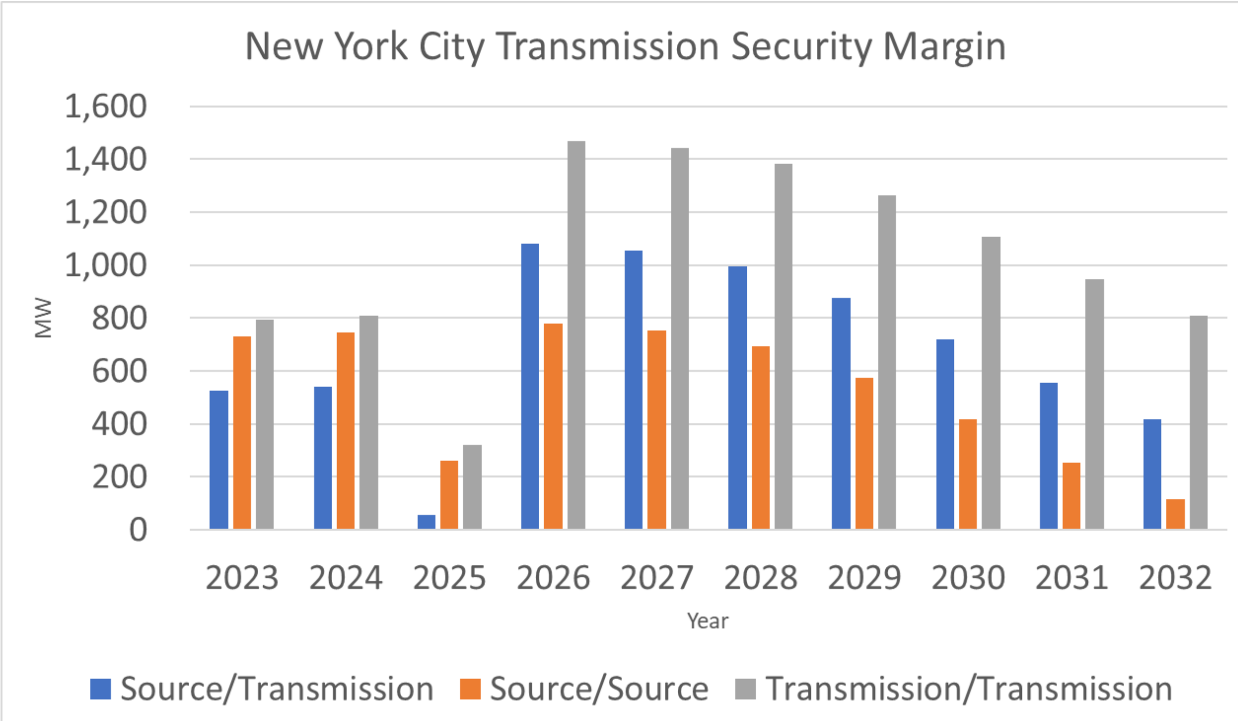


New York City (Zone J) Transmission Security Margins

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 contingencies and a return to normal (N-1-1-0).[32] Design criteria N-1-1-0 combinations include various combinations of the loss of generation and transmission facilities. As the system changes, the limiting contingency combination may also change. **Figure 49** shows how the summer transmission security margin changes through time in consideration of the planned transmission system changes, which impact the most limiting contingency combination for the year being evaluated. In the summer 2023, 2024, and 2025, the most limiting N-1-1-0 contingency combination is the loss of Ravenswood 3 followed by the loss of Mott Haven – Rainey 345 kV (Q12). Starting in summer 2026, the limiting contingency combination changes to the loss of CHPE followed by the loss of Ravenswood 3. Other contingency combinations result in changing the power flowing into Zone J from other NYCA zones. For example, in considering the possible combinations of N-1-1-0 events, these can include a mix of generation and transmission, two transmission events, or two generation events. **Figure 49** shows the transmission security margin for the contingency combinations of: Ravenswood 3 and Mott Haven — Rainey (Q12) 345 kV, Ravenswood 3 and Bayonne Energy Center (for years 2023 through 2025) or CHPE and Ravenswood 3 (years 2026 through 2032), and Sprain Brook-W. 49th St. 345 kV (M51 and M52). As seen in **Figure 49**, the selecting an interface flow with the lowest value (3,191 MW for the loss of M51/M52) does not result in the smallest transmission security margin. The limiting contingency combination for all winters is the loss of Ravenswood 3 followed by the loss of Mott Haven – Rainey 345 kV (Q12). This is due to the assumption that following the in-service status of CHPE by summer 2026, its schedule is 0 MW for the winter seasons.

[32] Con Edison, TP-7100-18 Transmission Planning Criteria, dated August 2019.

Figure 49: Impact of Contingency Combination on Zone J Transmission Security Margin



As transmission security analysis represents discrete snapshots in time of various credible combinations of system conditions, when reliability needs are identified only the magnitude of the need can be identified under those system conditions. Additional details are required to fully describe the nature of the need such as evaluating the hourly load shape and its impact on the need. To describe the nature of the New York City transmission security margin, load shapes are developed for the Zone J component of the statewide load shape. Details of the load shapes are provided later in this appendix. For this assessment, load shapes are not developed past 2032 and only developed for the summer conditions.

Figure 50 shows the calculation of the New York City transmission security margin at the statewide coincident peak hour for baseline expected weather, expected load conditions for summer with normal transfer criteria. The New York City transmission security margin coincident with the statewide system peak ranges from 526 MW in summer 2023 to 117 MW by summer 2032 (line-item L).

The narrowest margin in New York City in the 10-year horizon for the summer peak expected load, normal transfer criteria conditions is 54 MW, which is observed in summer 2025. With this narrow margin, it is feasible for a small increase in expected load forecast to cause the system to be deficient. For example, with a margin of 54 MW, a forecast change of about 0.5% in New York City would cause a deficiency. The

2022 Quarter 2 STAR,[33] which used the 2021 Gold Book forecast, showed that under baseline expected load conditions with normal transfer criteria and the unavailability of thermal generation there would be a deficiency of 190 MW in year 2025.

The load shapes for New York City show the contribution of Zone J **(Figure 85**) towards the statewide curve (which represents the statewide coincident peak) for each hour of the day. Utilizing the load shape for the baseline expected weather summer peak day, the New York City transmission security margin for each hour is shown in **Figure 51**. The hourly margins are created by using the load forecast for each hour in the margin calculation (*i.e.*, **Figure 50** line-item A) with additional adjustments to account for the appropriate derate for solar generation and energy limited resources in each hour (*i.e.*, **Figure 50** line-item H). All other values in the margin calculations are held constant. For all years in the 10-year study horizon, **Figure 51** shows that there are no observed deficiencies in consideration of the load shapes under baseline expected load, normal transfer criteria for New York City. However, the Zone J load during the system peak day does not necessarily peak during the same hour as the NYCA as a whole. In summer 2025, the Zone J peak hour is 16 while the statewide peak is hour 17. As such, the New York City margin for summer 2025 is 15 MW. Similarly, in 2032, the hourly margins are as narrow as 50 MW. A graphical representation of the New York City transmission security margin curve for summer peak baseline expected weather for the peak day in years 2023, 2025, 2027, and 2032 is provided **Figure 52**.

It is possible for other combinations of events, such as 1-in-10-year heatwaves and 1-in-100-year extreme heatwaves, to result in a deficient transmission security margin. **Figure 53** shows the New York City transmission security margin for the statewide coincident peak hour under the 1-in-10-year heatwave condition with the assumption that the system is using emergency transfer criteria. As seen in **Figure 53**, the margin is sufficient for summer 2023 or 2024; however, the margin is deficient in summer 2025 by 249 MW (line-item M). Starting in summer 2026 with CHPE in-service, the margins are sufficient through summer 2030. In summer 2031 the system is deficient by 71 MW with increased deficiency in summer 2032 to 215 MW due to the increased load. The load shapes for Zone J under a heatwave is provided in **Figure 90**. Utilizing the New York City load-duration heatwave curve, the transmission security margin for each hour utilizing emergency transfer criteria is shown in **Figure 54**. As shown in **Figure 54**, the deficiency in summer 2025 is observed over seven hours (988 MWh). While **Figure 53** does not show the system to be deficient in year 2030, the load shape results in a two-hour deficiency (163 MWh) as seen in **Figure 54**. This is due to the Zone J load component of the statewide 1-in-10-year summer peak day having less of a contribution to the load in hour beginning 18 as compared to hours beginning 16 and 17.

[33] The quarterly Short-Term Reliability Process (STAR) reports are available on the NYISO's website at https://www.nyiso.com/short-term-reliability-process.

In 2032, the MWh deficiency is observed over 8 hours (1,483 MWh). **Figure 55** provides a graphical representation of the New York City transmission security margin curve for the 1-in-10-year heatwave for the peak day in years 2023, 2025, 2027, and 2032.

The 1-in-100-year extreme heatwave transmission security margin in **Figure 56** shows that the transmission security margin is deficient for all years in the 10-year horizon (line-item M). As shown in **Figure 57**, in summer 2023 the 1-in-100-year peak day is deficient over 6 hours (1,472 MWh). In 2025, the deficiency increases to 5,352 MWh over 11 hours. In 2027, the deficiency is only observed for 3 hours (377 MWh). By 2032, the deficiency increases to 12 hours (6,850 MWh). **Figure 58** provides a graphical representation of the New York City transmission security margin curve for the 1-in-100-year extreme heatwave for the peak day in years 2023, 2025, 2027, and 2032.

In addition to heatwave or extreme heatwave conditions, other changes to the transmission system may result in a deficient transmission security margin. Considering the summer baseline peak load transmission security margin, several different single generator outages, or combinations of generator outages within New York City beyond those included in the RNA Base Case assumptions could result in a deficient transmission security margin. Details of specific generator impacts on the New York City transmission security margin are shown in **Figure 59**. In summer 2023, there are eight different units (or combinations of units) listed that could result in an insufficient transmission security margin. By 2025, the amount of units (or combination of units) that can result in insufficient margins increases to 33. These values reduce to three units (or combination of units) starting in summer 2026 with the in-service status of CHPE. However, by 2032, there are 22 units that could cause the margins to be deficient.

Figure 60 shows the New York City transmission security margin under winter peak baseline expected weather load conditions with normal transfer criteria. For winter peak, the margins are sufficient for all years and ranges from 4,571 MW in winter 2023-24 to 2,086 in winter 2032-33 (line-item L). Considering the winter baseline peak load transmission security margin, multiple outages in New York City would be required to show a deficient transmission security margin.

Figure 61 shows the New York City transmission security margin in a 1-in-10-year cold snap with emergency transfer criteria. Under this condition the margins are sufficient for all years and ranges from 4,316 MW in winter 2023-24 to 1,705 MW in winter 2032-33. Similarly, **Figure 62** shows the New York City transmission security margins for the 1-in-100-year extreme cold snap with emergency transfer criteria. The margin under this condition is sufficient for all years and ranges from 3,913 MW in winter 2023-24 to 1,168 MW in winter 2032-33.

Figure 63 provides a summary of the summer peak New York City transmission security margins under expected summer weather, heatwave, and extreme heatwave conditions. **Figure 64** provides a summary of the winter peak New York City transmission security margins under expected winter weather, cold snap, and extreme cold snap conditions.

Figure 50: New York City Transmission Security Margin (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

Summer Peak - Baseline Expected Weather, Normal Transfer Criteria (MW)											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	**Zone J Load Forecast**	(10,853)	(10,837)	(10,786)	(10,778)	(10,804)	(10,864)	(10,986)	(11,140)	(11,303)	(11,441)
B	I+K to J (3)	3,904	3,904	3,904	4,622	4,622	4,622	4,622	4,622	4,622	4,622
C	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
D	**Total J AC Import (B+C)**	3,893	3,893	3,893	4,611	4,611	4,611	4,611	4,611	4,611	4,611
E	Loss of Source Contingency	(980)	(980)	(980)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)
F	**Resource Need (A+D+E)**	(7,940)	(7,924)	(7,873)	(8,397)	(8,423)	(8,483)	(8,605)	(8,759)	(8,922)	(9,060)
G	J Generation (1)	8,796	8,796	8,197	8,197	8,197	8,197	8,197	8,197	8,197	8,197
H	J Generation Derates (2)	(645)	(645)	(584)	(584)	(584)	(584)	(584)	(584)	(584)	(584)
I	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	315	315	315	1,565	1,565	1,565	1,565	1,565	1,565	1,565
K	**Total Resources Available (H+I+J)**	8,466	8,466	7,928	9,178	9,178	9,178	9,178	9,178	9,178	9,178
L	**Transmission Security Margin (F+K)**	526	542	54	780	754	694	572	418	255	117

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based on the summer peak 2032 represenations evalauted in the 2022 RNA.

Figure 51: New York City Transmission Security Margin (Hourly) (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

Summer Peak - Baseline Expected Summer Weather, Normal Transfer Criteria (MW)										
J Transmission Security Margin										
Hour	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
HB0	3,485	3,491	2,993	3,703	3,561	3,490	3,357	3,188	3,010	2,860
HB1	3,842	3,849	3,356	4,069	3,933	3,868	3,740	3,581	3,413	3,271
HB2	4,104	4,113	3,620	4,335	4,202	4,140	4,017	3,865	3,705	3,570
HB3	4,253	4,262	3,771	4,488	4,357	4,300	4,181	4,034	3,880	3,751
HB4	4,264	4,275	3,787	4,507	4,379	4,326	4,211	4,073	3,926	3,805
HB5	4,063	4,072	3,580	4,300	4,171	4,115	4,001	3,860	3,713	3,590
HB6	3,587	3,598	3,110	3,833	3,705	3,653	3,542	3,403	3,257	3,132
HB7	2,917	2,937	2,460	3,194	3,077	3,035	2,932	2,799	2,658	2,535
HB8	2,299	2,324	1,849	2,587	2,472	2,432	2,328	2,193	2,043	1,912
HB9	1,807	1,834	1,363	2,103	1,992	1,954	1,853	1,719	1,568	1,433
HB10	1,413	1,444	976	1,723	1,616	1,582	1,486	1,353	1,202	1,069
HB11	1,133	1,169	706	1,458	1,356	1,331	1,241	1,115	970	840
HB12	917	955	496	1,253	1,155	1,135	1,051	931	793	672
HB13	756	795	336	1,092	997	975	893	779	646	530
HB14	688	724	261	1,012	911	886	800	681	547	431
HB15	597	628	157	901	794	761	667	542	404	284
HB16	464	491	15	752	640	600	499	368	226	102
HB17	526	542	54	780	653	600	486	340	185	50
HB18	646	659	168	887	754	694	572	418	255	117
HB19	836	845	351	1,065	928	862	733	574	407	263
HB20	1,065	1,072	576	1,291	1,152	1,084	953	791	620	474
HB21	1,317	1,328	833	1,551	1,414	1,348	1,220	1,058	886	741
HB22	1,752	1,763	1,270	1,985	1,846	1,779	1,646	1,480	1,302	1,152
HB23	2,309	2,321	1,829	2,544	2,407	2,339	2,208	2,041	1,865	1,713

Figure 52: New York City Transmission Security Margin Hourly Curve (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

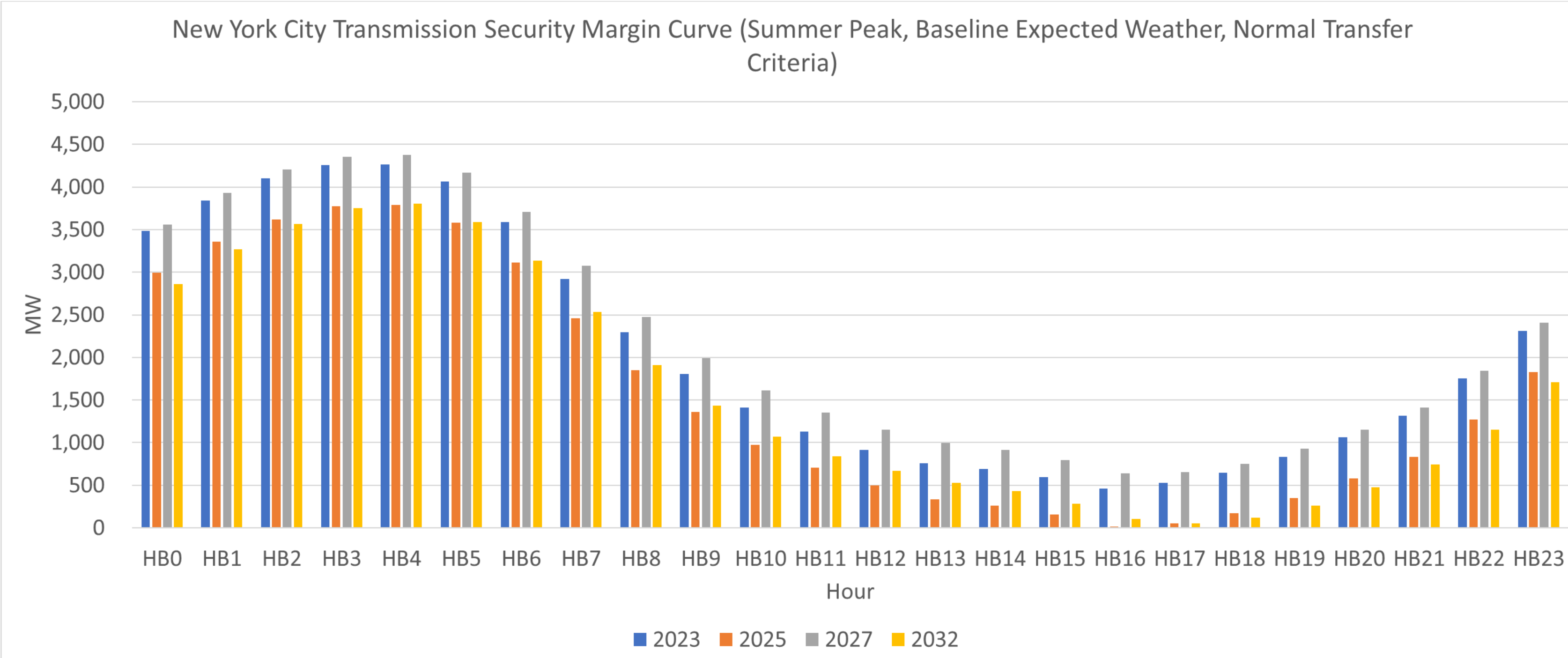


Figure 53: New York City Transmission Security Margin (1-in-10-Year Heatwave, Emergency Transfer Criteria)

Summer Peak - 1-in-10-Year Heatwave, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	**Zone J Load Forecast**	(11,324)	(11,308)	(11,254)	(11,246)	(11,273)	(11,336)	(11,463)	(11,624)	(11,794)	(11,938)
B	I+K to J (5)	3,904	3,904	3,904	4,622	4,622	4,622	4,622	4,622	4,622	4,622
C	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
D	**Total J Import (B+C)**	3,893	3,893	3,893	4,611	4,611	4,611	4,611	4,611	4,611	4,611
E	Loss of Source Contingency	(980)	(980)	(980)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)
F	**Resource Need (A+D+E)**	(8,411)	(8,395)	(8,341)	(8,865)	(8,892)	(8,955)	(9,082)	(9,243)	(9,413)	(9,557)
G	J Generation (1)	8,796	8,796	8,197	8,197	8,197	8,197	8,197	8,197	8,197	8,197
H	J Generation Derates (2)	(645)	(645)	(584)	(584)	(584)	(584)	(584)	(584)	(584)	(584)
I	Temperature Based Generation Derates	(64)	(64)	(55)	(55)	(55)	(55)	(55)	(55)	(55)	(55)
J	Net ICAP External Imports	315	315	315	1,565	1,565	1,565	1,565	1,565	1,565	1,565
K	SCRs (3), (4)	219	219	219	219	219	219	219	219	219	219
L	**Total Resources Available (G+H+I+J+K)**	8,621	8,621	8,092	9,342	9,342	9,342	9,342	9,342	9,342	9,342
M	**Transmission Security Margin (F+L)**	210	226	(249)	477	450	387	260	99	(71)	(215)

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 198 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based on the summer peak 2032 represenations evalauted in the 2022 RNA.

