Short-Term Assessment of Reliability: 2021 Quarter 4

A Report by the
New York Independent System Operator

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Contents

Executive Summary

This report sets forth the 2021 Quarter 4 Short-Term Assessment of Reliability ("STAR") findings for the five-year study period of October 15, 2021 through October 15, 2026. This assessment finds the planned Bulk Power Transmission Facilities ("BPTF") through the study period are within applicable reliability criteria under the assumed and forecasted base case system conditions.

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.

Central Hudson identified transmission security issues in their transmission district on their non-BPTF systems. The issues identified by Central Hudson are primarily driven by the assumed unavailability of certain generation in their district affected by the New York State Department of Environmental Conservation's "Peaker Rule." The local non-BPTF criteria violations identified by Central Hudson are not Generator Deactivation Reliability Needs.

At the July 23, 2021 ESPWG/TPAS, Con Edison presented a Local Transmission Plan ("LTP") update that included placing in-service the Gowanus-Farragut 345 kV 41 and 42 series reactors in summer 2025 to address non-BPTF transient voltage response issues. As described in the 2021 Quarter 3 STAR, beginning in 2025 the NYISO observed some non-convergence issues under N-1-1 conditions. These non-convergence issues relate to the status of the Gowanus-Farragut 345 kV 41 and 42 series reactors. With the Gowanus-Farragut 345 kV 41 and 42 series reactors bypassed, no BPTF or non-BPTF dynamics issues are observed. Accordingly, Con Edison updated its LTP at the November 19, 2021 ESPWG/TPAS to no longer include the plan to place in-service the Gowanus-Farragut 345 kV 41 and 42 series reactors in summer 2025.

This assessment does not identify any Short-Term Reliability Needs. As generators that are subject to the DEC Peaker Rule submit their Generator Deactivation Notices or provide notice of their intent to transition from an IIFO state to a Retired state, 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 2021 Quarter 4 findings for the study period from the STAR Start Date (October 15, 2021) through October 15, 2026. The NYISO assessed the potential reliability impacts to the 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]

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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

Assumptions

The NYISO evaluated the study period using the most recent Reliability Planning Process base case and data available as of October 14, 2021 before the October 15, 2021 Q4 STAR start date. In accordance with the base case inclusion rules,[5] 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.

This assessment used the major assumptions included in the 2020 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 October 25, 2021 Electric System Planning Working Group ("ESPWG")/Transmission Planning Advisory Subcommittee ("TPAS"). The meeting materials are posted on the NYISO's public website.[6]

Generation Assumptions

Generator Deactivation Notices

There are no generator deactivations to assess in the 2021 Quarter 4 STAR. A list of generator deactivations evaluated in prior STARs is provided in Appendix C.

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").[7] 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 electrical demand can only be served by local generators due to transmission limitations that occur during certain operational 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

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

[6] Short-Term Assessment of Reliability: 2021 Q4 Key Study Assumptions

[7] https://www.dec.ny.gov/regulations/116131.html

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 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 stated either that they comply with the emission limits as currently operated, or proposed equipment upgrades to achieve the emissions limits.

A summary of the list of peaker generation removals is provided in Figure 1. Peaker generators that have already completed a Generator Deactivation Notice or entered an IIFO are indicated in the table.

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.