Figure 54: New York City Transmission Security Margin (Hourly) (1-in-10-Year Heatwave, Emergency Transfer Criteria)

Summer Peak - Heatwave, Emergency Transfer Criteria (MW)										
J Transmission Security Margin										
Hour	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
HB0	2,618	2,627	2,144	2,857	2,692	2,604	2,451	2,266	2,078	1,921
HB1	3,016	3,024	2,547	3,262	3,103	3,021	2,872	2,696	2,518	2,369
HB2	3,291	3,303	2,827	3,545	3,390	3,312	3,169	3,002	2,832	2,690
HB3	3,456	3,469	2,995	3,715	3,561	3,489	3,349	3,187	3,022	2,887
HB4	3,480	3,495	3,023	3,746	3,595	3,526	3,389	3,235	3,077	2,948
HB5	3,264	3,278	2,803	3,527	3,376	3,306	3,172	3,016	2,860	2,730
HB6	2,740	2,752	2,278	3,003	2,850	2,780	2,647	2,491	2,334	2,202
HB7	2,054	2,063	1,589	2,314	2,161	2,091	1,954	1,795	1,635	1,495
HB8	1,467	1,478	1,001	1,725	1,571	1,498	1,359	1,195	1,025	877
HB9	1,012	1,022	547	1,270	1,120	1,047	909	746	574	422
HB10	689	701	227	954	806	736	601	438	264	112
HB11	563	581	111	843	701	639	510	352	185	34
HB12	443	463	(3)	735	597	538	413	260	98	(45)
HB13	402	426	(37)	702	596	538	419	241	86	(50)
HB14	336	360	(103)	634	547	493	374	162	8	(126)
HB15	224	246	(221)	514	449	391	270	23	(131)	(265)
HB16	132	153	(317)	414	369	309	184	(100)	(257)	(393)
HB17	210	226	(249)	477	450	387	260	(63)	(225)	(367)
HB18	406	420	(56)	663	632	563	430	99	(71)	(215)
HB19	632	643	164	878	821	747	606	304	130	(19)
HB20	863	872	390	1,105	1,023	944	802	529	353	200
HB21	1,117	1,126	641	1,353	1,244	1,162	1,015	771	588	433
HB22	1,568	1,576	1,089	1,798	1,663	1,575	1,420	1,203	1,013	850
HB23	2,144	2,150	1,663	2,371	2,213	2,122	1,967	1,781	1,591	1,426

Figure 55: New York City Transmission Security Margin Hourly Curve (1-in-10-Year Heatwave, Emergency Transfer Criteria)

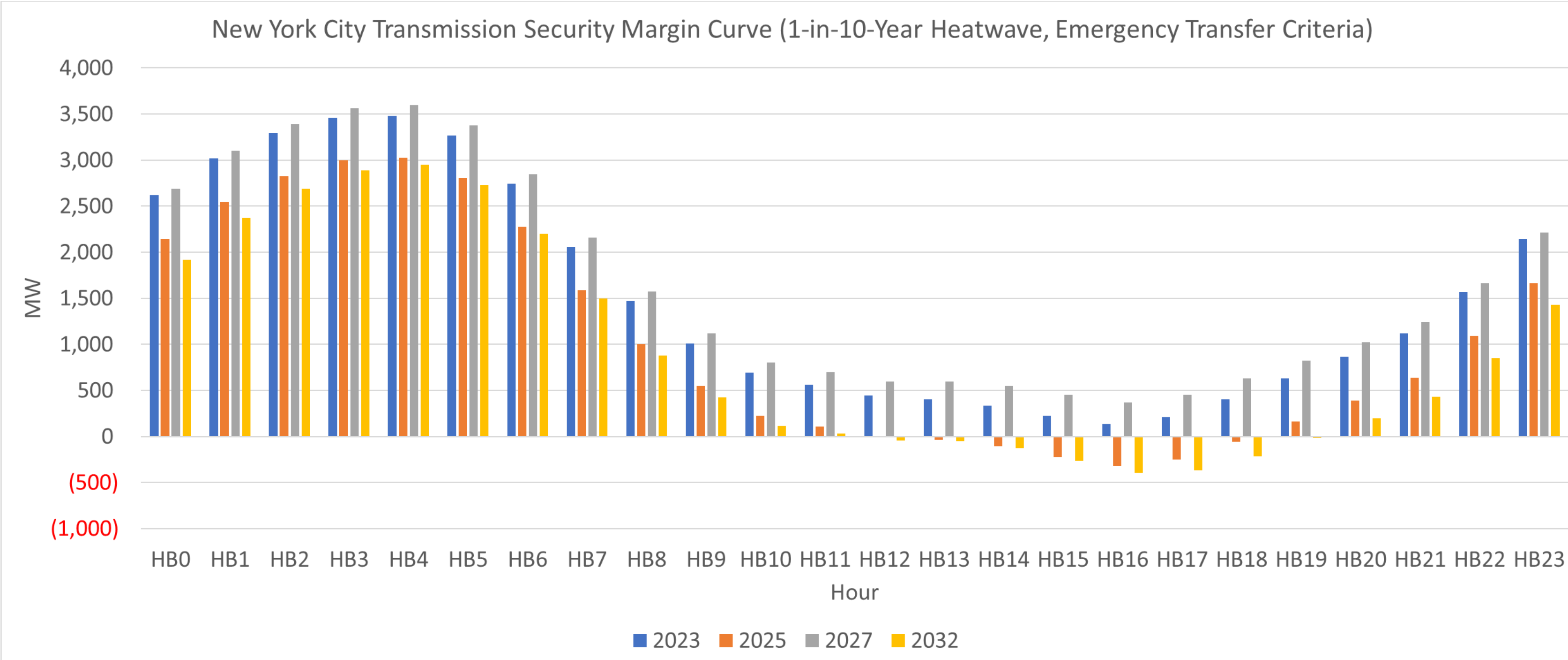


Figure 56: New York City Transmission Security Margin (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

Summer Peak - 1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	**Zone J Load Forecast**	(11,802)	(11,785)	(11,729)	(11,721)	(11,749)	(11,814)	(11,947)	(12,114)	(12,292)	(12,442)
B	I+K to J (5)	3,904	3,904	3,904	4,622	4,622	4,622	4,622	4,622	4,622	4,622
C	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
D	**Total J Import (B+C)**	3,893	3,893	3,893	4,611	4,611	4,611	4,611	4,611	4,611	4,611
E	Loss of Source Contingency	(980)	(980)	(980)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)
F	**Resource Need (A+D+E)**	(8,889)	(8,872)	(8,816)	(9,340)	(9,368)	(9,433)	(9,566)	(9,733)	(9,911)	(10,061)
G	J Generation (1)	8,796	8,796	8,197	8,197	8,197	8,197	8,197	8,197	8,197	8,197
H	J Generation Derates (2)	(645)	(645)	(584)	(584)	(584)	(584)	(584)	(584)	(584)	(584)
I	Temperature Based Generation Derates	(135)	(135)	(116)	(116)	(116)	(116)	(116)	(116)	(116)	(116)
J	Net ICAP External Imports	315	315	315	1,565	1,565	1,565	1,565	1,565	1,565	1,565
K	SCRs (3), (4)	219	219	219	219	219	219	219	219	219	219
L	**Total Resources Available (G+H+I+J+K)**	8,550	8,550	8,031	9,281	9,281	9,281	9,281	9,281	9,281	9,281
M	**Transmission Security Margin (F+L)**	(339)	(322)	(785)	(59)	(87)	(152)	(285)	(452)	(630)	(780)

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 198 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based on the summer peak 2032 represenations evalauted in the 2022 RNA.

Figure 57: New York City Transmission Security Margin (Hourly) (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

Summer Peak - 1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria (MW)										
J Transmission Security Margin										
Hour	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
HB0	2,247	2,257	1,788	2,503	2,335	2,246	2,090	1,901	1,708	1,548
HB1	2,643	2,654	2,190	2,907	2,745	2,662	2,509	2,329	2,146	1,994
HB2	2,918	2,932	2,470	3,190	3,031	2,952	2,805	2,633	2,458	2,314
HB3	3,083	3,097	2,637	3,359	3,202	3,128	2,985	2,817	2,648	2,508
HB4	3,107	3,124	2,665	3,390	3,235	3,165	3,024	2,865	2,701	2,569
HB5	2,890	2,905	2,444	3,169	3,015	2,942	2,804	2,643	2,481	2,348
HB6	2,362	2,375	1,913	2,638	2,481	2,409	2,270	2,109	1,945	1,809
HB7	1,672	1,681	1,218	1,942	1,784	1,710	1,569	1,404	1,236	1,093
HB8	1,083	1,092	625	1,347	1,188	1,111	966	797	620	468
HB9	628	635	170	891	734	657	513	343	164	8
HB10	307	316	(149)	576	421	346	204	34	(146)	(302)
HB11	185	200	(262)	467	318	251	115	(49)	(223)	(378)
HB12	9	25	(433)	301	155	90	(43)	(203)	(374)	(522)
HB13	(67)	(48)	(503)	233	118	55	(72)	(260)	(424)	(567)
HB14	(168)	(147)	(602)	132	38	(21)	(149)	(372)	(535)	(675)
HB15	(315)	(295)	(752)	(20)	(90)	(153)	(283)	(542)	(705)	(847)
HB16	(442)	(421)	(880)	(152)	(199)	(263)	(396)	(693)	(860)	(1,003)
HB17	(339)	(322)	(785)	(59)	(87)	(152)	(285)	(622)	(794)	(941)
HB18	(142)	(125)	(588)	132	101	32	(108)	(452)	(630)	(780)
HB19	122	136	(329)	386	330	255	109	(204)	(385)	(540)
HB20	391	402	(65)	651	569	489	341	60	(123)	(280)
HB21	678	690	217	933	822	739	588	336	147	(11)
HB22	1,161	1,170	696	1,408	1,270	1,182	1,024	801	606	440
HB23	1,771	1,779	1,305	2,016	1,855	1,763	1,605	1,415	1,221	1,053

Figure 58: New York City Transmission Security Margin Hourly Curve (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

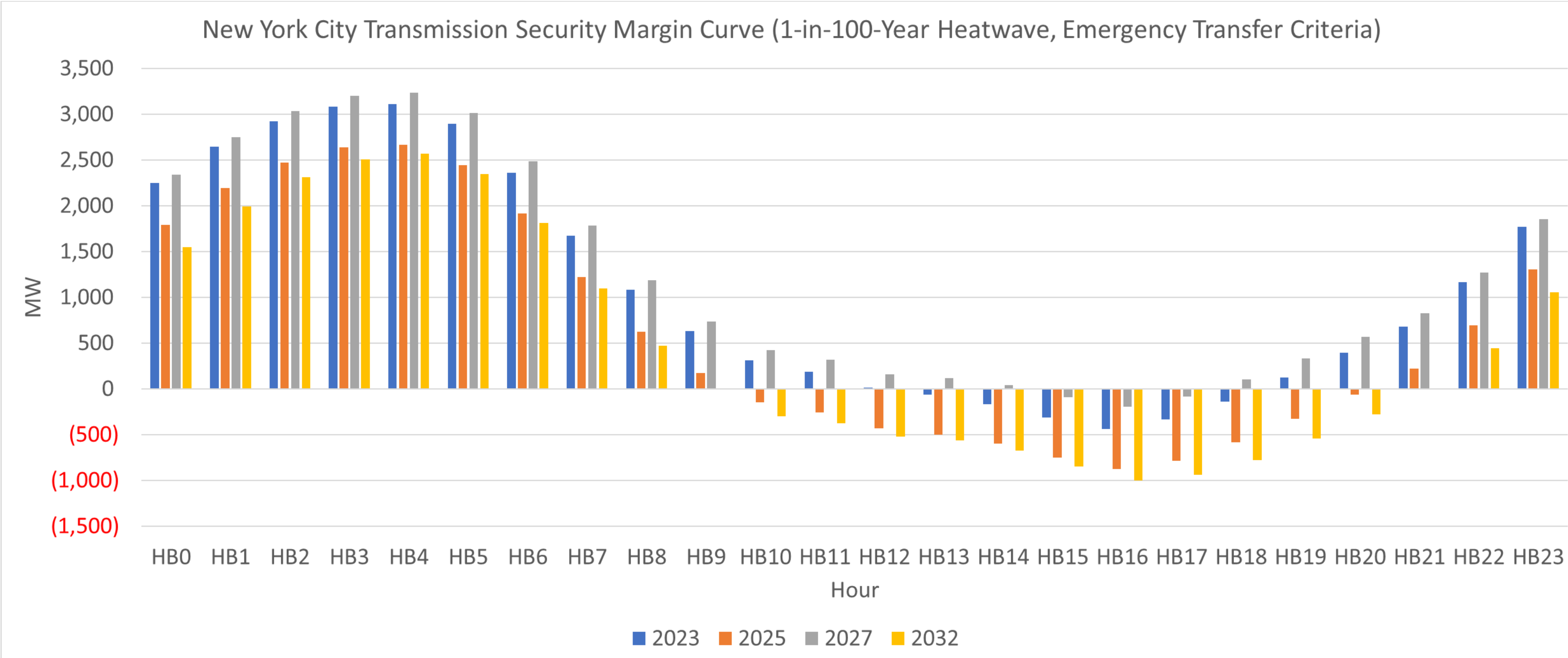


Figure 59: Impact of Generator Outages on New York City Transmission Security Margin (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

New York City Transmission Security Margin (MW)											
Year		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
New York City Transmission Security Margin (Summer Peak - Baseline Expected Weather, Normal Transfer Criteria)		526	542	54	780	754	694	572	418	255	117
Unit Name	Summer DMNC	Transmission Security Margin Less Summer DMNC									
Astoria 2, 3, and 5	918.8	(393)	(377)	(864)	(138)	(164)	(224)	(346)	(500)	(663)	(801)
Arthur Kill ST 2 and ST 3	860.1	(334)	(318)	(806)	(80)	(106)	(166)	(288)	(442)	(605)	(743)
Linden Cogen	790.8	(265)	(249)	(736)	(10)	(36)	(96)	(218)	(372)	(535)	(673)
Ravenswood ST 01 and ST 02	749.8	(224)	(208)	(695)	31	5	(55)	(177)	(331)	(494)	(632)
East River 1, 2, 6, and 7	638.8	(113)	(97)	(584)	142	116	56	(66)	(220)	(383)	(521)
Bayonne (all units)	607.8	(82)	(66)	(553)	173	147	87	(35)	(189)	(352)	(490)
Astoria East Energy - CC1 & CC2	584.4	(58)	(42)	(530)	196	170	110	(12)	(166)	(329)	(467)
Astoria Energy 2 - CC3 & CC4	571.2	(45)	(29)	(517)	209	183	123	1	(153)	(316)	(454)
Arthur Kill ST 3	520.1	6	22	(466)	260	234	174	52	(102)	(265)	(403)
Astoria CC 1 & 2	479.8	46	62	(425)	301	275	215	93	(61)	(224)	(362)
Ravenswood ST 02	377.5	149	165	(323)	403	377	317	195	41	(122)	(260)
Astoria 5	375.1	151	167	(321)	405	379	319	197	43	(120)	(258)
Ravenswood ST 01	372.3	154	170	(318)	408	382	322	200	46	(117)	(255)
Astoria 3	371.3	155	171	(317)	409	383	323	201	47	(116)	(254)
Arthur Kill ST 2	340.0	186	202	(286)	440	414	354	232	78	(85)	(223)
Brooklyn Navy Yard	256.9	269	285	(202)	524	498	438	316	162	(1)	(139)
Ravenswood CC 04	232.5	294	310	(178)	548	522	462	340	186	23	(115)
East River 7	184.8	341	357	(130)	596	570	510	388	234	71	(67)
Astoria 2	172.4	354	370	(118)	608	582	522	400	246	83	(55)
East River 1	155.8	370	386	(101)	625	599	539	417	263	100	(38)
East River 2	152.9	373	389	(98)	628	602	542	420	266	103	(35)
East River 6	145.3	381	397	(91)	635	609	549	427	273	110	(28)
KIAC JFK GT 1 & GT2	105.5	421	437	(51)	675	649	589	467	313	150	12
Bayonne EC CTG10	62.6	463	479	(8)	718	692	632	510	356	193	55
Bayonne EC CTG4	61.8	464	480	(7)	719	693	633	511	357	194	56
Bayonne EC CTG9	61.3	465	481	(7)	719	693	633	511	357	194	56
Bayonne EC CTG1	61.1	465	481	(7)	719	693	633	511	357	194	56
Bayonne EC CTG8	61.0	465	481	(7)	719	693	633	511	357	194	56
Bayonne EC CTG5	60.7	465	481	(6)	720	694	634	512	358	195	57
Bayonne EC CTG7	60.6	465	481	(6)	720	694	634	512	358	195	57
Bayonne EC CTG2	60.0	466	482	(6)	720	694	634	512	358	195	57
Bayonne EC CTG6	59.5	467	483	(5)	721	695	635	513	359	196	58
Bayonne EC CTG3	59.2	467	483	(5)	721	695	635	513	359	196	58
KIAC_JFK_GT1	53.4	473	489	1	727	701	641	519	365	202	64
KIAC_JFK_GT2	52.1	474	490	2	728	702	642	520	366	203	65
Kent	46.0	480	496	8	734	708	648	526	372	209	71
Pouch	45.2	481	497	9	735	709	649	527	373	210	72
Gowanus 5	40.0	486	502	14	740	714	654	532	378	215	77
Harlem River 2	40.0	486	502	14	740	714	654	532	378	215	77
Hellgate 2	40.0	486	502	14	740	714	654	532	378	215	77
Vernon Blvd 2	40.0	486	502	14	740	714	654	532	378	215	77
Gowanus 6	39.9	486	502	15	741	715	655	533	379	216	78
Harlem River 1	39.9	486	502	15	741	715	655	533	379	216	78
Hellgate 1	39.9	486	502	15	741	715	655	533	379	216	78
Vernon Blvd 3	39.9	486	502	15	741	715	655	533	379	216	78
Arthur Kill Cogen	9.0	517	533	45	771	745	685	563	409	246	108

Figure 60: New York City Transmission Security Margin (Winter Peak – Baseline Expected Weather, Normal Transfer Criteria)

Winter Peak - Baseline Expected Weather, Normal Transfer Criteria (MW)											
Line	**Item**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**	**2031-32**	**2032-33**
A	**Zone J Load Forecast**	(7,442)	(7,495)	(7,578)	(7,725)	(7,934)	(8,208)	(8,532)	(8,894)	(9,350)	(9,897)
B	I+K to J (3), (4)	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904
C	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
D	**Total J AC Import (B+C)**	3,893	3,893	3,893	3,893	3,893	3,893	3,893	3,893	3,893	3,893
E	Loss of Source Contingency	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)
F	**Resource Need (A+D+E)**	(4,539)	(4,592)	(4,675)	(4,822)	(5,031)	(5,305)	(5,629)	(5,991)	(6,447)	(6,994)
G	J Generation (1)	9,481	9,481	9,447	9,447	9,447	9,447	9,447	9,447	9,447	9,447
H	J Generation Derates (2)	(686)	(686)	(682)	(682)	(682)	(682)	(682)	(682)	(682)	(682)
I	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
K	**Total Resources Available (G+H+I+J)**	9,110	9,110	9,080	9,080	9,080	9,080	9,080	9,080	9,080	9,080
L	**Transmission Security Margin (F+K)**	4,571	4,518	4,405	4,258	4,049	3,775	3,451	3,089	2,633	2,086

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based also based on the summer peak 2025 representations evaluated in the post-2020 RNA analysis which does not include the impact of CHPE.
4. As a conservative winter peak assumption these limits utilize the summer values.

Figure 61: New York City Transmission Security Margin (1-in-10-Year Cold Snap, Emergency Transfer Criteria)

Winter Peak - 1-in-10-Year Cold Snap, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**	**2031-32**	**2032-33**
A	**Zone J Load Forecast**	(7,825)	(7,880)	(7,968)	(8,122)	(8,342)	(8,630)	(8,971)	(9,351)	(9,831)	(10,406)
B	I+K to J (5), (6)	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904
C	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
D	**Total J Import (B+C)**	3,893	3,893	3,893	3,893	3,893	3,893	3,893	3,893	3,893	3,893
E	Loss of Source Contingency	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)
F	**Resource Need (A+D+E)**	(4,922)	(4,977)	(5,065)	(5,219)	(5,439)	(5,727)	(6,068)	(6,448)	(6,928)	(7,503)
G	J Generation (1)	9,481	9,481	9,447	9,447	9,447	9,447	9,447	9,447	9,447	9,447
H	J Generation Derates (2)	(686)	(686)	(682)	(682)	(682)	(682)	(682)	(682)	(682)	(682)
I	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
K	SCRs (3), (4)	128	128	128	128	128	128	128	128	128	128
L	**Total Resources Available (G+H+I+J+K)**	9,238	9,238	9,208	9,208	9,208	9,208	9,208	9,208	9,208	9,208
M	**Transmission Security Margin (F+L)**	4,316	4,261	4,143	3,989	3,769	3,481	3,140	2,760	2,280	1,705

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 116 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based also based on the summer peak 2025 representations evaluated in the post-2020 RNA analysis which does not include the impact of CHPE.
6. As a conservative winter peak assumption these limits utilize the summer values.

Figure 62: New York City Transmission Security Margin (1-in-100-year Extreme Cold Snap, Emergency Transfer Criteria)

Winter Peak - 1-in-100-Year Extreme Cold Snap, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**	**2031-32**	**2032-33**
A	**Zone J Load Forecast**	(8,228)	(8,287)	(8,379)	(8,541)	(8,772)	(9,075)	(9,433)	(9,834)	(10,338)	(10,943)
B	I+K to J (5), (6)	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904
C	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
D	**Total J Import (B+C)**	3,893	3,893	3,893	3,893	3,893	3,893	3,893	3,893	3,893	3,893
E	Loss of Source Contingency	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)	(990)
F	**Resource Need (A+D+E)**	(5,325)	(5,384)	(5,476)	(5,638)	(5,869)	(6,172)	(6,530)	(6,931)	(7,435)	(8,040)
G	J Generation (1)	9,481	9,481	9,447	9,447	9,447	9,447	9,447	9,447	9,447	9,447
H	J Generation Derates (2)	(686)	(686)	(682)	(682)	(682)	(682)	(682)	(682)	(682)	(682)
I	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
K	SCRs (3), (4)	128	128	128	128	128	128	128	128	128	128
L	**Total Resources Available (G+H+I+J+K)**	9,238	9,238	9,208	9,208	9,208	9,208	9,208	9,208	9,208	9,208
M	**Transmission Security Margin (F+L)**	3,913	3,854	3,732	3,570	3,339	3,036	2,678	2,277	1,773	1,168

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 116 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based also based on the summer peak 2025 representations evaluated in the post-2020 RNA analysis which does not include the impact of CHPE.
6. As a conservative winter peak assumption these limits utilize the summer values.