Figure 1: Status Change Due to DEC Peaker Rule

Owner/Operator	Station	Zone	Nameplate (MW)	CRIS (MW) (1)		Capability (MW) (1)		Status Change Date (2)
				Summer	Winter	Summer	Winter	
Central Hudson Gas & Elec. Corp.	Coxsackie GT	G	21.6	21.6	26.0	19.3	24.8	5/1/2023
Central Hudson Gas & Elec. Corp.	South Cairo	G	21.6	19.8	25.9	18.4	22.9	5/1/2023
Consolidated Edison Co. of NY, Inc.	74 St. GT 1 & 2	J	37.0	39.1	49.2	39.3	42.4	5/1/2023
NRG Power Marketing, LLC	Astoria GT 2-1, 2-2, 2-3, 2-4	J	186.0	165.8	204.1	140.4	181.7	5/1/2023
NRG Power Marketing, LLC	Astoria GT 3-1, 3-2, 3-3, 3-4	J	186.0	170.7	210.0	142.3	180.8	5/1/2023
NRG Power Marketing, LLC	Astoria GT 4-1, 4-2, 4-3, 4-4	J	186.0	167.9	206.7	133.7	178.4	5/1/2023
Astoria Generating Company, L.P.	Gowanus 1-1 through 1-7	J	140.0	122.6	160.1	124.7	159.7	5/1/2023
Astoria Generating Company, L.P.	Gowanus 1-8	J	20.0	16.1	21.0	16.0	21.0	2/1/2021 (IIFO)
Astoria Generating Company, L.P.	Gowanus 4-1 through 4-8	J	160.0	140.1	182.9	142.5	184.5	5/1/2023
Consolidated Edison Co. of NY, Inc.	Hudson Ave 3	J	16.3	16.0	20.9	16.6	19.5	5/1/2023
Consolidated Edison Co. of NY, Inc.	Hudson Ave 5	J	16.3	15.1	19.7	14.2	18.5	5/1/2023
Helix Ravenswood, LLC	Ravenswood 01	J	18.6	8.8	11.5	7.7	9.4	5/1/2023
Helix Ravenswood, LLC	Ravenswood 10	J	25.0	21.2	27.0	16.0	21.8	5/1/2023
Helix Ravenswood, LLC	Ravenswood 11	J	25.0	20.2	25.7	16.1	22.2	5/1/2023
National Grid	Glenwood GT 01	K	16.0	14.6	19.1	13.0	15.3	2/28/2021 (R)
National Grid	Northport GT	K	16.0	13.8	18.0	11.9	15.6	5/1/2023
National Grid	Port Jefferson GT 01	K	16.0	14.1	18.4	12.7	17.5	5/1/2023
National Grid	Shoreham 1 (3)	K	52.9	48.9	63.9	42.7	65.5	5/1/2023
National Grid	Shoreham 2 (3)	K	18.6	18.5	23.5	15.7	20.4	5/1/2023
National Grid	Glenwood GT 03 (3)	K	55.0	54.7	71.5	53.1	68.1	5/1/2023
Consolidated Edison Co. of NY, Inc.	59 St. GT 1	J	17.1	15.4	20.1	15.6	19.5	5/1/2025
NRG Power Marketing, LLC	Arthur Kill GT 1	J	20.0	16.5	21.6	12.2	15.8	5/1/2025
Astoria Generating Company, L.P.	Astoria GT 01	J	16.0	15.7	20.5	13.6	19.3	5/1/2025
Astoria Generating Company, L.P.	Gowanus 2-1 through 2-8	J	160.0	152.8	199.6	144.1	185.0	5/1/2025
Astoria Generating Company, L.P.	Gowanus 3-1 through 3-8	J	160.0	146.8	191.7	136.5	179.4	5/1/2025
Astoria Generating Company, L.P.	Narrows 1-1 through 2-8	J	352.0	309.1	403.6	291.5	376.2	5/1/2025
	2023 Total		1,233.9	1,109.6	1,405.1	996.3	1,290.0	
	2025 Total		725.1	656.3	857.1	613.5	795.2	
	Total		1,959.0	1,765.9	2,262.2	1,609.8	2,085.2	

Notes

1. MW values are from the 2021 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

Study assumptions for the STAR come from the 2020 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 prior STARs. However, the planned commercial operation date of Roaring Brook Wind (Q#0546) has changed from April 2021 to December 2021. A list of generator additions included in prior STARs is provided in Appendix C.

Load Assumptions

There are no changes to the load assumptions beyond those included in prior STARs. Details of the load assumptions included in prior STARs is provided in Appendix C.

Transmission Assumptions

Existing Transmission

At the July 23, 2021 ESPWG/TPAS, Con Edison presented an LTP update that included placing in-service the Gowanus-Farragut 345 kV 41 and 42 series reactors in summer 2025 and updating the dynamic database for the Con Edison service area with the latest available state-of-the-art dynamic load model. The purpose of these updates was to address non-BPTF transient voltage response issues in the Greenwood/Fox Hills 138 kV TLA and East 13th Street 138 kV TLA that were first identified in the 2020 Quarter 3 STAR.[8] As observed in the 2021 Quarter 3 STAR, beginning in 2025 the NYISO observed some non-convergence issues under N-1-1 conditions. These non-convergence issues relate back to the prior Con Edison LTP update to place in-service the Gowanus-Farragut 345 kV 41 and 42 series reactors. However, with the Gowanus-Farragut 345 kV 41 and 42 series reactors bypassed, all events converge and no BPTF and non-BPTF dynamics issues are observed. Accordingly, Con Edison updated its LTP at the November 19, 2021 ESPWG/TPAS which no longer includes the plan to place in-service the Gowanus-Farragut 345 kV 41 and 42 series reactors in summer 2025.[9] Figure 2 provides a summary of the status of the Con Edision series reactors throughout the study period. A list of changes in existing transmission assumptions included in prior STARs is provided in Appendix C.

[8] https://www.nyiso.com/documents/20142/23262467/05 CECONY_LTP.pdf/

[9] https://www.nyiso.com/documents/20142/26278859/CECONY’s 2021 LTP.pdf/

Figure 2: Summary of Con Edison Series Reactor Changes

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

Additionally, compared to the prior STAR, the planned return-to-service dates of the Plattsburg 230/115 kV (AT1) and Moses 230/115 kV (AT2) transformers has been delayed to December 2022. Figure 3 provides a summary of the changes of the planned return-to-service dates.

Figure 3: Changes to Planned Return-to-Service Dates

From	To	kV	ID	Prior STAR	2021 Q4 STAR
Plattsburg (1)	Plattsburg	230/115	AT1	Dec-21	Dec-22
Moses	Moses	230/115	AT2	Oct-22	Dec-22

Notes

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

Proposed Transmission

At the October 1, 2021 ESPWG/TPAS meeting, National Grid presented an LTP update to upgrade terminal equipment on the Clay-Volney (#6) 345 kV line and to install a 3% series reactor at the Woodard 115 kV substation on the Clay-Woodard (#17) 115 kV line. The upgrade on Clay-Volney increases the normal rating from 1109 MVA to 1200 MVA and the emergency rating from 1344 MVA to 1396 MVA and is planned to be in-service by June 1, 2022. The installation of the 3% series reactor at the Woodard 115 kV substation on the Clay-Woodard (#17) 115 kV line is planned to be in-service by December 31, 2023.

There are no other changes to proposed transmission assumptions beyond those included in prior STARs. Details of the proposed transmission assumptions included in prior STARs is 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 their customers, taking into account scheduled and reasonably expected unscheduled outages of system elements.

This assessment finds that reliability criteria would be met 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.

Transmission Security Assessments

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.

Steady State Assessment

In the NYISO's evaluation of the BPTF thermal overloads are observed on the National Grid Clay-Woodard (#17) (specifically the Clay-Euclid segment of the line) 115 kV transmission line. This observation is summarized in Figure 4. 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. 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 solution is placed in-service. As such there are no thermal criteria violations.

Figure 4: Summary of BPTF N-1-1 Thermal Overloads

Zone	Owner	Element	Normal Rating (MVA)	Contingency Rating (MVA)	1st Contingency	2nd Contingency	2022 Summer Peak Flow (%)	2023 Summer Peak Flow (%)	2025 Summer Peak Flow (%)	2026 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	-	-

As reported in the NYISO's evaluation of the BPTF in the Quarter 3 STAR, certain non-BPTF thermal violations were observed for informational purposes on the National Grid Mortimer-Pannell (#24 and #25) 115 kV transmission lines following the N-1-1 contingency combination of the loss of both Rochester-Pannell 345 kV lines (RP1 and RP2) for all study years through year 2025. These overloads are sensitive to the additional load queue projects included in this assessment. The thermal violations were not observed in year 2026 due to a National Grid LTP update included in the 2021 Gold Book to reconductor the existing Mortimer-Pannell (#24 and #25) 115 kV transmission lines.

In the NYISO's evaluation of the BPTF, certain non-BPTF thermal violations were observed for informational purposes on the NYSEG Delhi-Colliers-Fraser (#951) 115 kV (specifically on the Delhi-Delhi tap segment of the line) following several different N-1-1 contingency combinations in 2022 and 2023. The worst-case combination is the loss of Lafayette-Clarks Corners (#4-46) 345 kV followed by the loss of Oakdale-Fraser (#32) 345 kV. These overloads are sensitive to the additional load queue projects included in this assessment. The thermal violations were not observed after summer 2023 due to a NYSEG LTP update included in the 2021 Gold Book to remove the Delhi 115 kV substation and terminate the existing lines to the Fraser 115 kV substation.