Figure 63: Summary of New York City Summer Transmission Security Margin – Summer

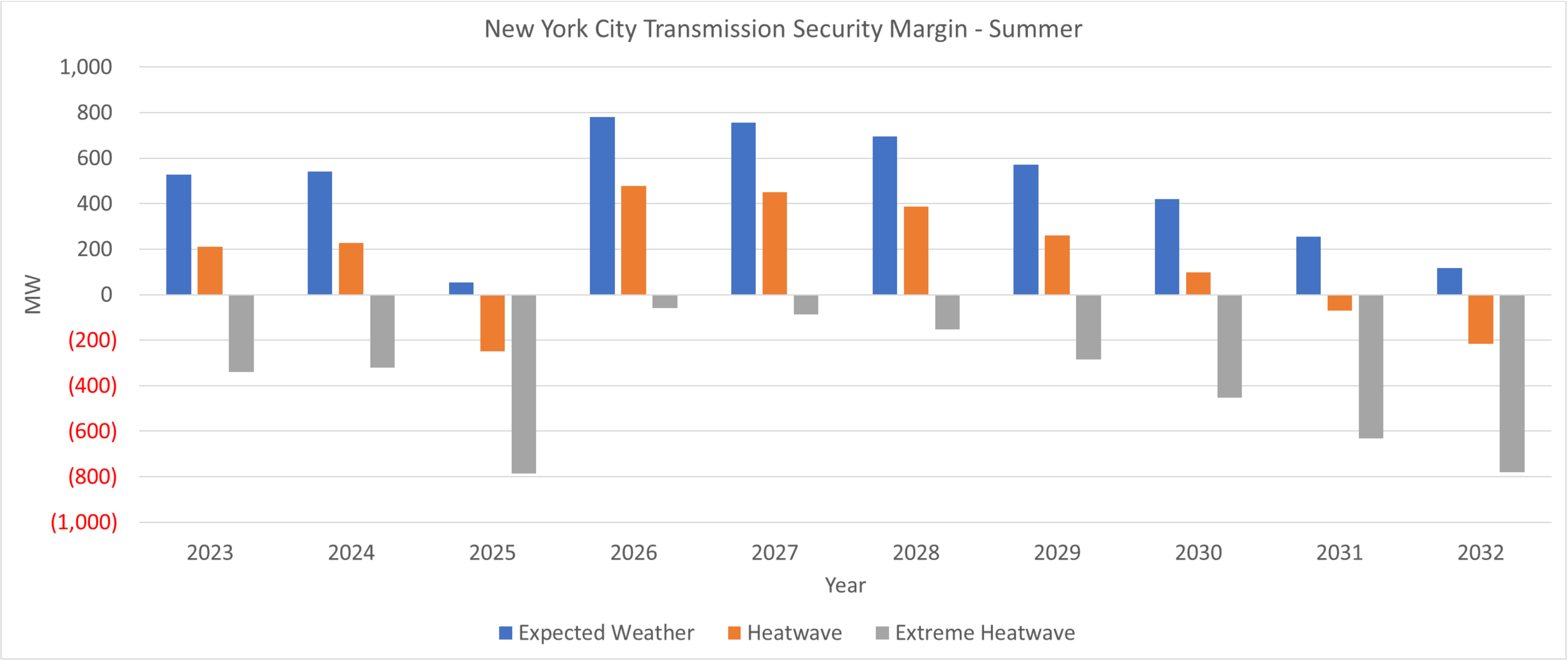
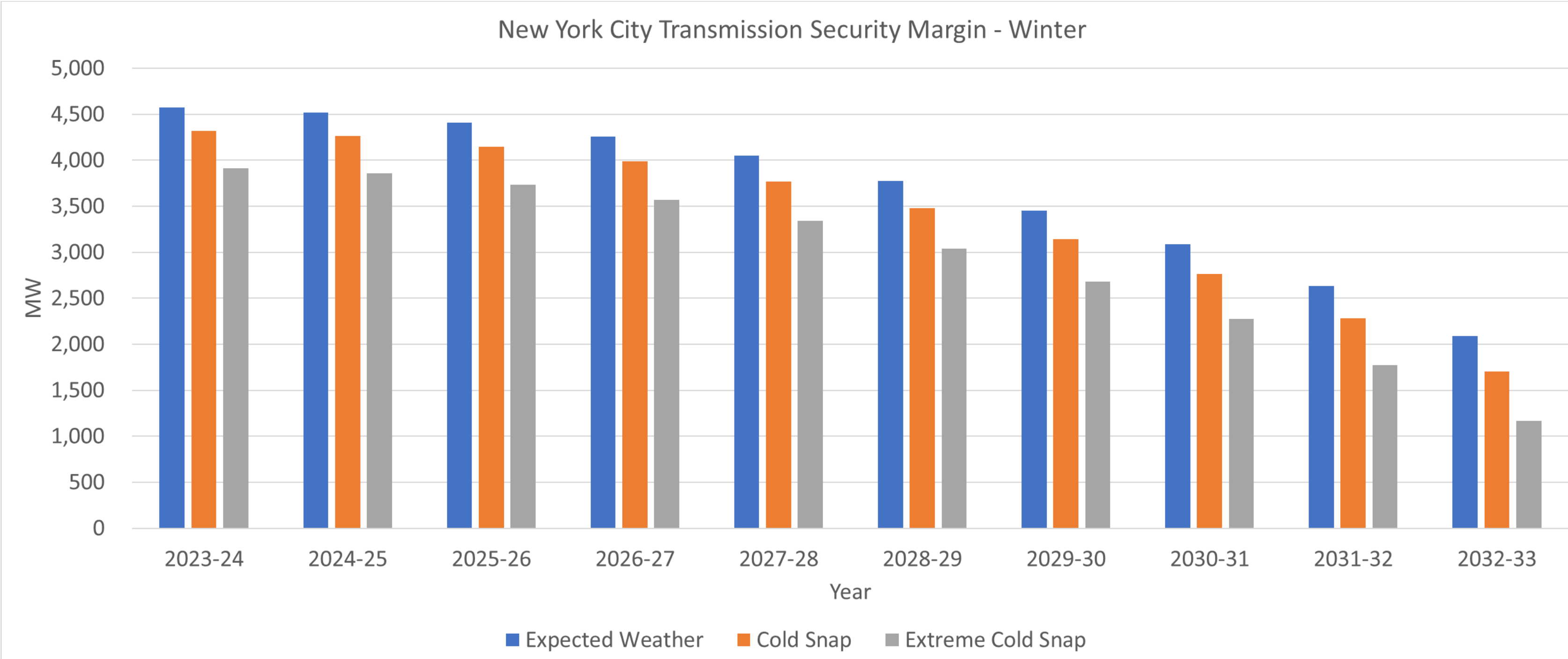


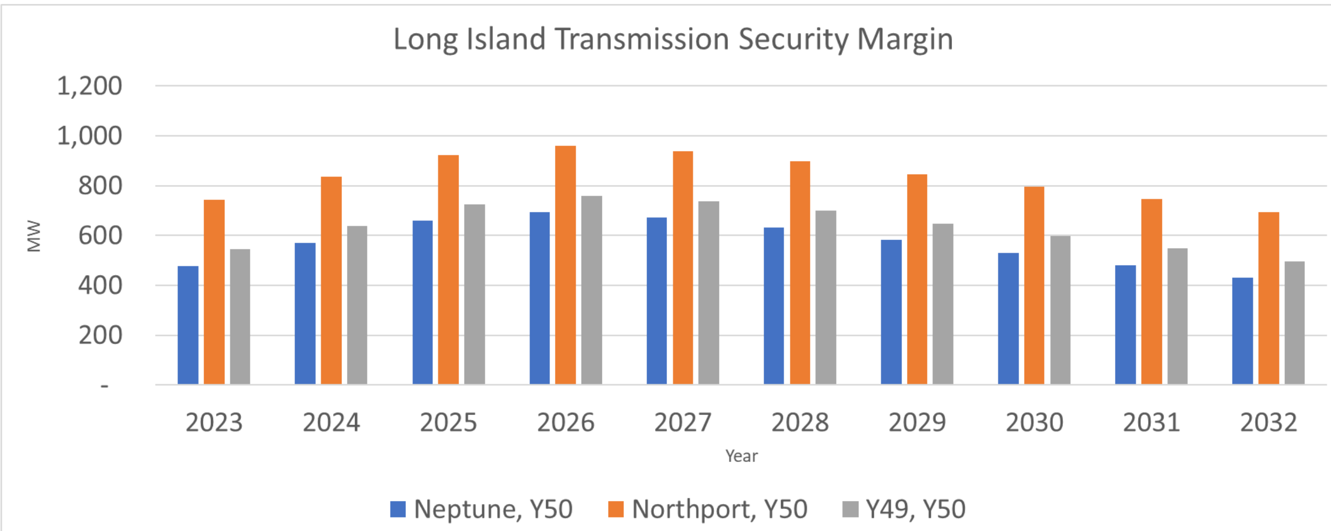
Figure 64: Summary of New York City Summer Transmission Security Margin – Winter



Long Island (Zone K) Transmission Security Margins

Within the PSEG Long Island service territory, the BPTF system (primarily comprised of 138 kV transmission) is designed for N-1-1. As shown in **Figure 65,** the most limiting N-1-1 combination for the transmission security margin under normal conditions is the outage of Neptune HVDC (660 MW) followed by securing for the loss of Dunwoodie — Shore Road 345 kV (Y50) for all evaluated years.

Figure 65: Impact of Contingency Combination on Zone K Transmission Security Margin



As transmission security analysis represents discrete snapshots in time of various credible combinations of system conditions, when reliability needs are identified only the magnitude of the need can be identified under those system conditions. Additional details are required to fully describe the nature of the need such as evaluating the hourly load shape and its impact on the need. To describe the nature of the Long Island transmission security margin, load shapes are developed for the Zone K component of the statewide load shape. Details of the load shapes are provided later in this appendix. For this assessment load shapes were not developed past 2032 and have only been developed for the summer conditions.

Figure 66 shows the calculation of the Long Island transmission security margin at the statewide coincident peak hour for baseline expected weather, expected load conditions for summer. The Long Island transmission security margin ranges from 478 MW in summer 2023 to 430 MW in summer 2032 (*see* line-item L). The narrowest transmission security margin in the 10-year horizon is 430 MW in summer 2032. The load shapes for Long Island show the contribution of Zone K (**Figure 86**) towards the statewide curve (which represents the statewide coincident peak) for each hour of the day. Utilizing the load shape for the baseline expected weather summer peak day, the Long Island transmission security margin for each hour is shown in **Figure 67**. The hourly margins are created by using the load forecast for each hour in the margin calculation (*i.e.*, placing each hour into **Figure 66** line-item A) with additional adjustments to account for the appropriate derate for solar generation and energy limited resources in each hour (*i.e.*, **Figure 66** line-item H). All other values in the margin calculations are held constant. For all years in the 10-year study horizon, **Figure 67** shows that there are no observed deficiencies considering the load shapes under baseline expected load, normal transfer criteria for Long Island. A graphical representation of the Long Island transmission security margin cure for summer peak baseline expected weather, normal transfer criteria for the peak day in years 2023, 2025, 2027 and 2032 is shown in **Figure 68**.

It is possible for other combinations of events such as 1-in-10-year heatwaves and 1-in-100-year extreme heatwaves to have a deficient transmission security margin. **Figure 69** shows the Long Island transmission security margin for the statewide coincident peak hour under the 1-in-10-year heatwave condition with the assumption that the system is using emergency transfer criteria. As seen in **Figure 69**, the system is sufficient under these conditions within the 10-year study horizon and ranges from 701 MW in summer 2023 to 649 MW in summer 2032 (*see* line-item M). The load shapes for Zone K under heatwave conditions is provided in **Figure 91**. Additionally, the hourly margins in **Figure 70** show that for each hour of the heatwave day the margins are sufficient. A graphical representation of the Long Island transmission security margins for the 1-in-10-year heatwave day with emergency transfer criteria for the peak day in years 2023, 2025, 2027 and 2032 is shown in **Figure 71**.

The 1-in-100-year extreme heatwave transmission security margin is shown in **Figure 72**. These margins assume that the system is using emergency transfer criteria. Under this condition the margin is sufficient for all years in the 10-year study horizon and ranges from 355 MW in summer 2023 to 299 MW in summer 2032 (*see* line-item M). Additionally, the hourly margins in **Figure 73** show that for each hour the margins are sufficient for the extreme heatwave day. The load shapes for Zone K under an extreme heatwave is provided in **Figure 96**. A graphical representation of the Long Island transmission security margins for the 1-in-100-year extreme heatwave day with emergency transfer criteria for the peak day in years 2023, 2025, 2027, and 2032 is shown in **Figure 74**.

In addition to heatwave or extreme heatwave conditions, other changes to the transmission system may plausibly result in deficient margins. Considering the summer baseline peak load transmission security margin, limited combinations of single generator outages, or combinations of generator outages within Long Island beyond those included in the RNA Base Case assumptions could result in deficient transmission security margins. Details of specific generator impacts on the Long Island transmission security margin are shown in **Figure 75**. In summer 2023, there are two different units (or combinations of units) listed that could result in a deficient transmission security margin. Starting in 2024, only one combination of units could result in a deficient transmission security margin.

Figure 76 shows the Long Island transmission security margin under winter peak baseline expected weather conditions. For winter peak, the margin ranges from 2,638 MW in winter 2023-24 to 1,802 MW in winter 2032-33. Considering the winter baseline peak load transmission security margin, multiple outages in Long Island would be required to have a deficient margin.

Figure 77 shows Long Island transmission security margin in a 1-in-10-year cold snap. Under this system condition the transmission security margins for all years are sufficient and range from 3,103 MW in winter 2023-24 to 2,224 MW in winter 2032-33. Similarly, **Figure 78** shows the transmission security margins for Long Island with a 1-in-100-year extreme cold snap (with emergency transfer criteria) is sufficient with the margin ranging from 2,929 MW in winter 2023-24 to 2,004 MW in winter 2032-33.

Figure 79 provides a summary of the summer peak Long Island transmission security margins under expected summer weather, heatwave, and extreme heatwave conditions. **Figure 80** provides a summary of the winter peak Long Island transmission security margins under expected winter weather, cold snap, and extreme cold snap conditions.

Figure 66: Long Island Transmission Security Margin (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

Summer Peak - Baseline Expected Weather, Normal Transfer Criteria (MW)											
Line	Item	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	**Zone K Load Forecast**	(4,951)	(4,870)	(4,782)	(4,746)	(4,768)	(4,806)	(4,857)	(4,907)	(4,956)	(5,007)
B	I+J to K	929	929	929	929	929	929	929	929	929	929
C	New England Import (NNC)	0	0	0	0	0	0	0	0	0	0
D	**Total K AC Import (B+C)**	929	929	929	929	929	929	929	929	929	929
E	Loss of Source Contingency	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)
F	**Resource Need (A+D+E)**	(4,682)	(4,601)	(4,513)	(4,477)	(4,499)	(4,537)	(4,588)	(4,638)	(4,687)	(4,738)
G	K Generation (1)	4,970	5,106	5,106	5,106	5,106	5,106	5,106	5,106	5,106	5,106
H	K Generation Derates (2)	(470)	(593)	(594)	(594)	(595)	(596)	(597)	(597)	(598)	(598)
I	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	660	660	660	660	660	660	660	660	660	660
K	**Total Resources Available (H+I+J)**	5,160	5,172	5,172	5,171	5,171	5,170	5,169	5,169	5,168	5,168
L	**Transmission Security Margin (F+K)**	478	571	659	694	672	633	581	531	481	430

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).

Figure 67: Long Island Transmission Security Margin (Hourly) (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

Summer Peak - Baseline Expected Summer Weather, Normal Transfer Criteria (MW)										
K Transmission Security Margin										
Hour	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
HB0	2,536	2,619	2,692	2,711	2,638	2,590	2,529	2,467	2,405	2,337
HB1	2,747	2,830	2,905	2,924	2,855	2,810	2,751	2,693	2,637	2,574
HB2	2,898	2,981	3,057	3,079	3,010	2,967	2,911	2,856	2,804	2,747
HB3	2,989	3,073	3,150	3,173	3,105	3,064	3,011	2,959	2,910	2,859
HB4	3,010	3,097	3,174	3,198	3,132	3,095	3,043	2,996	2,953	2,911
HB5	2,965	3,052	3,131	3,157	3,094	3,057	3,008	2,963	2,922	2,879
HB6	2,862	2,953	3,040	3,074	3,017	2,988	2,944	2,904	2,868	2,830
HB7	2,605	2,705	2,802	2,849	2,804	2,786	2,752	2,719	2,687	2,652
HB8	2,299	2,406	2,510	2,568	2,532	2,520	2,492	2,461	2,428	2,389
HB9	1,991	2,104	2,217	2,282	2,254	2,249	2,228	2,201	2,170	2,132
HB10	1,665	1,782	1,902	1,976	1,956	1,959	1,943	1,921	1,893	1,858
HB11	1,357	1,478	1,605	1,684	1,671	1,681	1,671	1,653	1,632	1,600
HB12	1,099	1,221	1,349	1,432	1,420	1,432	1,425	1,411	1,393	1,367
HB13	903	1,025	1,151	1,230	1,219	1,228	1,221	1,207	1,190	1,167
HB14	752	870	988	1,059	1,039	1,041	1,027	1,010	989	963
HB15	613	725	834	894	864	856	835	809	783	754
HB16	489	593	693	744	702	686	655	623	590	556
HB17	478	571	659	694	639	610	567	523	481	436
HB18	536	624	706	733	672	633	581	531	481	430
HB19	707	793	868	891	822	778	722	667	614	557
HB20	903	987	1,062	1,084	1,014	970	911	855	801	741
HB21	1,163	1,249	1,325	1,348	1,279	1,235	1,178	1,121	1,065	1,004
HB22	1,547	1,632	1,707	1,729	1,657	1,610	1,552	1,491	1,431	1,364
HB23	1,940	2,025	2,101	2,122	2,050	2,004	1,944	1,883	1,821	1,751

Figure 68: Long Island Transmission Security Margin Hourly Curve (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

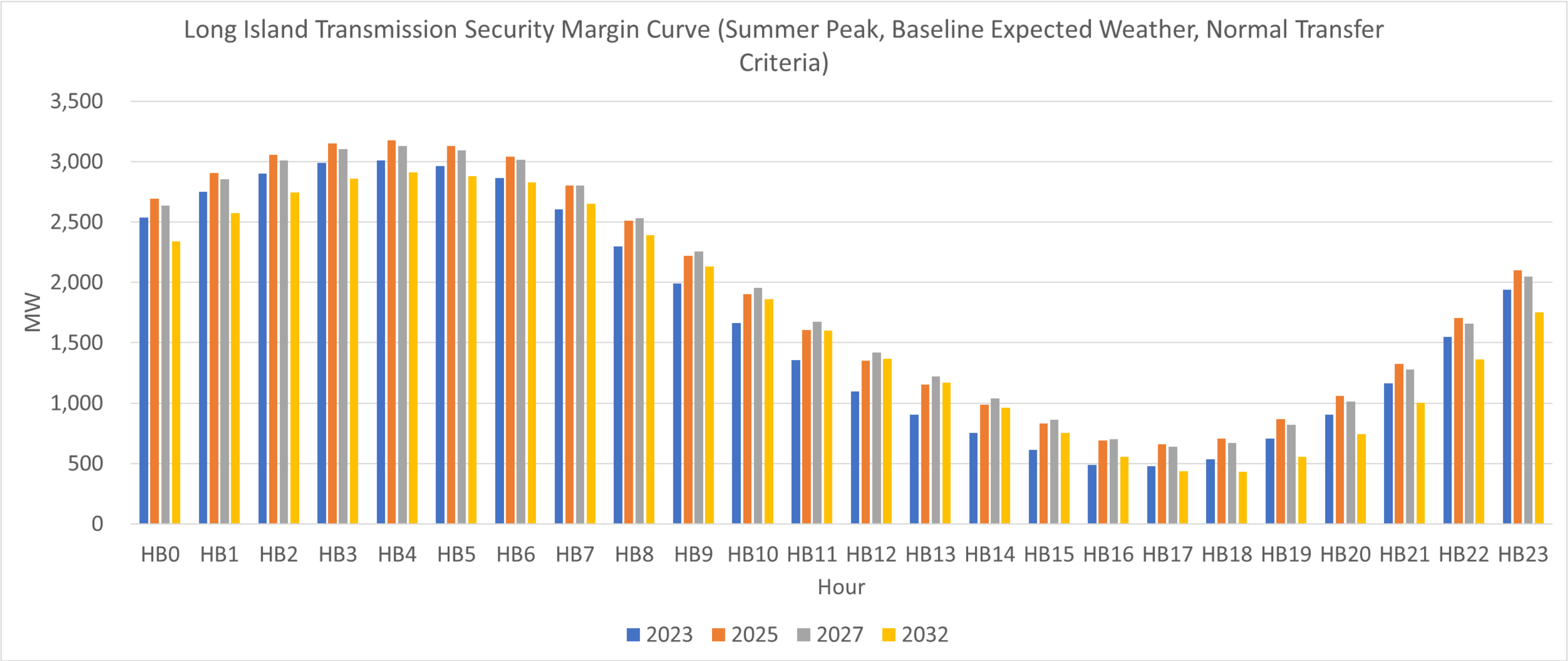


Figure 69: Long Island Transmission Security Margin (1-in-10-Year Heatwave, Emergency Transfer Criteria)

Summer Peak - 1-in-10-Year Heatwave, Emergency Transfer Criteria (MW)											
Line	Item	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	**Zone K Load Forecast**	(5,331)	(5,243)	(5,149)	(5,110)	(5,134)	(5,174)	(5,229)	(5,283)	(5,336)	(5,391)
B	I+J to K	887	887	887	887	887	887	887	887	887	887
C	New England Import (NNC)	0	0	0	0	0	0	0	0	0	0
D	**Total K AC Import (B+C)**	887	887	887	887	887	887	887	887	887	887
E	Loss of Source Contingency	0	0	0	0	0	0	0	0	0	0
F	**Resource Need (A+D+E)**	(4,444)	(4,356)	(4,262)	(4,223)	(4,247)	(4,287)	(4,342)	(4,396)	(4,449)	(4,504)
G	K Generation (1)	4,970	5,106	5,106	5,106	5,106	5,106	5,106	5,106	5,106	5,106
H	K Generation Derates (2)	(470)	(593)	(594)	(594)	(595)	(596)	(597)	(597)	(598)	(598)
I	Temperature Based Generation Derates	(33)	(33)	(33)	(33)	(33)	(33)	(33)	(33)	(33)	(33)
J	Net ICAP External Imports	660	660	660	660	660	660	660	660	660	660
K	SCRs (3), (4)	18	18	18	18	18	18	18	18	18	18
L	**Total Resources Available (G+H+I+J+K)**	5,145	5,157	5,157	5,156	5,156	5,155	5,154	5,153	5,153	5,153
M	**Transmission Security Margin (F+L)**	701	801	895	933	909	868	812	757	704	649

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 16 MW for SCRs.