Figure 5 summarizes the worst overload on each non-BPTF element along with the contingency combination resulting in the overload.

Figure 5: Summary of Non-BPTF N-1-1 Thermal Overloads

Zone	Owner	Element	Normal Rating (MVA)	Contingency Rating (MVA)	1st Contingency	2nd Contingency	2022 Summer Peak Flow (%)	2023 Summer Peak Flow (%)	2025 Summer Peak Flow (%)	2026 Summer Peak Flow (%)
B	National Grid	Mortimer-Pannell (#25) 115 kV (1)	114	142	Rochester-Pannell (RP2) 345	Rochester-Pannell (RP1) 345	126	137	146	-
B	National Grid	Mortimer-Pannell (#24) 115 kV (2)	129	160	Rochester-Pannell (RP1) 345	Rochester-Pannell (RP2) 345	123	133	129	-
C	NYSEG	Delhi-Colliers-Fraser (#951) 115 kV (Delhi-Delhi Tap)	164	164	Lafayette-Clarks Corners (4-46) 345 kV	Oakdale-Fraser (#32) 345 kV	110	116	-	-

Notes:

1. The Mortimer-Pannell (#25) 115 kV line ratings and percentage loadings reported in this table are for the Station 89-Pittsford line segment.

2. The Mortimer-Pannell (#24) 115 kV line ratings and percentage loadings reported in this table are for the Pittsford-Pannell line segment.

Dynamics Assessment

At the July 23, 2021 Electric System Planning Working Group ("ESPWG")/Transmission Planning Advisory Subcommittee ("TPAS"), Con Edison presented an LTP update to address transient voltage response issues in the Greenwood/Fox Hills 138 kV TLA that were first identified in the 2020 Quarter 3 STAR.[10] The transient voltage response issues were observed on Con Edison's non-BPTF system during 2025 through 2030, while the BPTF violations were observed starting in 2029. The post-RNA case update analysis showed that when the non-BPTF violations are addressed, the BPTF violations are no longer observed.[11]

The July 23, 2021 Con Edison LTP update included placing the Gowanus-Farragut 345 kV 41 and 42 series reactors in-service in summer 2025 and updating the dynamic database for the Con Edison service area with the latest available state-of-the-art dynamic load model. The status of the Gowanus-Farragut 345 kV 41 and 42 series reactors that are internal to Con Edison do not affect New York City import capability. Updating the dynamic load model showed improvements in non-BPTF transient voltage response. However, in the summer 2025 peak load case under the N-1-1 combinations with the loss of Ravenswood 3 as the first contingency, the analysis identifies several events that do not solve mathematically and therefore do not converge. This is also called "non-convergence." These non-convergence issues relate back to the Con Edison LTP update to place the Gowanus-Farragut 345 kV 41 and 42 series reactors in-service. With the Gowanus-Farragut 345 kV 41 and 42 series reactors remaining bypassed, all events converge and no BPTF dynamics issues are observed. Accordingly, Con Edison updated its LTP at the November 19, 2021 ESPWG/TPAS which no longer includes the plan to place in-service the Gowanus-Farragut 345 kV 41 and 42 series reactors in summer 2025.[12]

Transmission Owner Local Criteria Assessments

As described in the following sections, Con Edison and Central Hudson each 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.[13]

[10] https://www.nyiso.com/documents/20142/23262467/05 CECONY_LTP.pdf/

[11] https://www.nyiso.com/documents/20142/20255668/03%202020-2021RPP_PostRNABaseCaseUpdates_Dynamics.pdf

[12] https://www.nyiso.com/documents/20142/26278859/CECONY's 2021 LTP.pdf/

[13] *See* OATT §§ 38.1 (definition of Generator Deactivation Reliability Need) 38.2 (scope of Short-Term Reliability Process), 38.10.1.2 (other reliability

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 Local Transmission Plan to address the Westerlo transmission loop voltage issue.[14] 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.

Con Edison Assessment

Prior STARs identified that transient voltage response issues are observed on Con Edison's non-BPTF system in year 2025 in the Greenwood / Fox Hills 138 kV TLA as well as the East 13th Street 138 kV TLA.[15]

Figure 6 shows an example of transient voltage response for a bus in the Con Edison transmission district that satisfies the stated criteria as observed in assessments that have the peaker units in-service, as compared to the response observed with the peaker units out-of-service. For Con Edison, to pass the transient voltage response criteria, the post-fault value must settle to at least 0.9 p.u. voltage five seconds after the fault has cleared. When the transient voltage response fails the stated criteria (as shown in Figure 6), this is referred to as fault-induced delayed voltage recovery ("FIDVR"). FIDVR events are driven by end-use load behavior and load composition, primarily by induction motor loads. One of the causes of FIDVR is the stalling of induction motors due to low voltages. When an induction motor stalls, the motors draw excessive reactive power from the grid and require five to six times their typical steady-state running current in this locked-rotor condition,[16] which can eventually lead to a significant loss of generation and load.

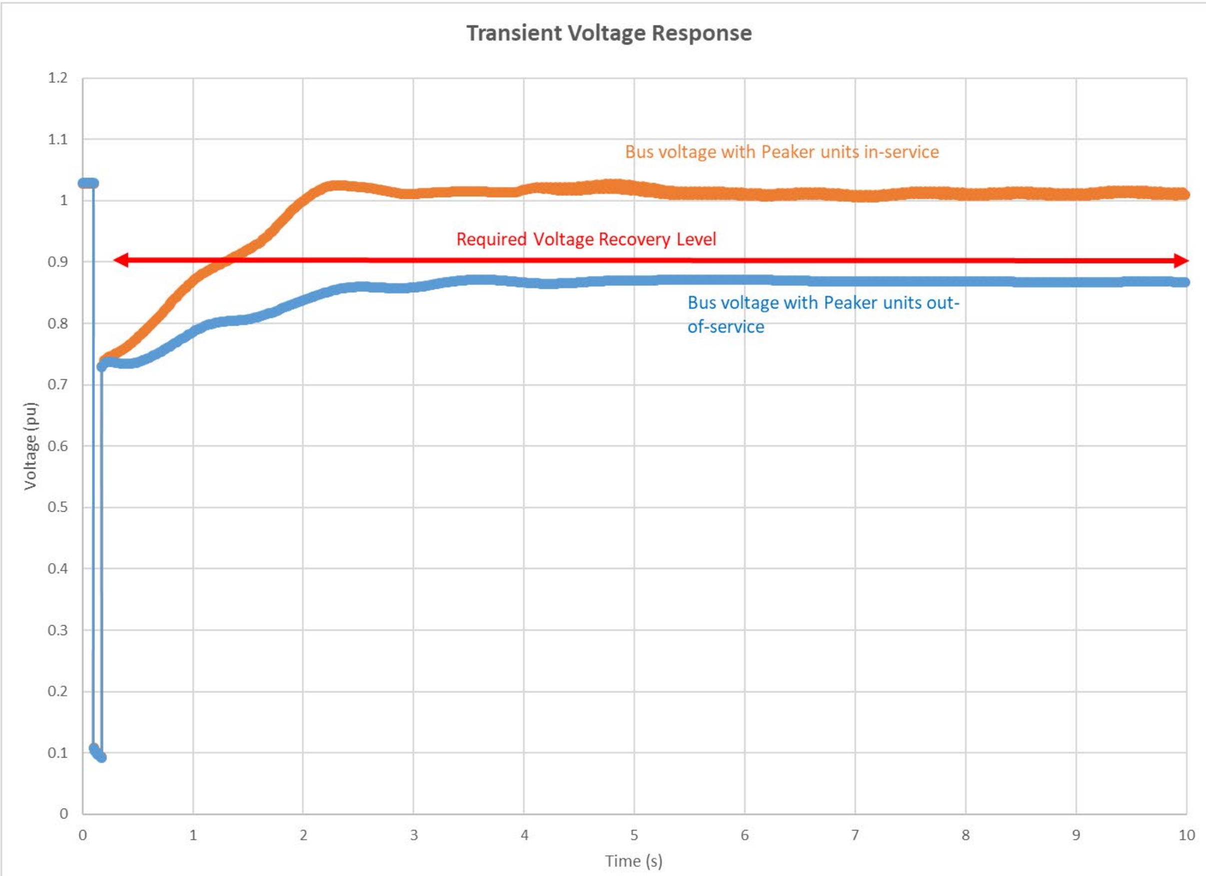
needs that arise on non-BPTFs may be reported in a STAR for informational purposes).