Figure 70: Long Island Transmission Security Margin (Hourly) (1-in-10-Year Heatwave, Emergency Transfer Criteria)

Summer Peak - Heatwave, Emergency Transfer Criteria (MW)										
K Transmission Security Margin										
Hour	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
HB0	2,766	2,859	2,942	2,964	2,880	2,824	2,754	2,686	2,620	2,548
HB1	3,002	3,095	3,180	3,202	3,122	3,069	3,000	2,936	2,877	2,810
HB2	3,166	3,259	3,346	3,372	3,292	3,241	3,176	3,115	3,060	3,000
HB3	3,268	3,362	3,450	3,477	3,398	3,349	3,287	3,230	3,178	3,123
HB4	3,296	3,393	3,480	3,508	3,432	3,387	3,326	3,273	3,227	3,182
HB5	3,249	3,346	3,436	3,467	3,394	3,350	3,293	3,243	3,200	3,154
HB6	3,136	3,236	3,334	3,373	3,306	3,270	3,217	3,173	3,134	3,094
HB7	2,869	2,975	3,080	3,129	3,072	3,044	3,000	2,960	2,923	2,883
HB8	2,562	2,673	2,783	2,842	2,794	2,771	2,733	2,694	2,656	2,612
HB9	2,251	2,368	2,486	2,551	2,511	2,495	2,463	2,428	2,393	2,350
HB10	1,934	2,053	2,176	2,249	2,216	2,208	2,180	2,150	2,117	2,077
HB11	1,671	1,791	1,919	1,996	1,970	1,967	1,945	1,918	1,891	1,853
HB12	1,439	1,561	1,688	1,768	1,742	1,741	1,720	1,695	1,671	1,638
HB13	1,256	1,377	1,502	1,579	1,563	1,557	1,536	1,502	1,478	1,448
HB14	1,068	1,186	1,305	1,374	1,358	1,345	1,316	1,270	1,243	1,210
HB15	881	996	1,108	1,168	1,149	1,127	1,091	1,028	996	962
HB16	739	847	951	1,002	980	950	903	823	785	745
HB17	701	801	895	933	909	868	813	714	669	620
HB18	794	889	977	1,006	977	927	862	757	704	649
HB19	1,019	1,111	1,192	1,217	1,173	1,118	1,051	951	896	835
HB20	1,253	1,342	1,423	1,447	1,393	1,340	1,271	1,181	1,124	1,061
HB21	1,553	1,642	1,720	1,742	1,682	1,627	1,559	1,476	1,415	1,349
HB22	1,983	2,070	2,146	2,167	2,094	2,037	1,969	1,892	1,826	1,754
HB23	2,420	2,506	2,582	2,601	2,521	2,465	2,396	2,328	2,261	2,185

Figure 71: Long Island Transmission Security Margin Hourly Curve (1-in-10-Year Heatwave, Emergency Transfer Criteria)

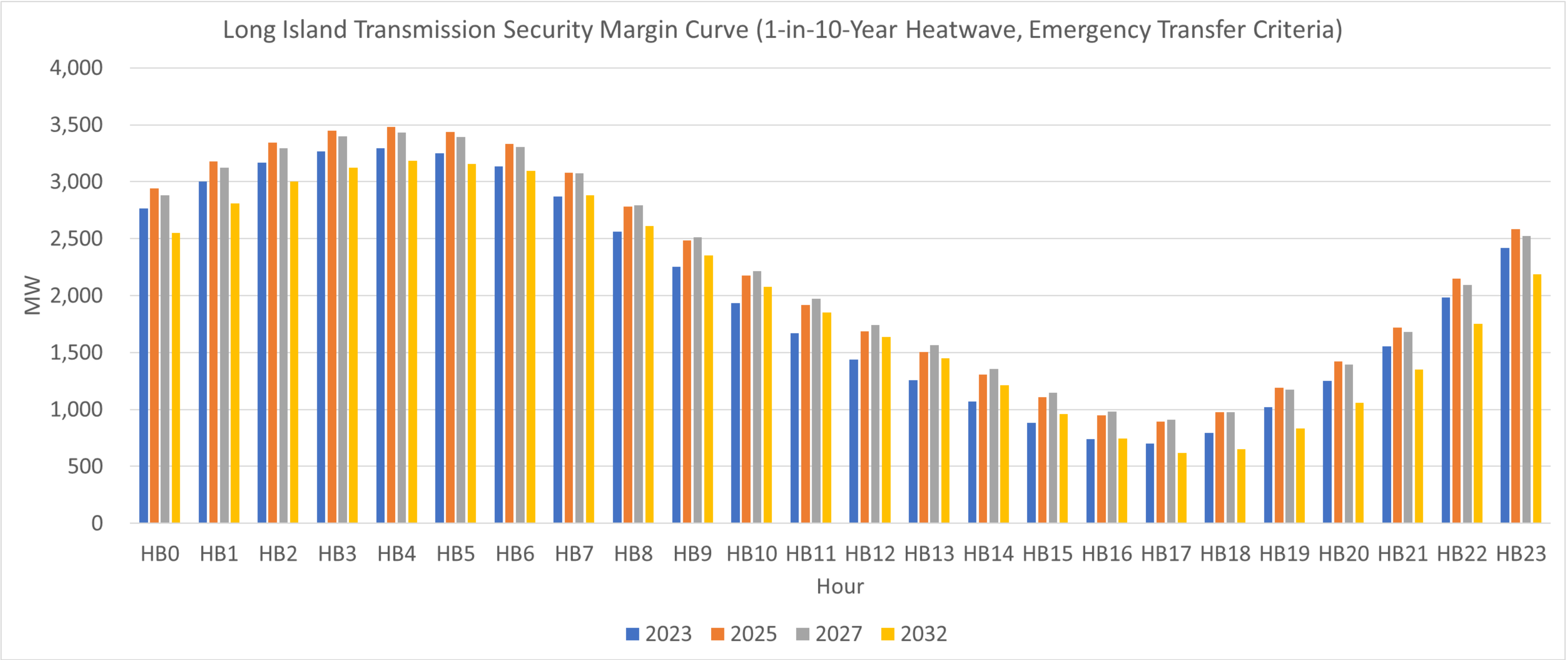


Figure 72: Long Island Transmission Security Margin (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

Summer Peak - 1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	**Zone K Load Forecast**	(5,640)	(5,548)	(5,448)	(5,407)	(5,432)	(5,475)	(5,533)	(5,590)	(5,646)	(5,704)
B	I+J to K	887	887	887	887	887	887	887	887	887	887
C	New England Import (NNC)	0	0	0	0	0	0	0	0	0	0
D	**Total K AC Import (B+C)**	887	887	887	887	887	887	887	887	887	887
E	Loss of Source Contingency	0	0	0	0	0	0	0	0	0	0
F	**Resource Need (A+D+E)**	(4,753)	(4,661)	(4,561)	(4,520)	(4,545)	(4,588)	(4,646)	(4,703)	(4,759)	(4,817)
G	K Generation (1)	4,970	5,106	5,106	5,106	5,106	5,106	5,106	5,106	5,106	5,106
H	K Generation Derates (2)	(470)	(593)	(594)	(594)	(595)	(596)	(597)	(597)	(598)	(598)
I	Temperature Based Generation Derates	(70)	(70)	(70)	(70)	(70)	(70)	(70)	(70)	(70)	(70)
J	Net ICAP External Imports	660	660	660	660	660	660	660	660	660	660
K	SCRs (3), (4)	18	18	18	18	18	18	18	18	18	18
L	**Total Resources Available (G+H+I+J+K)**	5,108	5,120	5,120	5,119	5,119	5,118	5,117	5,116	5,116	5,116
M	**Transmission Security Margin (F+L)**	355	459	559	599	574	530	471	413	357	299

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 16 MW for SCRs.

Figure 73: Long Island Transmission Security Margin (Hourly) (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

Summer Peak - 1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria (MW)										
K Transmission Security Margin										
Hour	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
HB0	2,620	2,715	2,802	2,826	2,740	2,682	2,610	2,541	2,474	2,400
HB1	2,859	2,954	3,043	3,067	2,985	2,930	2,860	2,794	2,733	2,664
HB2	3,024	3,121	3,211	3,239	3,157	3,105	3,038	2,975	2,919	2,856
HB3	3,128	3,226	3,317	3,346	3,265	3,214	3,151	3,092	3,038	2,982
HB4	3,156	3,257	3,348	3,378	3,299	3,253	3,190	3,136	3,088	3,042
HB5	3,110	3,211	3,305	3,337	3,262	3,216	3,157	3,106	3,061	3,014
HB6	2,999	3,102	3,203	3,243	3,174	3,136	3,082	3,036	2,996	2,955
HB7	2,728	2,837	2,945	2,996	2,937	2,908	2,862	2,820	2,782	2,741
HB8	2,417	2,530	2,643	2,704	2,654	2,630	2,589	2,549	2,510	2,465
HB9	2,101	2,220	2,341	2,407	2,365	2,348	2,315	2,279	2,241	2,197
HB10	1,779	1,900	2,025	2,099	2,065	2,055	2,026	1,994	1,960	1,918
HB11	1,511	1,633	1,763	1,841	1,813	1,810	1,786	1,757	1,729	1,690
HB12	1,251	1,374	1,504	1,585	1,557	1,554	1,531	1,505	1,478	1,445
HB13	1,029	1,154	1,282	1,360	1,342	1,334	1,310	1,273	1,248	1,216
HB14	805	926	1,048	1,119	1,100	1,085	1,053	1,004	975	940
HB15	580	698	814	876	856	831	793	725	690	653
HB16	402	514	622	676	652	618	570	485	443	401
HB17	355	459	559	599	574	530	472	368	320	267
HB18	449	549	642	675	644	590	524	413	357	299
HB19	714	810	896	924	878	821	753	649	590	526
HB20	987	1,080	1,165	1,192	1,137	1,081	1,011	917	858	791
HB21	1,325	1,418	1,500	1,525	1,462	1,406	1,336	1,250	1,188	1,119
HB22	1,793	1,884	1,963	1,986	1,912	1,854	1,784	1,704	1,637	1,562
HB23	2,268	2,356	2,436	2,456	2,374	2,318	2,247	2,177	2,109	2,032

Figure 74: Long Island Transmission Security Margin Hourly Curve (1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria)

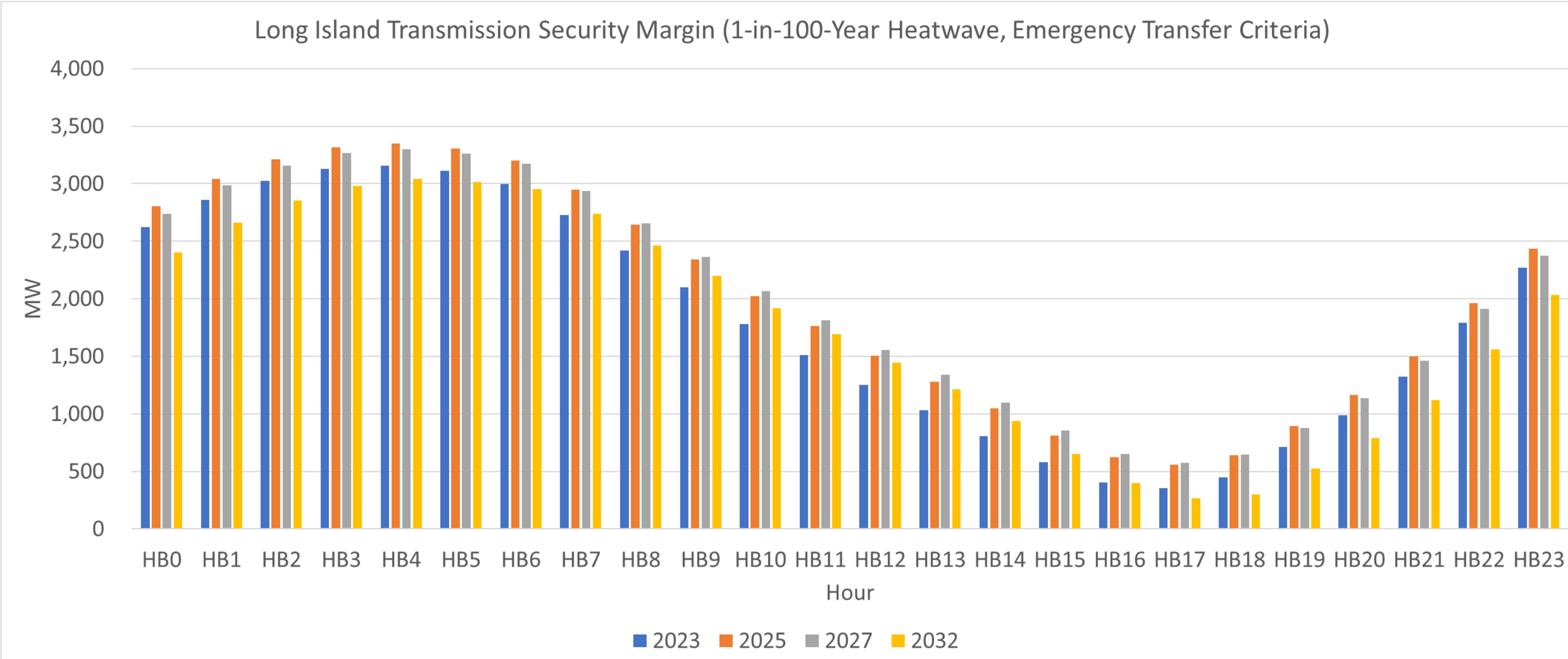


Figure 75: Impact of Generator Outages on Long Island Transmission Security Margin (Summer Peak – Baseline Expected Weather, Normal Transfer Criteria)

Long Island Transmission Security Margin (MW)											
Year		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Summer Peak - Baseline Expected Weather, Normal Transfer Criteria Transmission Security Margin with Generation Unavailability (Line Item O)		478	571	659	694	672	633	581	531	481	430
Unit Name	Summer DMNC	Adjusted Transmission Security Margin (Line Item O minus each generator)									
Northport 1, 2, 3, and 4	1,567.9	(1,090)	(997)	(909)	(874)	(896)	(935)	(987)	(1,037)	(1,087)	(1,138)
Holtsville (all units)	529.9	(52)	41	129	164	142	103	51	1	(49)	(100)
Northport 2	398.2	80	173	261	296	273	234	183	132	83	32
Northport 3	397.0	81	174	262	297	275	236	184	134	84	33
Northport 1	394.7	83	177	264	300	277	238	186	136	86	35
Barrett ST 01 and ST 02	383.0	95	188	276	311	289	250	198	148	98	47
Northport 4	378.0	100	193	281	316	294	255	203	153	103	52
Port Jefferson 3 and 4	377.2	101	194	282	317	294	255	204	153	104	53
Caithness_CC_1	310.1	168	261	349	384	362	323	271	220	171	120
Barrett 03 through 12	231.6	246	340	427	463	440	401	349	299	249	198
Wading River 1, 2, and 3	224.5	253	347	434	470	447	408	357	306	256	205
Barrett ST 02	193.0	285	378	466	501	479	440	388	338	288	237
Barrett ST 01	190.0	288	381	469	504	482	443	391	341	291	240
Port Jefferson 4	188.7	289	383	470	506	483	444	392	342	292	241
Port Jefferson 3	188.5	289	383	470	506	483	444	393	342	292	241
Flynn	141.5	336	430	517	553	530	491	440	389	339	288
Glenwood GT 02, 04, and 05	126.3	352	445	532	568	545	506	455	404	355	304
Far Rockaway GT1 and GT 2	109.7	368	462	549	585	562	523	471	421	371	320
Freeport CT 1 and CT 2	85.2	393	486	574	609	586	547	496	445	396	345
Shoreham GT3 and GT 4	84.9	393	486	574	609	587	548	496	446	396	345
Pilgrim GT 1 and GT 2	84.5	393	487	574	610	587	548	497	446	396	345
Port Jefferson GT 02 and GT 03	80.7	397	491	578	614	591	552	500	450	400	349
Wading River 1	75.6	402	496	583	619	596	557	505	455	405	354
Wading River 3	74.9	403	496	584	619	597	558	506	456	406	355
Bethpage 3	74.8	403	497	584	619	597	558	506	456	406	355
Hempstead (RR)	74.2	404	497	585	620	597	558	507	456	407	356
Wading River 2	74.0	404	497	585	620	598	559	507	457	407	356
Pinelawn Power 1	72.2	406	499	587	622	599	560	509	458	409	358

Figure 76: Long Island Transmission Security Margin (Winter Peak – Baseline Expected Weather, Normal Transfer Criteria)

Winter Peak - Baseline Expected Weather, Normal Transfer Criteria (MW)											
Line	**Item**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**	**2031-32**	**2032-33**
A	**Zone K Load Forecast**	(3,213)	(3,229)	(3,262)	(3,319)	(3,396)	(3,491)	(3,604)	(3,737)	(3,891)	(4,049)
B	I+J to K (3), (4)	929	929	929	929	929	929	929	929	929	929
C	New England Import (NNC)	0	0	0	0	0	0	0	0	0	0
D	**Total K AC Import (B+C)**	929	929	929	929	929	929	929	929	929	929
E	Loss of Source Contingency	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)
F	**Resource Need (A+D+E)**	(2,944)	(2,960)	(2,993)	(3,050)	(3,127)	(3,222)	(3,335)	(3,468)	(3,622)	(3,780)
G	K Generation (1)	5,559	5,559	5,559	5,559	5,559	5,559	5,559	5,559	5,559	5,559
H	K Generation Derates (2)	(637)	(637)	(637)	(637)	(637)	(637)	(637)	(637)	(637)	(637)
I	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	660	660	660	660	660	660	660	660	660	660
K	**Total Resources Available (G+H+I+J)**	5,582	5,582	5,582	5,582	5,582	5,582	5,582	5,582	5,582	5,582
L	**Transmission Security Margin (F+K)**	2,638	2,622	2,589	2,532	2,455	2,360	2,247	2,114	1,960	1,802

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based also based on the summer peak 2025 representations evaluated in the post-2020 RNA analysis which does not include the impact of CHPE.
4. As a conservative winter peak assumption these limits utilize the summer values.

Figure 77: Long Island Transmission Security Margin (1-in-10-Year Cold Snap, Emergency Transfer Criteria)

Winter Peak - 1-in-10-Year Cold Snap, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**	**2031-32**	**2032-33**
A	**Zone K Load Forecast**	(3,378)	(3,395)	(3,430)	(3,490)	(3,571)	(3,671)	(3,789)	(3,929)	(4,091)	(4,257)
B	I+J to K (5), (6)	887	887	887	887	887	887	887	887	887	887
C	New England Import (NNC)	0	0	0	0	0	0	0	0	0	0
D	**Total K AC Import (B+C)**	887	887	887	887	887	887	887	887	887	887
E	Loss of Source Contingency	0	0	0	0	0	0	0	0	0	0
F	**Resource Need (A+D+E)**	(2,491)	(2,508)	(2,543)	(2,603)	(2,684)	(2,784)	(2,902)	(3,042)	(3,204)	(3,370)
G	K Generation (1)	5,559	5,559	5,559	5,559	5,559	5,559	5,559	5,559	5,559	5,559
H	K Generation Derates (2)	(637)	(637)	(637)	(637)	(637)	(637)	(637)	(637)	(637)	(637)
I	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	660	660	660	660	660	660	660	660	660	660
K	SCRs (3), (4)	12	12	12	12	12	12	12	12	12	12
L	**Total Resources Available (G+H+I+J+K)**	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594
M	**Transmission Security Margin (F+L)**	3,103	3,086	3,051	2,991	2,910	2,810	2,692	2,552	2,390	2,224

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 10 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based also based on the summer peak 2025 representations evaluated in the post-2020 RNA analysis which does not include the impact of CHPE.
6. As a conservative winter peak assumption these limits utilize the summer values.

Figure 78: Long Island Transmission Security Margin (1-in-100-year Extreme Cold Snap, Emergency Transfer Criteria)

Winter Peak - 1-in-100-Year Extreme Cold Snap, Emergency Transfer Criteria (MW)											
Line	**Item**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**	**2031-32**	**2032-33**
A	**Zone K Load Forecast**	(3,552)	(3,570)	(3,607)	(3,670)	(3,755)	(3,860)	(3,985)	(4,132)	(4,302)	(4,477)
B	I+J to K (5), (6)	887	887	887	887	887	887	887	887	887	887
C	New England Import (NNC)	0	0	0	0	0	0	0	0	0	0
D	**Total K AC Import (B+C)**	887	887	887	887	887	887	887	887	887	887
E	Loss of Source Contingency	0	0	0	0	0	0	0	0	0	0
F	**Resource Need (A+D+E)**	(2,665)	(2,683)	(2,720)	(2,783)	(2,868)	(2,973)	(3,098)	(3,245)	(3,415)	(3,590)
G	K Generation (1)	5,559	5,559	5,559	5,559	5,559	5,559	5,559	5,559	5,559	5,559
H	K Generation Derates (2)	(637)	(637)	(637)	(637)	(637)	(637)	(637)	(637)	(637)	(637)
I	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	660	660	660	660	660	660	660	660	660	660
K	SCRs (3), (4)	12	12	12	12	12	12	12	12	12	12
L	**Total Resources Available (G+H+I+J+K)**	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594	5,594
M	**Transmission Security Margin (F+L)**	2,929	2,911	2,874	2,811	2,726	2,621	2,496	2,349	2,179	2,004

Notes:

1. Reflects the 2022 Gold Book existing winter capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 10% of the total nameplate, off-shore wind at 15% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). For winter the expected solar PV output at peak is 0 MW. Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 10 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based also based on the summer peak 2025 representations evaluated in the post-2020 RNA analysis which does not include the impact of CHPE.
6. As a conservative winter peak assumption these limits utilize the summer values.