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

[15] At the March 26, 2021 ESPWG/TPAS (See https://www.nyiso.com/espwg) the NYISO presented to stakeholders the post-RNA Base Case updates showing that transient voltage response issues are observed on Con Edison's non-BPTF system from 2025 through 2030.

[16] https://www.nerc.com/docs/pc/tis/FIDVR_Tech_Ref%20V1-2_PC_Approved.pdf

Figure 6: New York City (NYC) Transient Voltage Response Example



At the July 23, 2021 ESPWG/TPAS, Con Edison updated the series reactor status on the Gowanus-Farragut 345 kV 41 and 42 series reactors as part of an LTP update to further address local reliability deficiencies as well as updating the dynamic database for the Con Edison service area with the latest available state-of-the-art dynamic load model. As discussed earlier in this report, placing in-service the Gowanus-Farragut 345 kV 41 and 42 series reactors in summer 2025 results in non-convergence issues for several N-1-1 combinations, with the loss of Ravenswood 3 as the first contingency. With Con Edison continuing to bypass the Gowanus-Farragut 345 kV 41 and 42 series reactors, all events converge and no non-BPTF dynamic issues are observed. Accordingly, Con Edison updated its LTP at the November 19, 2021 ESPWG/TPAS which no longer includes the plan to place in-service the Gowanus-Farragut 345 kV 41 and 42 series reactors in summer 2025.[17]

[17] https://www.nyiso.com/documents/20142/26278859/CECONY's 2021 LTP.pdf/

Reliability Metrics

With the plans and assumptions described above, the BPTF system as planned meets all currently applicable reliability criteria. The increased load (see Figure 11) due to large load queue projects has narrowed the available system margins reported in the 2021-2030 Comprehensive Reliability Plan ("CRP").[18] However, as reported starting in the 2021 Quarter 3 STAR the planned system through the study period continues to meet the applicable reliability criteria

Transmission Security

Statewide System Margin

The large load projects degrade the statewide system margins by 175 MW starting in summer 2022 and increasing to 750 MW in summer 2026. After summer 2026 the large load projects are forecasted to degrade the statewide system margins by 810 MW. As shown in Figure 7 under baseline load conditions, the statewide system margin (line item H) ranges between 2,128 MW in 2022 to 508 MW in 2031.

It is possible for other combinations of events to tip the system beyond its margin, such as further increases in load or a reduction in total resources, as discussed further in the Risk Factors section of the 2021-2030 CRP. For example, in consideration of the transmission security margin (line item H), the values show that it is possible to have zero transmission security margin starting in 2024 and for the system to tip into a reliability issue as early as 2025 with the largest loss of source contingency of 1,310 MW.

It is feasible for other combinations of events to tip the system over its margin. An additional evaluation shown in Figure 7 is the impact of the historical forced outage rate of NYCA thermal generation on the statewide system margin. Also, while special case resources ("SCRs") are not included for transmission security analysis under normal conditions, they are used for this forced outage rate evaluation. The adjusted statewide margin (line item K), including consideration of SCRs and historical thermal forced outage rates, tips into a reliability issue as early as 2025 with extremely narrow margins as early as summer 2023. The impact of the addition of large load projects under heatwave ("90/10") and extreme weather (1-in-100 year load forecast) conditions is shown in Appendix E.

[18] https://www.nyiso.com/documents/20142/2248481/2021-2030-Comprehensive-Reliability-Plan.pdf/

Figure 7: Statewide System Margin (Summer Baseline Peak Forecast - Normal)