Figure 79: Summary of Long Island Summer Transmission Security Margin – Summer

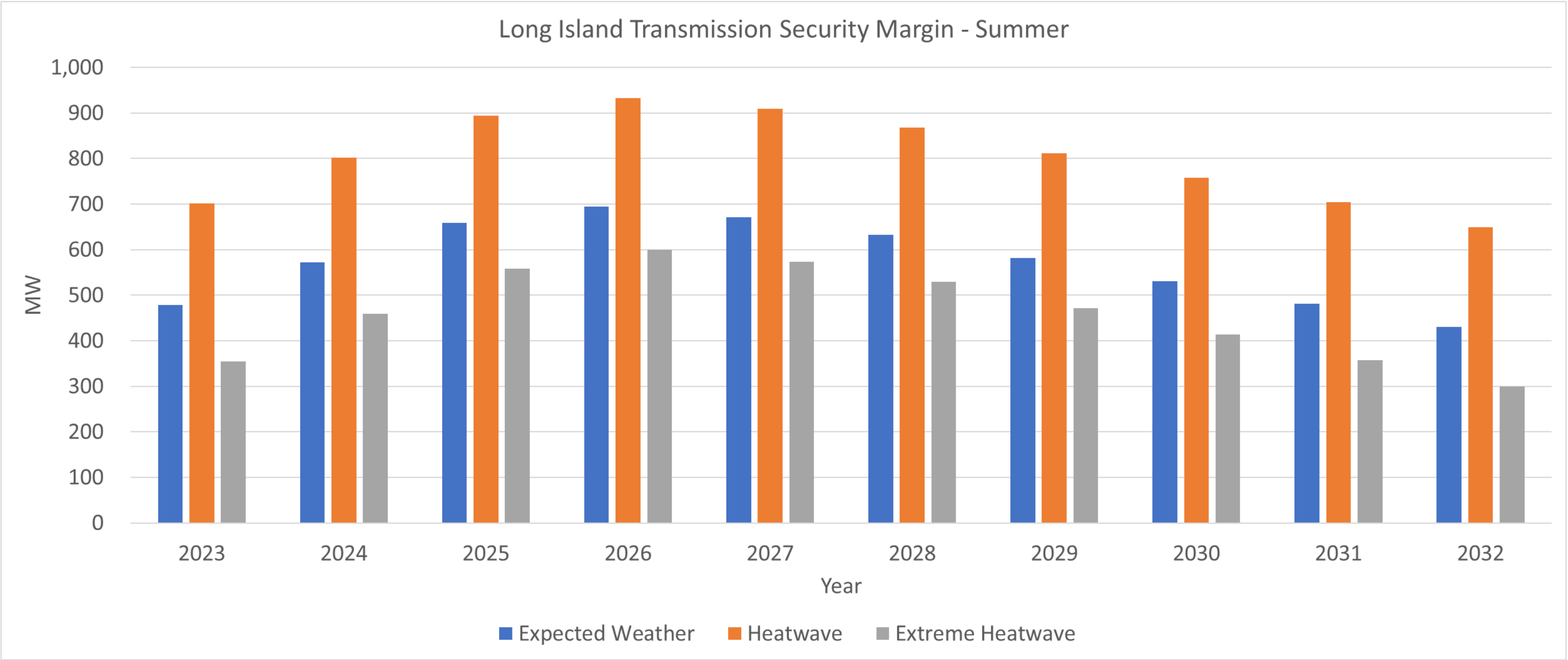
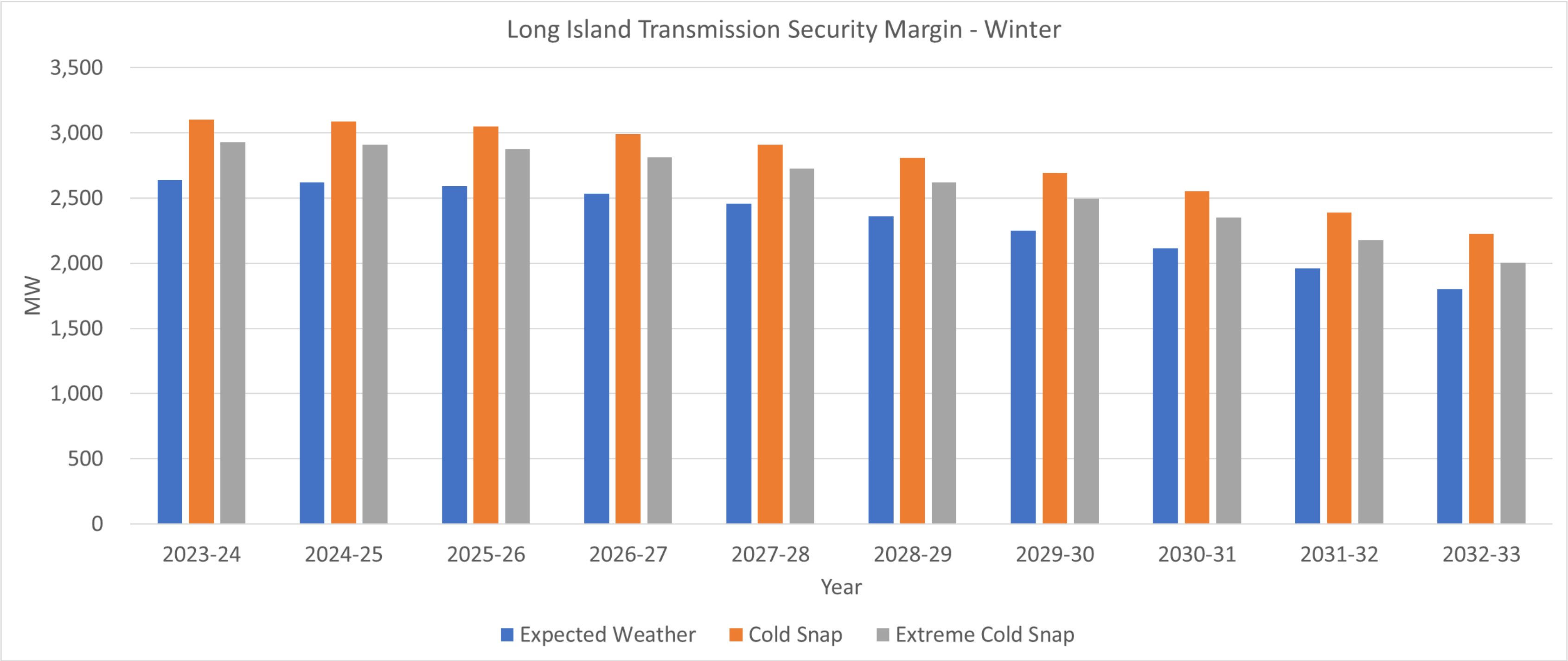


Figure 80: Summary of Long Island Summer Transmission Security Margin – Winter



Load Shape Details for Transmission Security Margins

As part of the 2022 Gold Book, representative load shapes for the NYCA summer high load day were produced.[34] For the transmission security margin analysis, the shapes are adjusted to match the Gold Book coincident peak forecasts. These shapes reflect the current observed base load shape, using the average load shape of high load days from recent summers. The shapes also incorporate the evolving and increasing impacts of BtM-PV, electric vehicle charging, and building electrification on summer hourly loads. For the statewide coincident summer peak, the peak during the 5 pm hour for summers 2023 through 2026. However, due to the impacts of increasing BtM-PV and increased electric vehicle charging in the late afternoon and evening hours, the peak is expected to shift to the 6 pm hour from 2027 through 2032.

The contribution of the hourly shapes from Zones A-F, GHI, J, and K as a fraction of the overall NYCA shape are calculated from the same sample of historical summer high load days used to calculate the NYCA shape. For the localities, the BtM-PV, electric vehicle, and electrification shape impacts for each locality are based on their share of the expected penetration for each technology. Similar processes were utilized to create the 1-in-10-year heatwave and 1-in-100-year extreme heatwave shapes.

As seen in **Figure 81**, the load shapes show a changing peak hour in Zones A-F, GHI, J, and K from 2023 through the 10-year horizon in 2032. For instance, the peak hour in A-F changes from HB17 in 2023 which is the same as the 2023 NYCA peak hour to HB19 in 2032 which is one hour after the NYCA peaks. In reality, zones will often peak on different hour during the same high summer load day, not fully coincident with the NYCA peak hour itself.

[34] The 2022 Long-Term Forecast Load Shape Projections are available here.

Figure 81: NYCA Baseline Expected Weather Summer Peak Load shape

	A-F		GHI		J		K		NYCA	
	2023	2032	2023	2032	2023	2032	2023	2032	2023	2032
HB0	8,846	9,012	2,685	2,928	7,894	8,699	2,880	3,093	22,305	23,732
HB1	8,505	8,591	2,515	2,725	7,537	8,288	2,669	2,856	21,226	22,460
HB2	8,260	8,283	2,395	2,573	7,275	7,989	2,518	2,683	20,448	21,528
HB3	8,151	8,107	2,312	2,462	7,126	7,808	2,427	2,571	20,016	20,948
HB4	8,180	8,051	2,284	2,394	7,115	7,754	2,406	2,519	19,985	20,718
HB5	8,400	8,147	2,333	2,414	7,316	7,969	2,451	2,551	20,500	21,081
HB6	8,738	8,130	2,445	2,463	7,792	8,427	2,556	2,602	21,531	21,622
HB7	9,188	8,100	2,640	2,587	8,462	9,024	2,818	2,785	23,108	22,496
HB8	9,567	8,115	2,832	2,749	9,080	9,647	3,131	3,055	24,610	23,566
HB9	9,905	8,102	3,024	2,895	9,572	10,126	3,447	3,319	25,948	24,442
HB10	10,240	8,114	3,233	3,054	9,966	10,490	3,779	3,599	27,218	25,257
HB11	10,549	8,172	3,436	3,205	10,246	10,718	4,091	3,861	28,322	25,956
HB12	10,860	8,375	3,631	3,376	10,462	10,886	4,352	4,097	29,305	26,734
HB13	11,191	8,753	3,809	3,558	10,623	11,028	4,548	4,297	30,171	27,636
HB14	11,401	9,251	3,955	3,754	10,691	11,127	4,696	4,499	30,743	28,631
HB15	11,604	9,822	4,069	3,940	10,782	11,274	4,831	4,704	31,286	29,740
HB16	11,885	10,501	4,173	4,118	10,915	11,456	4,947	4,894	31,920	30,969
HB17	12,006	11,129	4,208	4,256	10,853	11,508	4,951	5,003	32,018	31,896
HB18	11,963	11,472	4,173	4,294	10,733	11,441	4,887	5,007	31,756	32,214
HB19	11,853	11,632	4,060	4,229	10,543	11,295	4,711	4,875	31,167	32,031
HB20	11,679	11,548	3,943	4,124	10,314	11,084	4,513	4,689	30,449	31,445
HB21	11,305	11,236	3,752	3,939	10,062	10,817	4,253	4,426	29,372	30,418
HB22	10,561	10,621	3,455	3,676	9,627	10,407	3,869	4,066	27,512	28,770
HB23	9,802	9,949	3,158	3,396	9,070	9,846	3,476	3,679	25,506	26,870

Figure 82 shows the load shapes for the baseline expected weather summer peak conditions. The statewide behavior can be broken down further into groups of zones. **Figure 83** shows the Zones A-F component of the NYCA baseline expected weather forecast for the summer peak day. As seen in **Figure 83,** over each year with increased penetrations of BtM-PV, the load continues to flatten in the zones in the early morning hours and shifts the peak to later in the day.[35] **Figure 84** shows the Zones G-I component of the NYCA baseline expected weather forecast for the summer peak day. As seen in **Figure 84,** the increased BtM-PV results a slight flattening of the load and shifting of the peak hour is still observed.[36] **Figure 85** shows the Zone J component of the NYCA baseline expected weather forecast for the summer peak day. As seen in **Figure 85,** the BtM-PV

[35]From Table I-9a in the 2022 Load and Capacity Data report, in 2023 Zones A-F has 3,068 MW (nameplate) of the 5,152 MW of BtM-PV (nameplate) statewide (approximately 60% of the statewide BtM-PV). In 2032, the forecast for BtM-PV in Zones A-F more than doubles to 6,768 MW (nameplate) of the 10,484 MW (nameplate) of the BtM-PV statewide (approximately 65% of the statewide BtM-PV).

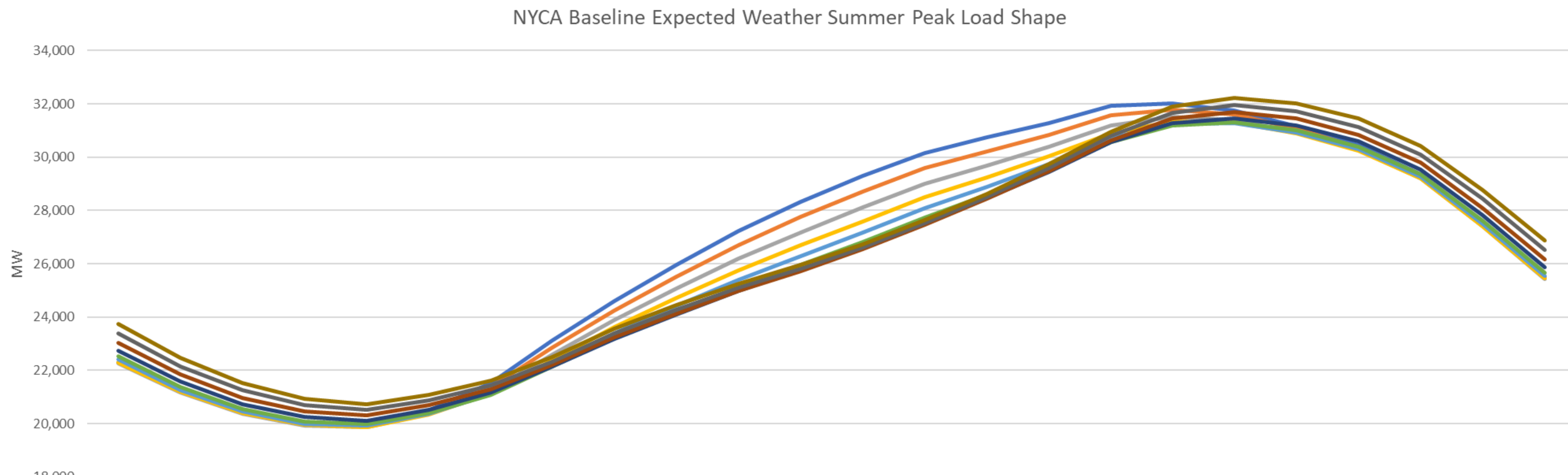
[36]In 2023, Zones G-I has 762 MW (nameplate) of the 5,152 MW (nameplate) of BtM-PV statewide (approximately 15% of the statewide BtM-PV). In 2032, the forecast for BtM-PV in Zones G-I increases by about 80% to 1,366 MW (nameplate) (approximately 13% of the statewide BtM-PV).

primarily reduces the load from year to year but has negligible impact on the shifting of the peak hour.[37] **Figure 86** shows the Zone K component of the NYCA baseline expected weather forecast for the summer peak day. As seen in **Figure 86,** BtM-PV does have some impact on the Zone K shape over time.[38] Similar curves were developed for the heatwave (**Figure 87** through **Figure 91**) and extreme heatwave conditions (**Figure 92** through **Figure 96**).

[37]In 2023, Zone J has 401 MW (nameplate) of the 5,152 MW of BtM-PV (nameplate) statewide (approximately 8% of the statewide BtM-PV). In 2032, the forecast for BtM-PV in Zone J nearly doubles to 793 MW (nameplate) (approximately 8% of the statewide BtM-PV in Zone J).

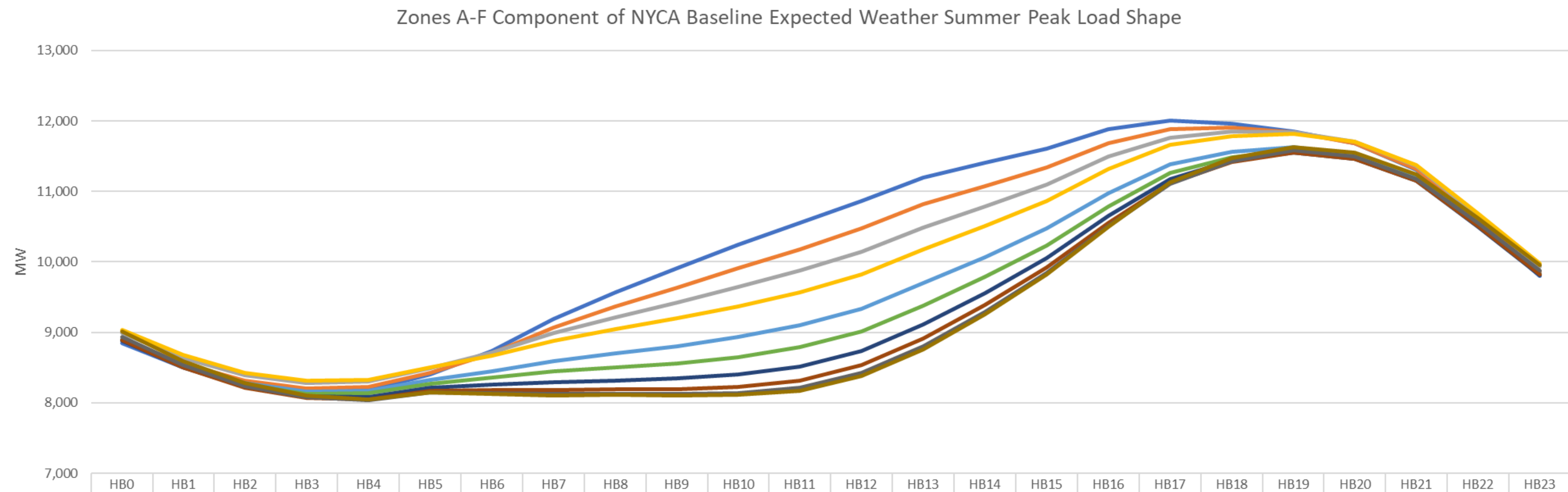
[38]In 2023, Zone K has 921 MW (nameplate) of the 5,152 MW of BtM-PV (nameplate) statewide (approximately 18% of the statewide BtM-PV). In 2032, the forecast for BtM-PV in Zone K increases by approximately 70% to 1,557 MW (nameplate) (approximately 15% of the statewide BtM-PV in Zone K).

Figure 82: NYCA Baseline Expected Weather Summer Peak Load shape



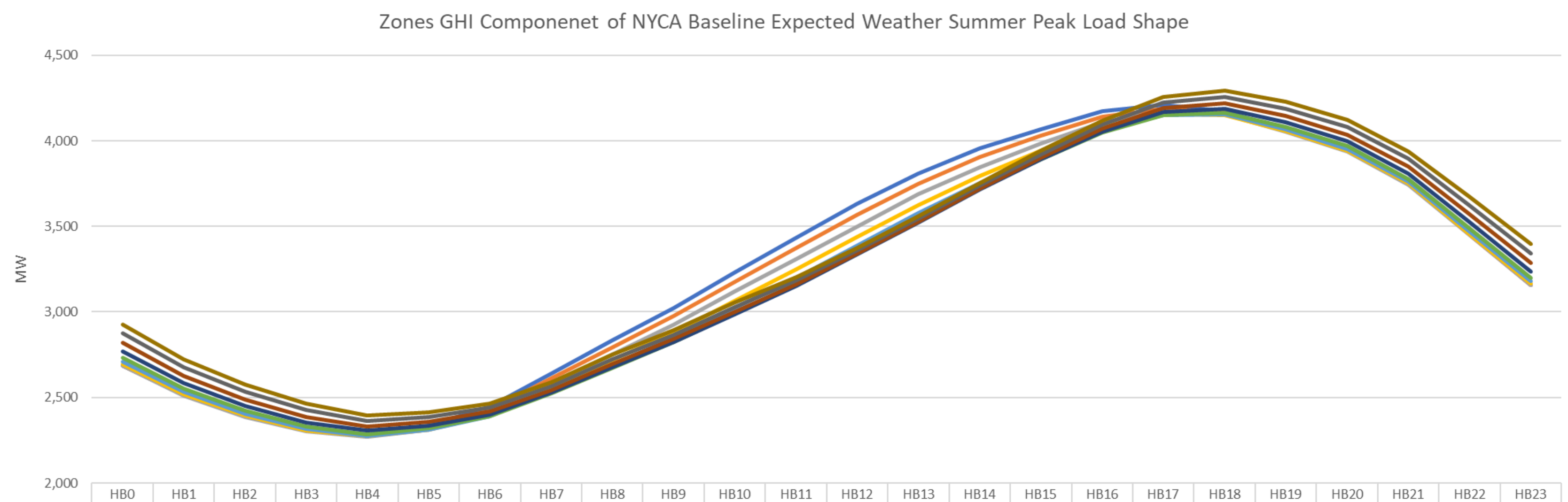
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	22,305	21,226	20,448	20,016	19,985	20,500	21,531	23,108	24,610	25,948	27,218	28,322	29,305	30,171	30,743	31,286	31,920	32,018	31,756	31,167	30,449	29,372	27,512	25,506
2024	22,286	21,198	20,416	19,980	19,942	20,437	21,392	22,850	24,253	25,505	26,698	27,749	28,708	29,587	30,222	30,847	31,567	31,778	31,596	31,066	30,371	29,302	27,462	25,469
2025	22,261	21,162	20,375	19,932	19,884	20,362	21,243	22,586	23,894	25,065	26,182	27,179	28,104	28,990	29,683	30,383	31,181	31,505	31,402	30,939	30,270	29,216	27,401	25,431
2026	22,306	21,194	20,398	19,945	19,885	20,343	21,152	22,388	23,611	24,707	25,754	26,698	27,600	28,497	29,250	30,028	30,906	31,339	31,313	30,907	30,258	29,211	27,417	25,463
2027	22,399	21,270	20,462	19,998	19,922	20,362	21,107	22,242	23,391	24,418	25,399	26,292	27,172	28,080	28,892	29,746	30,705	31,243	31,292	30,937	30,305	29,262	27,489	25,545
2028	22,532	21,384	20,562	20,083	19,987	20,410	21,094	22,141	23,228	24,195	25,119	25,962	26,822	27,737	28,603	29,527	30,561	31,198	31,317	31,010	30,392	29,354	27,603	25,669
2029	22,751	21,580	20,737	20,241	20,122	20,528	21,160	22,134	23,180	24,099	24,975	25,775	26,619	27,544	28,462	29,454	30,559	31,287	31,468	31,198	30,587	29,547	27,812	25,883
2030	23,046	21,843	20,975	20,453	20,301	20,690	21,282	22,205	23,237	24,128	24,972	25,732	26,554	27,479	28,436	29,481	30,641	31,448	31,684	31,447	30,844	29,807	28,097	26,178
2031	23,389	22,152	21,252	20,701	20,510	20,884	21,444	22,338	23,384	24,262	25,088	25,815	26,616	27,531	28,512	29,594	30,793	31,665	31,946	31,738	31,145	30,111	28,433	26,523
2032	23,732	22,460	21,528	20,948	20,718	21,081	21,622	22,496	23,566	24,442	25,257	25,956	26,734	27,636	28,631	29,740	30,969	31,896	32,214	32,031	31,445	30,418	28,770	26,870

Figure 83: Zones A-F Component of NYCA Baseline Expected Weather Summer Peak Load shape



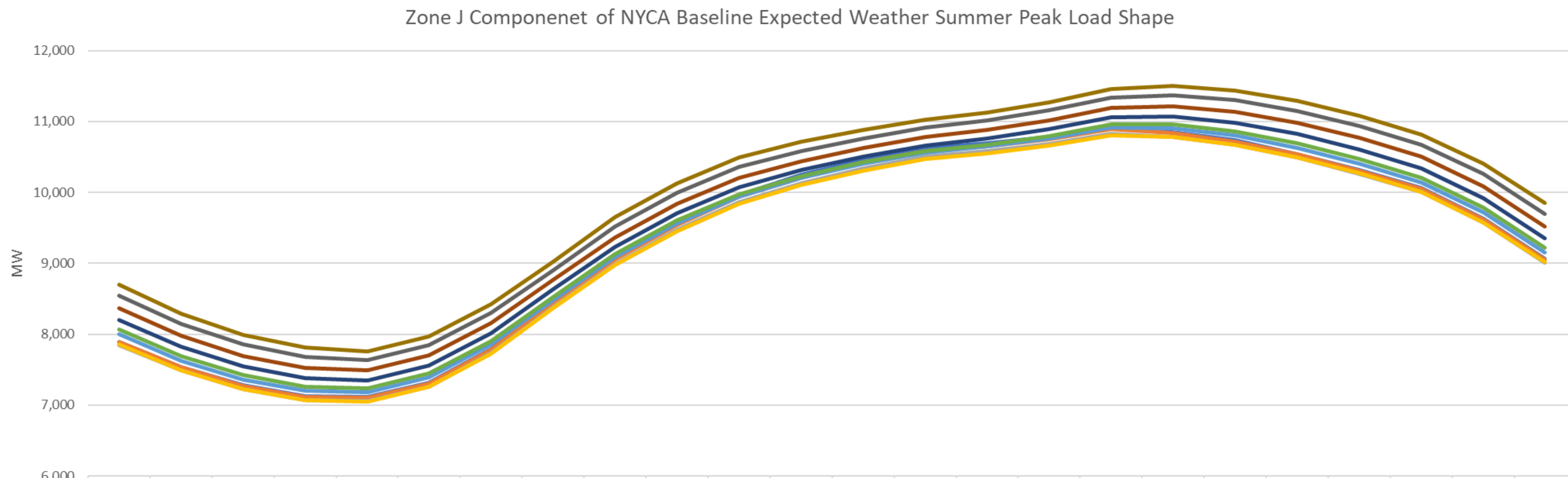
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	8,846	8,505	8,260	8,151	8,180	8,400	8,738	9,188	9,567	9,905	10,240	10,549	10,860	11,191	11,401	11,604	11,885	12,006	11,963	11,853	11,679	11,305	10,561	9,802
2024	8,902	8,554	8,310	8,199	8,227	8,429	8,705	9,065	9,367	9,636	9,911	10,181	10,473	10,814	11,072	11,335	11,680	11,882	11,900	11,837	11,681	11,322	10,596	9,850
2025	8,990	8,640	8,394	8,278	8,303	8,488	8,710	8,990	9,216	9,427	9,644	9,880	10,144	10,487	10,783	11,093	11,490	11,766	11,845	11,835	11,702	11,359	10,656	9,935
2026	9,034	8,677	8,428	8,309	8,328	8,499	8,671	8,881	9,045	9,200	9,372	9,571	9,823	10,171	10,504	10,863	11,313	11,657	11,786	11,816	11,701	11,370	10,684	9,976
2027	8,898	8,537	8,281	8,156	8,167	8,326	8,449	8,591	8,701	8,807	8,933	9,099	9,338	9,699	10,067	10,476	10,978	11,385	11,565	11,632	11,529	11,206	10,532	9,835
2028	8,889	8,521	8,259	8,130	8,133	8,274	8,356	8,443	8,503	8,563	8,651	8,789	9,016	9,379	9,785	10,237	10,790	11,260	11,484	11,581	11,488	11,171	10,513	9,823
2029	8,878	8,497	8,225	8,090	8,080	8,211	8,256	8,293	8,319	8,345	8,400	8,513	8,735	9,112	9,554	10,051	10,651	11,176	11,438	11,556	11,464	11,148	10,496	9,809
2030	8,893	8,501	8,218	8,070	8,049	8,165	8,181	8,184	8,192	8,196	8,228	8,317	8,532	8,915	9,385	9,916	10,553	11,121	11,417	11,553	11,466	11,149	10,507	9,826
2031	8,940	8,535	8,239	8,076	8,037	8,143	8,138	8,122	8,130	8,122	8,139	8,215	8,421	8,802	9,291	9,846	10,507	11,110	11,430	11,583	11,496	11,179	10,552	9,877
2032	9,012	8,591	8,283	8,107	8,051	8,147	8,130	8,100	8,115	8,102	8,114	8,172	8,375	8,753	9,251	9,822	10,501	11,129	11,472	11,632	11,548	11,236	10,621	9,949

Figure 84: Zones GHI Component of NYCA Baseline Expected Weather Summer Peak Load shape



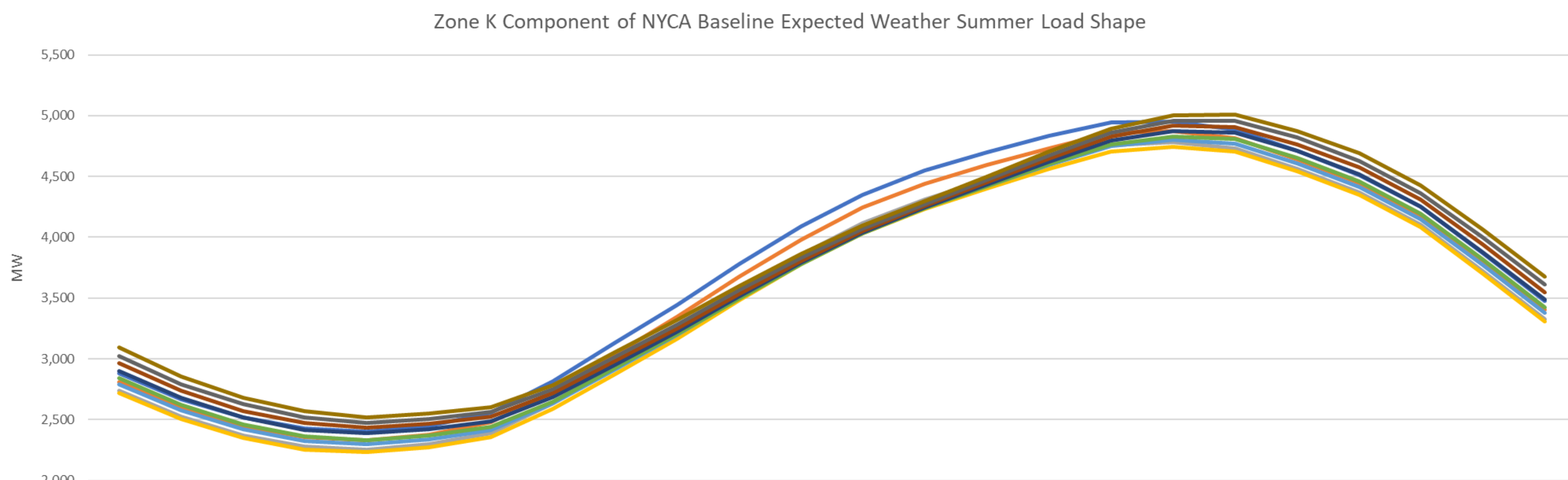
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	2,685	2,515	2,395	2,312	2,284	2,333	2,445	2,640	2,832	3,024	3,233	3,436	3,631	3,809	3,955	4,069	4,173	4,208	4,173	4,060	3,943	3,752	3,455	3,158
2024	2,685	2,514	2,391	2,307	2,278	2,323	2,427	2,611	2,793	2,977	3,177	3,375	3,568	3,750	3,903	4,028	4,142	4,189	4,163	4,056	3,940	3,748	3,452	3,156
2025	2,685	2,512	2,387	2,304	2,271	2,314	2,410	2,580	2,752	2,926	3,119	3,309	3,501	3,686	3,847	3,983	4,109	4,171	4,154	4,051	3,936	3,745	3,451	3,155
2026	2,697	2,521	2,395	2,308	2,273	2,312	2,397	2,554	2,718	2,882	3,065	3,249	3,439	3,625	3,796	3,944	4,081	4,158	4,152	4,056	3,943	3,751	3,458	3,164
2027	2,711	2,532	2,404	2,315	2,277	2,312	2,389	2,536	2,691	2,847	3,022	3,200	3,386	3,575	3,755	3,912	4,061	4,152	4,155	4,065	3,953	3,760	3,471	3,178
2028	2,734	2,552	2,421	2,328	2,286	2,319	2,388	2,523	2,674	2,825	2,993	3,165	3,350	3,539	3,725	3,891	4,049	4,151	4,163	4,079	3,969	3,777	3,490	3,200
2029	2,770	2,585	2,451	2,354	2,307	2,337	2,399	2,529	2,678	2,825	2,988	3,154	3,337	3,524	3,715	3,889	4,054	4,167	4,187	4,107	3,999	3,808	3,525	3,237
2030	2,819	2,627	2,489	2,387	2,332	2,359	2,417	2,543	2,696	2,842	3,002	3,163	3,342	3,528	3,722	3,900	4,071	4,193	4,220	4,145	4,036	3,848	3,572	3,287
2031	2,875	2,678	2,533	2,426	2,363	2,387	2,440	2,565	2,722	2,868	3,028	3,183	3,359	3,543	3,737	3,919	4,094	4,224	4,257	4,186	4,082	3,895	3,625	3,343
2032	2,928	2,725	2,573	2,462	2,394	2,414	2,463	2,587	2,749	2,895	3,054	3,205	3,376	3,558	3,754	3,940	4,118	4,256	4,294	4,229	4,124	3,939	3,676	3,396

Figure 85: Zone J Component of NYCA Baseline Expected Weather Summer Peak Load shape



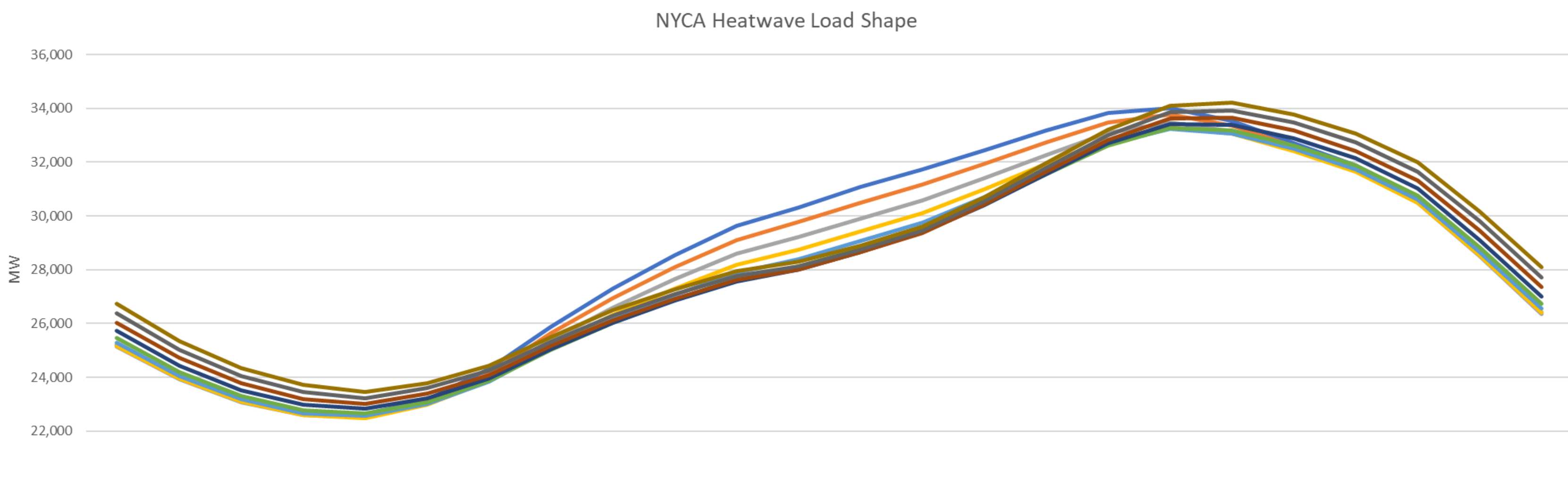
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	7,894	7,537	7,275	7,126	7,115	7,316	7,792	8,462	9,080	9,572	9,966	10,246	10,462	10,623	10,691	10,782	10,915	10,853	10,733	10,543	10,314	10,062	9,627	9,070
2024	7,888	7,530	7,266	7,117	7,104	7,307	7,781	8,442	9,055	9,545	9,935	10,210	10,424	10,584	10,655	10,751	10,888	10,837	10,720	10,534	10,307	10,051	9,616	9,058
2025	7,848	7,485	7,221	7,070	7,054	7,261	7,731	8,381	8,992	9,478	9,864	10,134	10,344	10,504	10,579	10,683	10,825	10,786	10,672	10,489	10,264	10,007	9,571	9,012
2026	7,856	7,490	7,224	7,071	7,052	7,259	7,726	8,365	8,972	9,456	9,836	10,101	10,306	10,467	10,547	10,657	10,806	10,778	10,671	10,494	10,268	10,008	9,574	9,015
2027	7,998	7,626	7,357	7,202	7,180	7,388	7,854	8,482	9,087	9,567	9,943	10,203	10,404	10,561	10,647	10,764	10,918	10,905	10,804	10,630	10,407	10,145	9,713	9,152
2028	8,069	7,691	7,419	7,259	7,233	7,444	7,906	8,524	9,127	9,605	9,977	10,228	10,424	10,583	10,672	10,797	10,958	10,958	10,864	10,696	10,475	10,211	9,780	9,220
2029	8,202	7,819	7,542	7,378	7,348	7,558	8,017	8,627	9,231	9,706	10,073	10,318	10,508	10,665	10,758	10,891	11,059	11,072	10,986	10,825	10,605	10,339	9,913	9,351
2030	8,371	7,978	7,694	7,525	7,486	7,699	8,156	8,760	9,366	9,840	10,206	10,444	10,627	10,779	10,877	11,016	11,190	11,218	11,140	10,984	10,767	10,501	10,079	9,518
2031	8,549	8,146	7,854	7,679	7,633	7,846	8,302	8,901	9,516	9,991	10,357	10,588	10,765	10,912	11,011	11,154	11,332	11,373	11,303	11,151	10,938	10,672	10,257	9,694
2032	8,699	8,288	7,989	7,808	7,754	7,969	8,427	9,024	9,647	10,126	10,490	10,718	10,886	11,028	11,127	11,274	11,456	11,508	11,441	11,295	11,084	10,817	10,407	9,846

Figure 86: Zone K Component of NYCA Baseline Expected Weather Summer Peak Load shape



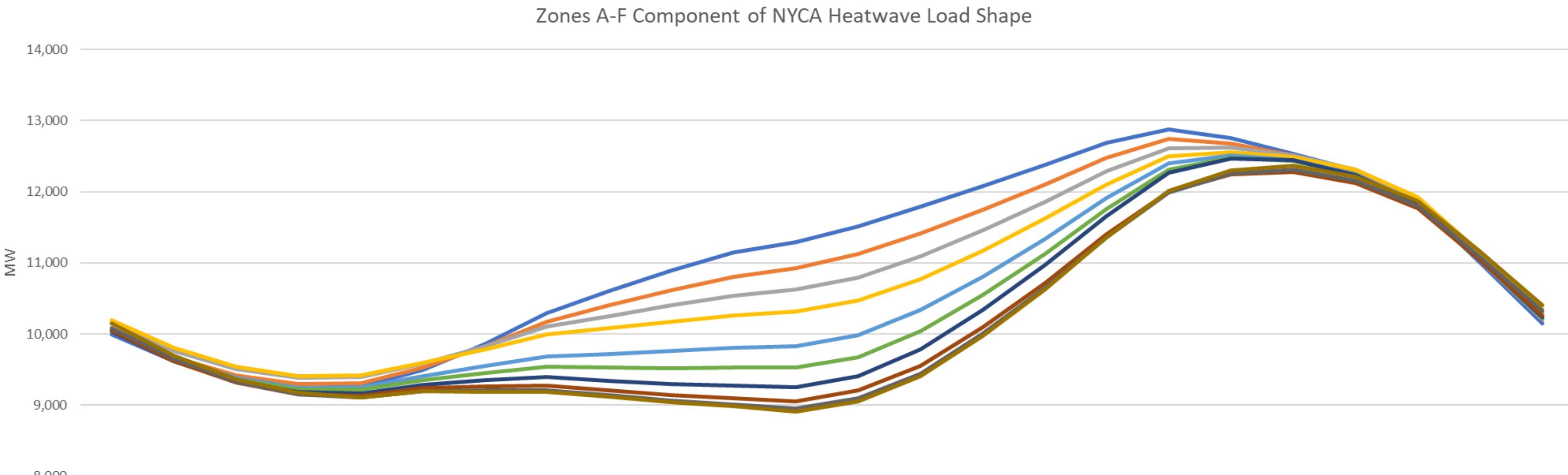
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	2,880	2,669	2,518	2,427	2,406	2,451	2,556	2,818	3,131	3,447	3,779	4,091	4,352	4,548	4,696	4,831	4,947	4,951	4,887	4,711	4,513	4,253	3,869	3,476
2024	2,811	2,600	2,449	2,357	2,333	2,378	2,479	2,732	3,038	3,347	3,675	3,983	4,243	4,439	4,592	4,733	4,857	4,870	4,813	4,639	4,443	4,181	3,798	3,405
2025	2,738	2,525	2,373	2,280	2,256	2,299	2,392	2,635	2,934	3,234	3,555	3,856	4,115	4,313	4,474	4,624	4,757	4,782	4,731	4,564	4,368	4,105	3,723	3,329
2026	2,719	2,506	2,351	2,257	2,232	2,273	2,358	2,588	2,876	3,169	3,481	3,777	4,032	4,234	4,403	4,564	4,706	4,746	4,704	4,541	4,346	4,082	3,701	3,308
2027	2,792	2,575	2,420	2,325	2,298	2,336	2,415	2,633	2,912	3,197	3,501	3,790	4,044	4,245	4,423	4,594	4,748	4,801	4,768	4,610	4,416	4,151	3,773	3,380
2028	2,840	2,620	2,463	2,366	2,335	2,373	2,444	2,651	2,924	3,202	3,498	3,780	4,032	4,236	4,421	4,602	4,764	4,829	4,806	4,654	4,460	4,195	3,820	3,426
2029	2,901	2,679	2,519	2,419	2,387	2,422	2,488	2,685	2,952	3,223	3,514	3,790	4,039	4,243	4,435	4,623	4,795	4,872	4,857	4,710	4,519	4,252	3,878	3,486
2030	2,963	2,737	2,574	2,471	2,434	2,467	2,528	2,718	2,983	3,250	3,536	3,808	4,053	4,257	4,452	4,649	4,827	4,916	4,907	4,765	4,575	4,309	3,939	3,547
2031	3,025	2,793	2,626	2,520	2,477	2,508	2,564	2,750	3,016	3,281	3,564	3,829	4,071	4,274	4,473	4,675	4,860	4,958	4,956	4,818	4,629	4,365	3,999	3,609
2032	3,093	2,856	2,683	2,571	2,519	2,551	2,602	2,785	3,055	3,319	3,599	3,861	4,097	4,297	4,499	4,704	4,894	5,003	5,007	4,875	4,689	4,426	4,066	3,679

Figure 87: NYCA Heatwave Load shape



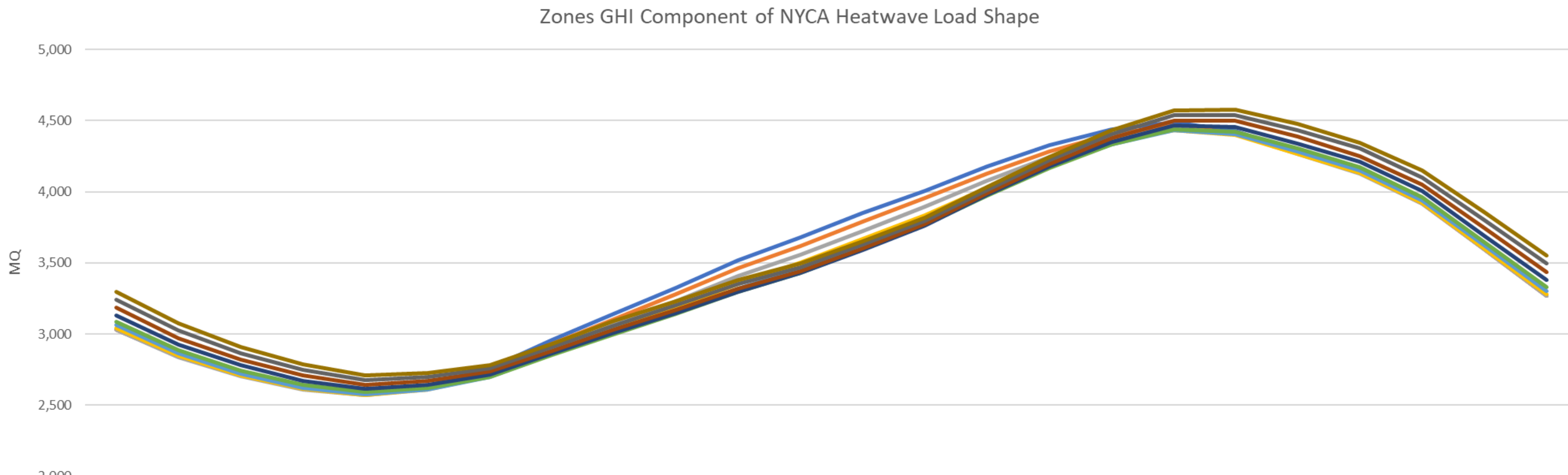
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	25,192	23,990	23,169	22,689	22,622	23,172	24,299	25,888	27,285	28,523	29,619	30,325	31,067	31,733	32,438	33,178	33,827	34,016	33,535	32,715	31,868	30,648	28,597	26,405
2024	25,166	23,956	23,127	22,642	22,567	23,092	24,143	25,634	26,935	28,089	29,112	29,769	30,489	31,166	31,927	32,739	33,470	33,758	33,358	32,600	31,777	30,581	28,556	26,385
2025	25,134	23,914	23,075	22,583	22,500	23,001	23,979	25,374	26,584	27,657	28,608	29,217	29,908	30,587	31,398	32,275	33,082	33,467	33,148	32,459	31,665	30,499	28,507	26,363
2026	25,175	23,942	23,091	22,588	22,493	22,968	23,874	25,182	26,312	27,311	28,196	28,758	29,427	30,115	30,978	31,924	32,809	33,288	33,048	32,417	31,645	30,503	28,538	26,414
2027	25,293	24,043	23,177	22,663	22,553	23,004	23,845	25,074	26,132	27,063	27,886	28,403	29,058	29,760	30,682	31,700	32,669	33,238	33,074	32,490	31,731	30,603	28,659	26,545
2028	25,463	24,195	23,310	22,781	22,652	23,079	23,860	25,020	26,022	26,893	27,662	28,136	28,780	29,496	30,472	31,560	32,609	33,263	33,170	32,628	31,877	30,761	28,837	26,730
2029	25,719	24,428	23,520	22,973	22,821	23,226	23,956	25,063	26,026	26,850	27,576	28,011	28,651	29,382	30,412	31,567	32,693	33,422	33,393	32,881	32,131	31,020	29,111	27,005
2030	26,035	24,714	23,776	23,202	23,018	23,400	24,089	25,165	26,119	26,916	27,613	28,015	28,642	29,375	30,441	31,643	32,828	33,621	33,649	33,167	32,422	31,324	29,441	27,344
2031	26,388	25,032	24,058	23,455	23,232	23,592	24,252	25,318	26,289	27,075	27,758	28,132	28,743	29,466	30,553	31,785	33,009	33,852	33,926	33,473	32,735	31,654	29,806	27,722
2032	26,740	25,349	24,340	23,707	23,446	23,789	24,429	25,497	26,495	27,279	27,955	28,307	28,900	29,609	30,707	31,959	33,213	34,096	34,209	33,780	33,050	31,987	30,173	28,101

Figure 88: Zones A-F Component of NYCA Heatwave Load shape



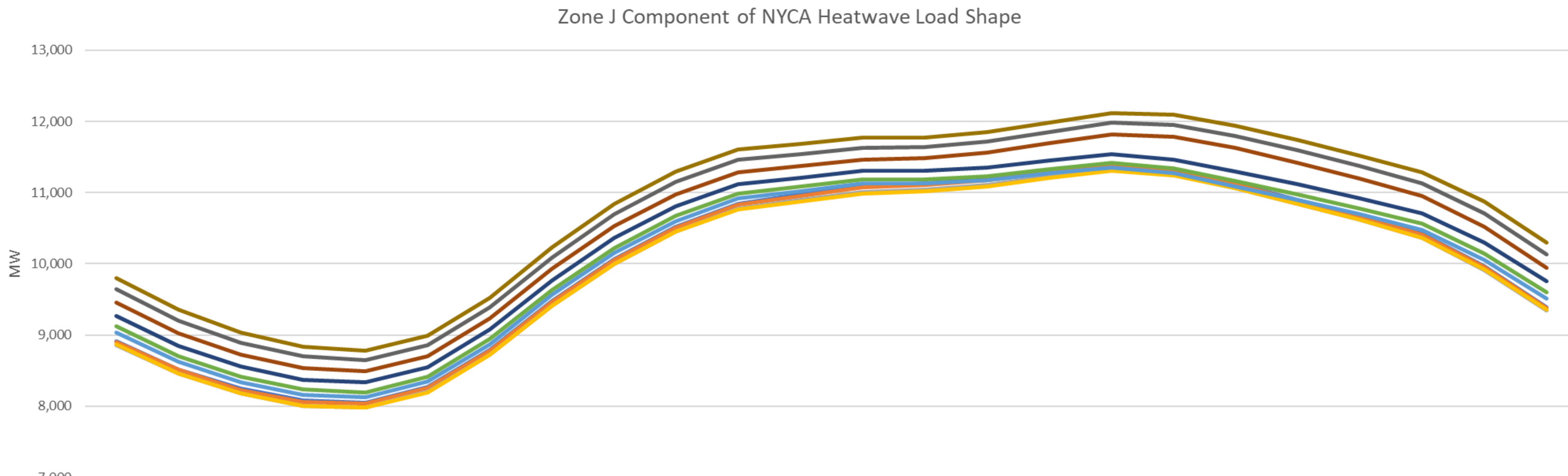
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	9,991	9,612	9,359	9,240	9,260	9,495	9,861	10,293	10,607	10,888	11,144	11,295	11,513	11,795	12,077	12,376	12,688	12,872	12,750	12,535	12,294	11,843	11,001	10,147
2024	10,053	9,667	9,414	9,291	9,310	9,524	9,824	10,169	10,403	10,612	10,807	10,922	11,123	11,414	11,743	12,101	12,477	12,739	12,680	12,515	12,291	11,863	11,041	10,205
2025	10,151	9,764	9,507	9,379	9,395	9,588	9,832	10,100	10,254	10,402	10,538	10,621	10,795	11,087	11,453	11,854	12,284	12,615	12,620	12,510	12,312	11,904	11,109	10,299
2026	10,196	9,802	9,541	9,410	9,420	9,596	9,787	9,989	10,080	10,170	10,261	10,310	10,473	10,772	11,171	11,618	12,101	12,497	12,554	12,485	12,307	11,918	11,144	10,348
2027	10,047	9,650	9,380	9,243	9,246	9,406	9,545	9,685	9,721	9,761	9,808	9,830	9,986	10,337	10,806	11,336	11,909	12,399	12,510	12,445	12,243	11,835	11,038	10,220
2028	10,046	9,642	9,363	9,222	9,218	9,356	9,452	9,541	9,526	9,518	9,527	9,525	9,675	10,035	10,547	11,127	11,759	12,313	12,472	12,431	12,234	11,830	11,045	10,229
2029	10,037	9,618	9,329	9,181	9,164	9,290	9,347	9,391	9,341	9,298	9,275	9,251	9,402	9,785	10,338	10,967	11,655	12,264	12,463	12,439	12,238	11,834	11,051	10,234
2030	10,047	9,618	9,315	9,155	9,126	9,235	9,260	9,275	9,208	9,143	9,098	9,055	9,203	9,554	10,093	10,713	11,398	12,005	12,241	12,277	12,123	11,763	11,034	10,264
2031	10,086	9,645	9,327	9,151	9,103	9,199	9,203	9,205	9,140	9,064	9,005	8,952	9,094	9,444	10,003	10,644	11,356	11,994	12,255	12,310	12,152	11,799	11,085	10,324
2032	10,154	9,696	9,365	9,174	9,111	9,193	9,185	9,180	9,123	9,043	8,981	8,912	9,053	9,401	9,968	10,626	11,356	12,014	12,300	12,361	12,209	11,862	11,162	10,404

Figure 89: Zones GHI Component of NYCA Heatwave Load shape



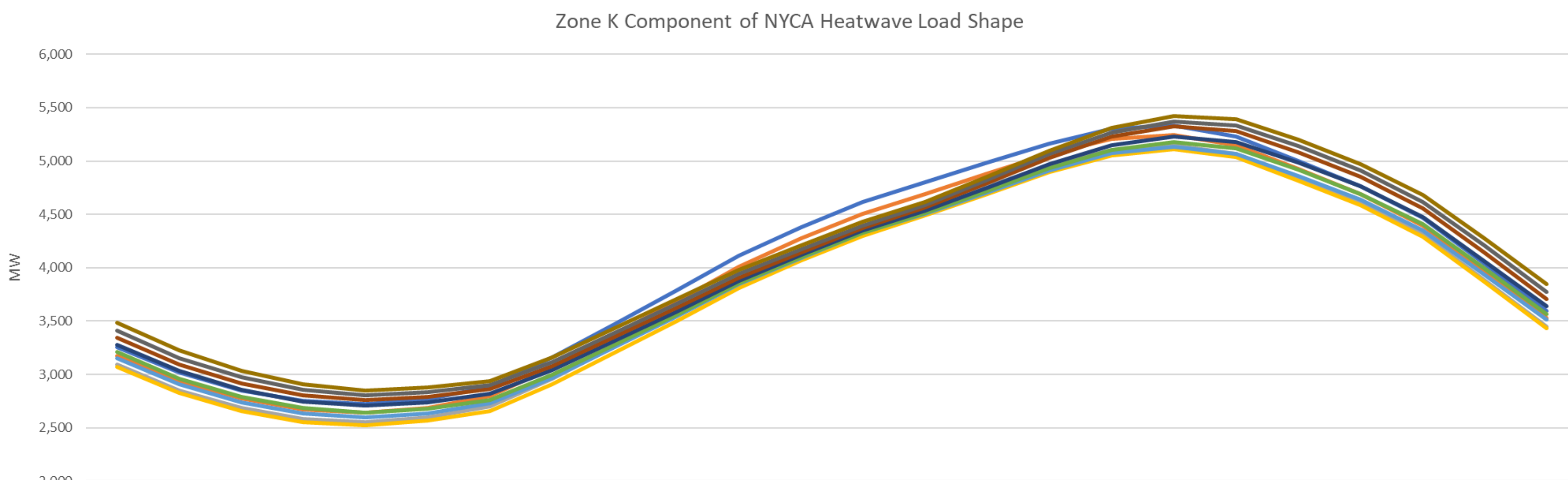
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	3,032	2,843	2,714	2,620	2,585	2,637	2,759	2,958	3,140	3,324	3,518	3,679	3,849	4,009	4,180	4,326	4,437	4,489	4,425	4,276	4,137	3,922	3,594	3,269
2024	3,032	2,841	2,708	2,615	2,578	2,625	2,739	2,929	3,102	3,279	3,465	3,621	3,789	3,954	4,131	4,285	4,406	4,468	4,413	4,270	4,133	3,919	3,594	3,269
2025	3,031	2,839	2,703	2,611	2,570	2,614	2,720	2,898	3,062	3,229	3,408	3,557	3,726	3,893	4,077	4,242	4,374	4,449	4,404	4,265	4,128	3,918	3,595	3,271
2026	3,044	2,848	2,711	2,614	2,571	2,610	2,706	2,873	3,029	3,185	3,355	3,500	3,667	3,834	4,027	4,204	4,348	4,435	4,400	4,269	4,134	3,924	3,603	3,282
2027	3,062	2,862	2,723	2,623	2,578	2,612	2,699	2,859	3,006	3,156	3,317	3,457	3,621	3,792	3,993	4,178	4,333	4,432	4,407	4,281	4,148	3,938	3,622	3,303
2028	3,089	2,887	2,744	2,641	2,591	2,623	2,701	2,851	2,995	3,140	3,296	3,430	3,594	3,766	3,975	4,167	4,333	4,440	4,423	4,304	4,171	3,964	3,648	3,332
2029	3,131	2,926	2,780	2,672	2,616	2,645	2,716	2,863	3,007	3,147	3,299	3,428	3,592	3,762	3,976	4,177	4,349	4,466	4,458	4,341	4,210	4,004	3,693	3,378
2030	3,184	2,972	2,822	2,708	2,644	2,668	2,736	2,882	3,030	3,170	3,320	3,443	3,604	3,774	3,992	4,197	4,377	4,502	4,501	4,387	4,253	4,052	3,746	3,433
2031	3,244	3,026	2,867	2,748	2,677	2,697	2,760	2,908	3,060	3,201	3,351	3,469	3,628	3,796	4,013	4,222	4,405	4,537	4,541	4,431	4,304	4,102	3,804	3,494
2032	3,299	3,076	2,909	2,787	2,709	2,724	2,783	2,932	3,091	3,231	3,380	3,495	3,650	3,816	4,035	4,246	4,433	4,570	4,580	4,477	4,346	4,151	3,859	3,552

Figure 90: Zone J Component of NYCA Heatwave Load shape



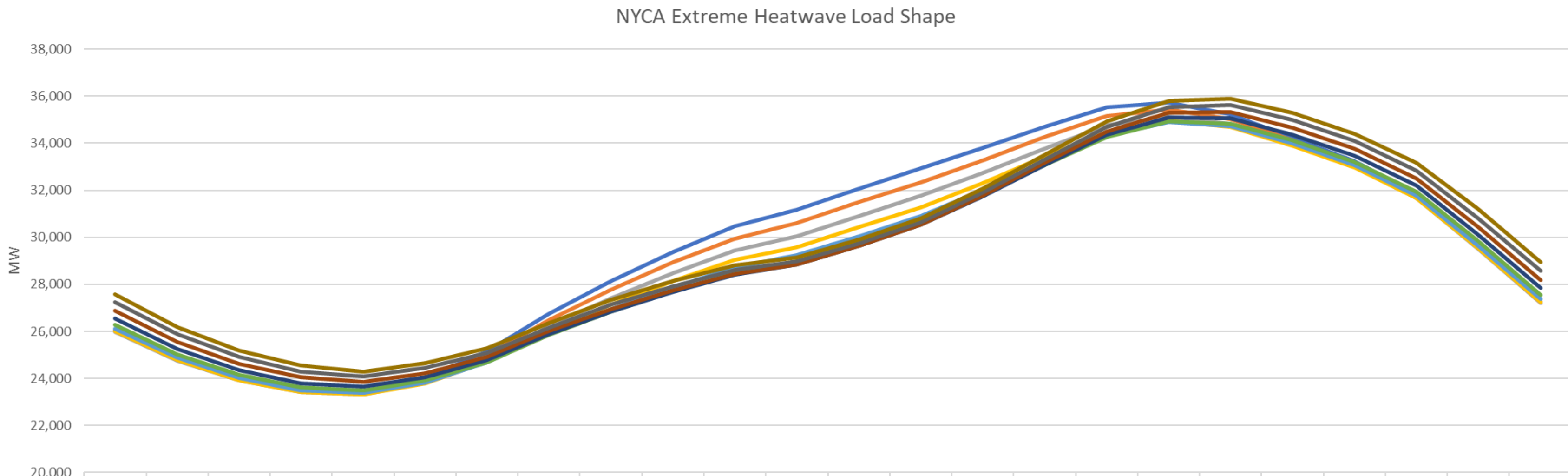
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	8,916	8,518	8,243	8,078	8,054	8,270	8,794	9,480	10,067	10,522	10,845	10,971	11,091	11,132	11,198	11,310	11,402	11,324	11,128	10,902	10,671	10,417	9,966	9,390
2024	8,907	8,510	8,231	8,065	8,039	8,256	8,782	9,471	10,056	10,512	10,833	10,953	11,071	11,108	11,174	11,288	11,381	11,308	11,114	10,891	10,662	10,408	9,958	9,384
2025	8,861	8,458	8,178	8,010	7,982	8,202	8,727	9,416	10,004	10,458	10,778	10,894	11,008	11,042	11,108	11,226	11,322	11,254	11,061	10,841	10,615	10,364	9,916	9,342
2026	8,866	8,461	8,178	8,008	7,977	8,196	8,720	9,409	9,998	10,453	10,769	10,880	10,988	11,021	11,089	11,209	11,309	11,246	11,060	10,845	10,618	10,370	9,925	9,352
2027	9,031	8,620	8,333	8,162	8,128	8,347	8,873	9,562	10,152	10,603	10,917	11,022	11,126	11,127	11,176	11,274	11,354	11,273	11,091	10,902	10,700	10,479	10,060	9,510
2028	9,119	8,702	8,411	8,234	8,197	8,417	8,943	9,632	10,225	10,676	10,987	11,084	11,185	11,185	11,230	11,332	11,414	11,336	11,160	10,976	10,779	10,561	10,148	9,601
2029	9,272	8,851	8,554	8,374	8,334	8,551	9,076	9,769	10,364	10,814	11,122	11,213	11,310	11,304	11,349	11,453	11,539	11,463	11,293	11,117	10,921	10,708	10,303	9,756
2030	9,457	9,027	8,721	8,536	8,488	8,707	9,232	9,928	10,528	10,977	11,285	11,371	11,463	11,482	11,561	11,700	11,823	11,786	11,624	11,419	11,194	10,952	10,520	9,942
2031	9,645	9,205	8,891	8,701	8,646	8,863	9,389	10,088	10,698	11,149	11,459	11,538	11,625	11,637	11,715	11,854	11,980	11,948	11,794	11,593	11,370	11,135	10,710	10,132
2032	9,802	9,354	9,033	8,836	8,775	8,993	9,521	10,228	10,846	11,301	11,611	11,689	11,768	11,773	11,849	11,988	12,116	12,090	11,938	11,742	11,523	11,290	10,873	10,297

Figure 91: Zone K Component of NYCA Heatwave Load shape



	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	3,253	3,017	2,853	2,751	2,723	2,770	2,885	3,157	3,471	3,789	4,112	4,380	4,614	4,797	4,983	5,166	5,300	5,331	5,232	5,002	4,766	4,466	4,036	3,599
2024	3,174	2,938	2,774	2,671	2,640	2,687	2,798	3,065	3,374	3,686	4,007	4,273	4,506	4,690	4,879	5,065	5,206	5,243	5,151	4,924	4,691	4,391	3,963	3,527
2025	3,091	2,853	2,687	2,583	2,553	2,597	2,700	2,960	3,264	3,568	3,884	4,145	4,379	4,565	4,760	4,953	5,102	5,149	5,063	4,843	4,610	4,313	3,887	3,451
2026	3,069	2,831	2,661	2,556	2,525	2,566	2,661	2,911	3,205	3,503	3,811	4,068	4,299	4,488	4,691	4,893	5,051	5,110	5,034	4,818	4,586	4,291	3,866	3,432
2027	3,153	2,911	2,741	2,635	2,601	2,639	2,728	2,968	3,253	3,543	3,844	4,094	4,325	4,504	4,707	4,912	5,073	5,134	5,066	4,862	4,640	4,351	3,939	3,512
2028	3,209	2,964	2,792	2,684	2,646	2,683	2,764	2,996	3,276	3,559	3,852	4,097	4,326	4,510	4,720	4,934	5,103	5,174	5,115	4,917	4,693	4,406	3,996	3,568
2029	3,279	3,033	2,857	2,746	2,707	2,740	2,817	3,040	3,314	3,591	3,880	4,119	4,347	4,531	4,749	4,970	5,150	5,229	5,179	4,984	4,762	4,474	4,064	3,637
2030	3,347	3,097	2,918	2,803	2,760	2,790	2,861	3,080	3,353	3,626	3,910	4,146	4,372	4,565	4,795	5,033	5,230	5,328	5,283	5,084	4,852	4,557	4,141	3,705
2031	3,413	3,156	2,973	2,855	2,806	2,833	2,900	3,117	3,391	3,661	3,943	4,173	4,396	4,589	4,822	5,065	5,268	5,373	5,336	5,139	4,909	4,618	4,207	3,772
2032	3,485	3,223	3,033	2,910	2,851	2,879	2,940	3,157	3,435	3,704	3,983	4,211	4,429	4,619	4,855	5,099	5,308	5,422	5,391	5,200	4,972	4,684	4,279	3,848

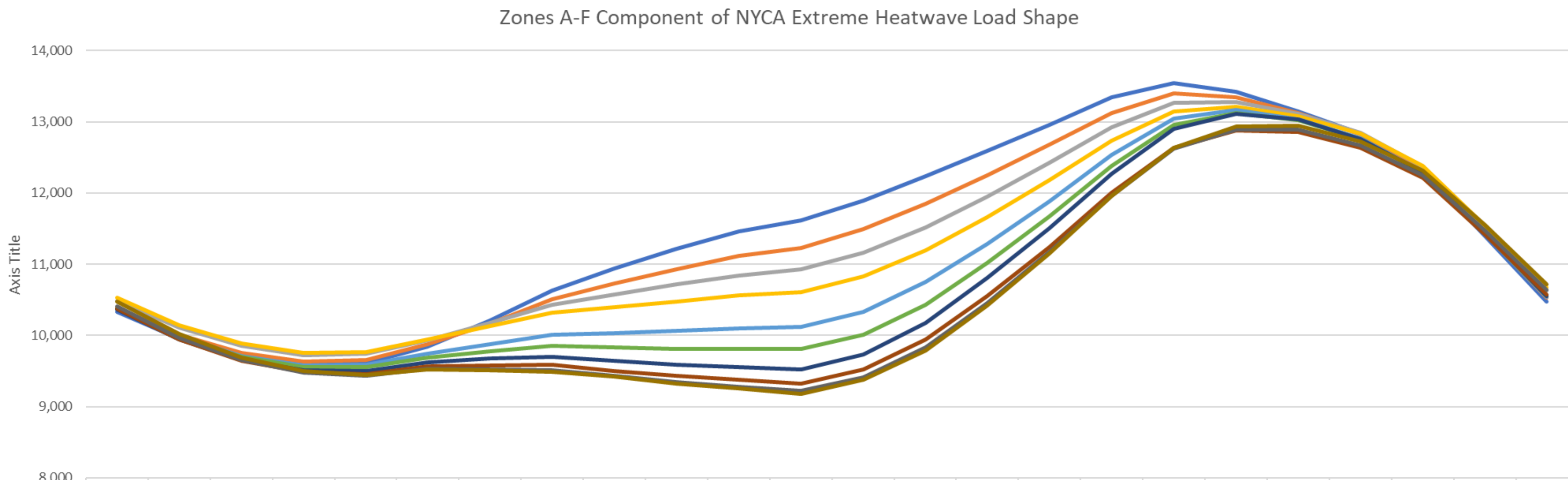
Figure 92: NYCA Extreme Heatwave Load shape



	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11
2023	26,041	24,839	24,018	23,538	23,471	24,021	25,148	26,737	28,134	29,372	30,468	31,174
2024	26,009	24,799	23,970	23,485	23,410	23,935	24,986	26,477	27,778	28,932	29,955	30,612
2025	25,970	24,750	23,911	23,419	23,336	23,837	24,815	26,210	27,420	28,493	29,444	30,053
2026	26,007	24,774	23,923	23,420	23,325	23,800	24,706	26,014	27,144	28,143	29,028	29,590
2027	26,122	24,872	24,006	23,492	23,382	23,833	24,674	25,903	26,961	27,892	28,715	29,232
2028	26,292	25,024	24,139	23,610	23,481	23,908	24,689	25,849	26,851	27,722	28,491	28,965
2029	26,552	25,261	24,353	23,806	23,654	24,059	24,789	25,896	26,859	27,683	28,409	28,844
2030	26,873	25,552	24,614	24,040	23,856	24,238	24,927	26,003	26,957	27,754	28,451	28,853
2031	27,234	25,878	24,904	24,301	24,078	24,438	25,098	26,164	27,135	27,921	28,604	28,978
2032	27,591	26,200	25,191	24,558	24,297	24,640	25,280	26,348	27,346	28,130	28,806	29,158

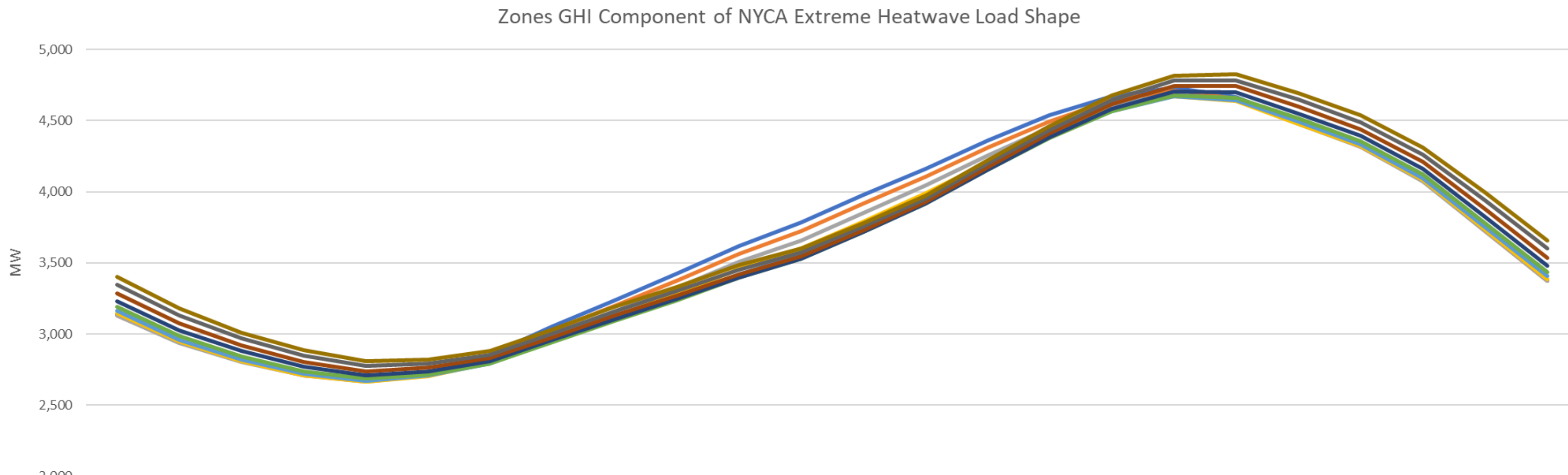
	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	32,085	32,921	33,795	34,705	35,524	35,713	35,232	34,242	33,225	31,836	29,615	27,254
2024	31,500	32,346	33,275	34,256	35,155	35,443	35,043	34,117	33,125	31,761	29,567	27,228
2025	30,911	31,757	32,734	33,779	34,753	35,138	34,819	33,963	33,001	31,669	29,510	27,199
2026	30,425	31,279	32,309	33,420	34,472	34,951	34,711	33,913	32,976	31,667	29,536	27,246
2027	30,053	30,921	32,009	33,193	34,328	34,897	34,733	33,983	33,058	31,764	29,654	27,374
2028	29,775	30,657	31,799	33,052	34,267	34,921	34,828	34,120	33,204	31,922	29,832	27,559
2029	29,650	30,548	31,745	33,066	34,359	35,088	35,059	34,380	33,464	32,186	30,110	27,838
2030	29,648	30,549	31,782	33,153	34,505	35,298	35,326	34,677	33,763	32,498	30,447	28,182
2031	29,758	30,650	31,905	33,307	34,700	35,543	35,617	34,995	34,087	32,838	30,821	28,568
2032	29,921	30,800	32,067	33,490	34,914	35,797	35,910	35,311	34,410	33,178	31,194	28,952

Figure 93: Zones A-F Component of NYCA Extreme Heatwave Load shape



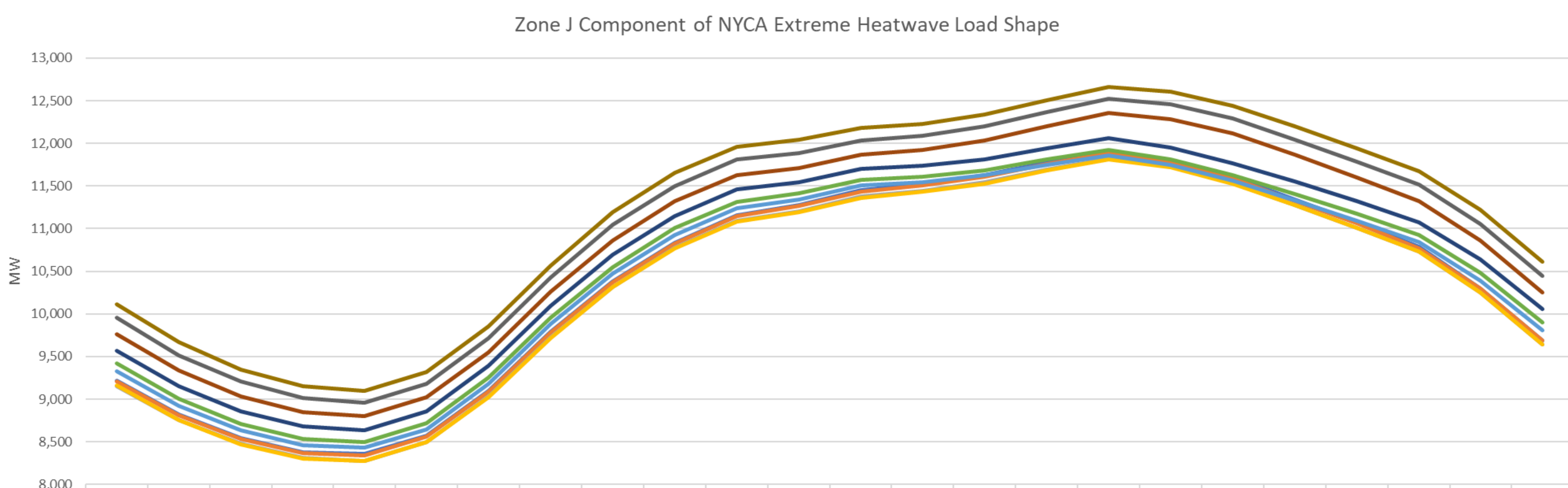
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	10,328	9,953	9,702	9,585	9,607	9,843	10,206	10,630	10,937	11,212	11,463	11,611	11,890	12,240	12,593	12,961	13,346	13,541	13,421	13,142	12,833	12,313	11,397	10,474
2024	10,389	10,007	9,757	9,638	9,657	9,872	10,168	10,504	10,728	10,930	11,120	11,231	11,491	11,852	12,250	12,678	13,128	13,402	13,348	13,119	12,830	12,332	11,438	10,530
2025	10,488	10,105	9,851	9,726	9,744	9,937	10,175	10,432	10,576	10,717	10,845	10,924	11,157	11,518	11,951	12,422	12,925	13,272	13,283	13,111	12,847	12,372	11,506	10,626
2026	10,533	10,143	9,885	9,757	9,769	9,944	10,128	10,320	10,399	10,479	10,563	10,608	10,828	11,193	11,662	12,179	12,737	13,149	13,213	13,084	12,841	12,385	11,539	10,674
2027	10,377	9,983	9,715	9,581	9,586	9,745	9,877	10,005	10,029	10,060	10,099	10,116	10,328	10,747	11,284	11,887	12,536	13,045	13,165	13,039	12,773	12,295	11,428	10,539
2028	10,372	9,971	9,696	9,557	9,555	9,692	9,780	9,857	9,829	9,811	9,812	9,806	10,009	10,436	11,018	11,669	12,377	12,953	13,120	13,021	12,760	12,288	11,432	10,547
2029	10,361	9,946	9,659	9,515	9,498	9,623	9,672	9,703	9,639	9,586	9,555	9,527	9,730	10,179	10,803	11,505	12,271	12,902	13,112	13,030	12,763	12,290	11,437	10,550
2030	10,370	9,944	9,643	9,486	9,459	9,565	9,582	9,584	9,503	9,428	9,374	9,326	9,526	9,941	10,549	11,241	12,004	12,632	12,879	12,860	12,641	12,216	11,416	10,578
2031	10,410	9,970	9,655	9,481	9,435	9,529	9,525	9,513	9,434	9,347	9,280	9,222	9,415	9,829	10,457	11,172	11,961	12,622	12,894	12,893	12,673	12,252	11,468	10,639
2032	10,477	10,021	9,692	9,504	9,442	9,522	9,506	9,487	9,417	9,324	9,254	9,180	9,374	9,785	10,421	11,151	11,959	12,640	12,939	12,943	12,727	12,315	11,545	10,720

Figure 94: Zones GHI Component of NYCA Extreme Heatwave Load shape



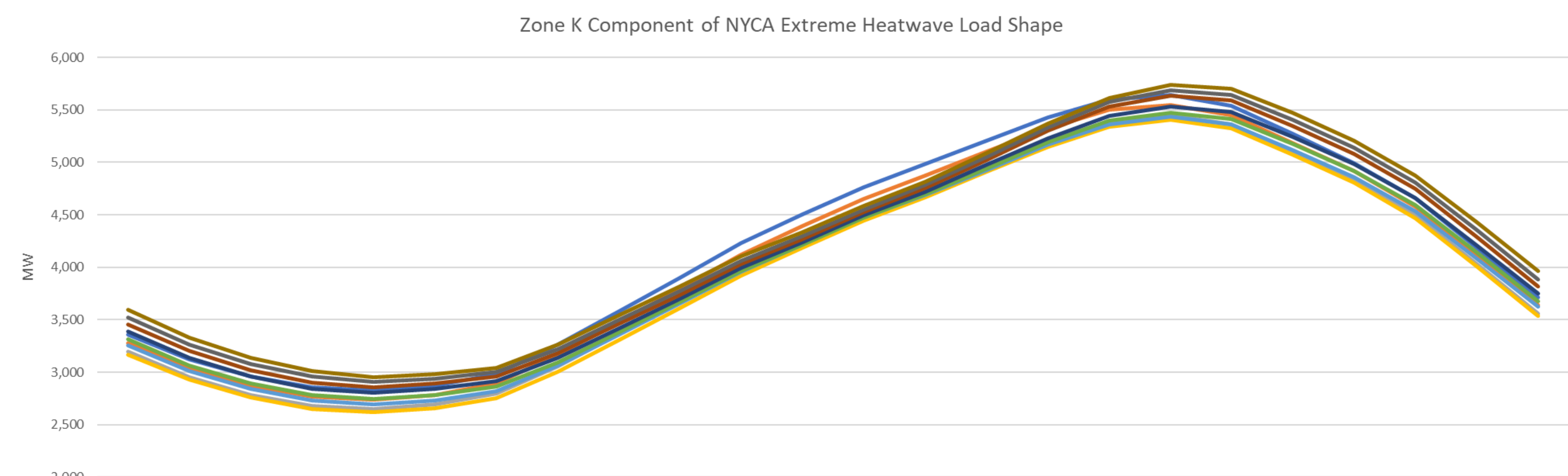
	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	3,135	2,943	2,813	2,719	2,682	2,733	2,856	3,055	3,238	3,423	3,619	3,782	3,976	4,164	4,362	4,536	4,673	4,730	4,666	4,489	4,325	4,081	3,727	3,374
2024	3,133	2,941	2,807	2,711	2,675	2,720	2,835	3,025	3,199	3,377	3,565	3,724	3,915	4,107	4,313	4,494	4,641	4,708	4,653	4,483	4,318	4,078	3,724	3,374
2025	3,132	2,938	2,801	2,707	2,665	2,709	2,815	2,994	3,158	3,326	3,508	3,659	3,851	4,044	4,257	4,451	4,610	4,689	4,643	4,477	4,314	4,074	3,723	3,374
2026	3,145	2,947	2,809	2,710	2,666	2,704	2,800	2,967	3,124	3,283	3,455	3,601	3,791	3,987	4,208	4,411	4,581	4,674	4,640	4,479	4,320	4,082	3,733	3,386
2027	3,162	2,961	2,821	2,720	2,672	2,707	2,793	2,954	3,102	3,252	3,417	3,558	3,745	3,942	4,173	4,386	4,567	4,671	4,645	4,492	4,333	4,095	3,750	3,406
2028	3,190	2,987	2,842	2,737	2,686	2,716	2,795	2,945	3,091	3,237	3,395	3,531	3,718	3,918	4,155	4,375	4,567	4,679	4,663	4,515	4,356	4,121	3,778	3,435
2029	3,233	3,026	2,879	2,769	2,712	2,739	2,810	2,959	3,103	3,246	3,399	3,529	3,716	3,915	4,156	4,385	4,584	4,706	4,697	4,552	4,395	4,162	3,823	3,482
2030	3,287	3,073	2,921	2,805	2,740	2,764	2,831	2,978	3,128	3,269	3,420	3,546	3,732	3,929	4,175	4,409	4,615	4,745	4,743	4,602	4,441	4,210	3,878	3,538
2031	3,348	3,129	2,968	2,848	2,774	2,793	2,855	3,004	3,159	3,300	3,453	3,573	3,755	3,953	4,198	4,434	4,644	4,780	4,785	4,647	4,491	4,263	3,938	3,601
2032	3,404	3,179	3,011	2,886	2,808	2,822	2,879	3,030	3,190	3,332	3,483	3,601	3,778	3,972	4,221	4,459	4,675	4,816	4,825	4,694	4,536	4,313	3,993	3,659

Figure 95: Zone J Component of NYCA Extreme Heatwave Load shape



	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	9,216	8,820	8,545	8,380	8,356	8,573	9,101	9,791	10,380	10,835	11,156	11,278	11,454	11,530	11,631	11,778	11,905	11,802	11,605	11,341	11,072	10,785	10,302	9,692
2024	9,206	8,809	8,531	8,366	8,339	8,558	9,088	9,782	10,371	10,828	11,147	11,263	11,438	11,511	11,610	11,758	11,884	11,785	11,588	11,327	11,061	10,773	10,293	9,684
2025	9,156	8,754	8,474	8,307	8,279	8,500	9,031	9,726	10,319	10,774	11,093	11,206	11,377	11,447	11,546	11,696	11,824	11,729	11,532	11,273	11,009	10,727	10,248	9,639
2026	9,159	8,755	8,472	8,303	8,272	8,493	9,024	9,720	10,315	10,771	11,086	11,195	11,361	11,429	11,530	11,682	11,814	11,721	11,530	11,276	11,011	10,729	10,254	9,646
2027	9,327	8,917	8,631	8,460	8,427	8,647	9,181	9,878	10,474	10,928	11,241	11,344	11,507	11,544	11,624	11,752	11,861	11,749	11,561	11,332	11,093	10,840	10,392	9,807
2028	9,416	9,000	8,710	8,534	8,497	8,720	9,253	9,952	10,551	11,005	11,316	11,411	11,572	11,607	11,683	11,815	11,925	11,814	11,630	11,407	11,173	10,923	10,480	9,899
2029	9,572	9,153	8,857	8,677	8,638	8,858	9,392	10,093	10,696	11,149	11,458	11,547	11,705	11,734	11,811	11,945	12,058	11,947	11,770	11,553	11,321	11,074	10,638	10,057
2030	9,761	9,333	9,029	8,845	8,797	9,019	9,553	10,258	10,865	11,319	11,628	11,711	11,865	11,922	12,034	12,204	12,355	12,284	12,114	11,866	11,602	11,326	10,861	10,247
2031	9,954	9,516	9,204	9,014	8,961	9,181	9,717	10,426	11,042	11,498	11,808	11,885	12,036	12,086	12,197	12,367	12,522	12,456	12,292	12,047	11,785	11,515	11,056	10,441
2032	10,114	9,668	9,348	9,154	9,093	9,314	9,853	10,569	11,194	11,654	11,964	12,040	12,184	12,229	12,337	12,509	12,665	12,603	12,442	12,202	11,942	11,673	11,222	10,609

Figure 96: Zone K Component of NYCA Extreme Heatwave Load shape



	HB0	HB1	HB2	HB3	HB4	HB5	HB6	HB7	HB8	HB9	HB10	HB11	HB12	HB13	HB14	HB15	HB16	HB17	HB18	HB19	HB20	HB21	HB22	HB23
2023	3,362	3,123	2,958	2,854	2,826	2,872	2,985	3,261	3,579	3,902	4,230	4,503	4,765	4,987	5,209	5,430	5,600	5,640	5,540	5,270	4,995	4,657	4,189	3,714
2024	3,281	3,042	2,875	2,770	2,739	2,785	2,895	3,166	3,480	3,797	4,123	4,394	4,656	4,876	5,102	5,326	5,502	5,548	5,454	5,188	4,916	4,578	4,112	3,640
2025	3,194	2,953	2,785	2,679	2,648	2,691	2,794	3,058	3,367	3,676	3,998	4,264	4,526	4,748	4,980	5,210	5,394	5,448	5,361	5,102	4,831	4,496	4,033	3,560
2026	3,170	2,929	2,757	2,650	2,618	2,659	2,754	3,007	3,306	3,610	3,924	4,186	4,445	4,670	4,909	5,148	5,340	5,407	5,328	5,074	4,804	4,471	4,010	3,540
2027	3,256	3,011	2,839	2,731	2,697	2,734	2,823	3,066	3,356	3,652	3,958	4,214	4,473	4,688	4,928	5,168	5,364	5,432	5,362	5,120	4,859	4,534	4,084	3,622
2028	3,314	3,066	2,891	2,782	2,743	2,780	2,861	3,095	3,380	3,669	3,968	4,217	4,476	4,696	4,943	5,193	5,398	5,475	5,415	5,177	4,915	4,590	4,142	3,678
2029	3,386	3,136	2,958	2,845	2,806	2,839	2,915	3,141	3,421	3,702	3,997	4,241	4,499	4,720	4,975	5,231	5,446	5,533	5,480	5,245	4,985	4,660	4,212	3,749
2030	3,455	3,202	3,021	2,904	2,860	2,890	2,961	3,183	3,461	3,738	4,029	4,270	4,525	4,757	5,024	5,299	5,531	5,637	5,590	5,349	5,079	4,746	4,292	3,819
2031	3,522	3,263	3,077	2,958	2,908	2,935	3,001	3,221	3,500	3,776	4,063	4,298	4,552	4,782	5,053	5,334	5,573	5,685	5,646	5,408	5,138	4,808	4,359	3,887
2032	3,596	3,332	3,140	3,014	2,954	2,982	3,042	3,262	3,545	3,820	4,105	4,337	4,585	4,814	5,088	5,371	5,615	5,738	5,704	5,472	5,205	4,877	4,434	3,964