Line	Item	Peak Load Forecast									
		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
A	NYCA Generation (1)	35,257	34,307	34,297	33,684	33,679	33,679	33,674	33,669	33,664	33,659
B	External Area Interchanges (2)	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844
C	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
D	**Total Resources (A+B+C) (3)**	37,101	36,151	36,141	35,528	35,523	35,523	35,518	35,513	35,508	35,503
E	Load Forecast	(32,353)	(32,380)	(32,211)	(32,140)	(32,076)	(32,088)	(32,094)	(32,158)	(32,263)	(32,375)
F	Operating Reserve Requirement	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)
G	**Total Capability Requirement (E+F)**	(34,973)	(35,000)	(34,831)	(34,760)	(34,696)	(34,708)	(34,714)	(34,778)	(34,883)	(34,995)
H	**Statewide System Margin (D+G)**	2,128	1,151	1,310	768	827	815	804	735	625	508
I	SCRs (4), (5)	822	822	822	822	822	822	822	822	822	822
J	Forced Outages (3)	(2,164)	(1,952)	(1,952)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)
K	**Adjusted Statewide System Margin (H+I+J) (4)**	786	21	180	(277)	(218)	(230)	(241)	(310)	(420)	(537)

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service.
2. Interchanges are based on ERAG MMWG values.
3. Includes de-rates for thermal resources.
4. Special Case Resources (SCRs) are not applied for transmission security analysis of normal operations.
5. Includes a de-rate of 373 MW for SCRs.

Lower Hudson Valley, New York City, and Long Island Transmission Security Margin

Due to the location of these large load projects there is no impact to the Lower Hudson Valley, New York City, or Long Island transmission security margins. Results from the 2021-2030 CRP on the transmission security margins for these locations are provided in Appendix E.

Resource Adequacy

While the NYCA LOLE is below the 0.1 event-days/year, the system margin has been decreasing, and the additional large loads forecasted in upstate New York (Zones A, C, and D) significantly contribute to the decrease in the system's resource adequacy margin.

For instance, the 2021-2030 Comprehensive Reliability Plan (CRP) indicated that the zonal resource adequacy margin (ZRAM) as measured in "perfect capacity[19]" in Zone A was around 950 MW away from violating NYCA LOLE criterion of 0.1 event-days/year under the study assumptions for study year 2026; lower margins were identified in the outer study years. This relative value did not take into consideration the addition of large loads listed in Figure 11. For instance, a 450 MW large load added in Zone A can have an impact of close to 1-to-1 on decreasing the margin in Zone A, bringing its margin to around 500 MW. Other potential modeling and assumption changes under consideration can further decrease this relative margin to as low as 250 MW in Zone A. Similar impacts could be observed in other zones if the zonal load increases or the zonal resources decrease The 2022 RNA will provide updated results.

Conclusions and Next Steps

This assessment finds the planned BPTF system through the study period meets applicable reliability criteria.

This concludes the 2021 Quarter 4 Short-Term Reliability Process.

[19] "Perfect capacity" is capacity that is not derated (*e.g.,* due to ambient temperature or unit unavailability), not subject to energy durations limitations (*i.e.*, available at maximum capacity every hour of the study year), and not tested for transmission security or interface impacts.

Appendix A: List of Short-Term Reliability Needs

No short-term reliability needs are observed in 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 2020 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 October 25, 2021 Electric System Planning Working Group ("ESPWG")/Transmission Planning Advisory Subcommittee ("TPAS"). The meeting materials are posted on the NYISO's public website.[20] The figures below summarize the changes to generation, load, and transmission.

Generation Assumptions

Figure 8: Generator Deactivations

Owner/ Operator	Plant Name	Zone	CRIS (MW)		Capability (MW)			Deactivation date
			Summer	Winter	Summer	Winter	Status	
International Paper Company	Ticonderoga (1)	F	7.6		9.5	9.8	I	05/01/2017
Helix Ravenswood, LLC	Ravenswood 09	J	21.7	27.6	16.3	22.8	R	11/01/2017
Binghamton BOP, LLC	Binghamton	C	43.8	57.2	43.7	47.1	I	01/09/2018
Helix Ravenswood, LLC	Ravenswood 2-1	J	40.4	51.4	31.4	41.7	I	04/01/2018
	Ravenswood 2-2	J	37.6	47.8	29.9	41.9	I	04/01/2018
	Ravenswood 2-3	J	39.2	49.9	28.9	37.3	I	04/01/2018
	Ravenswood 2-4	J	39.8	50.6	30.7	41.6	I	04/01/2018
	Ravenswood 3-1	J	40.5	51.5	31.9	40.8	I	04/01/2018
	Ravenswood 3-2	J	38.1	48.5	29.4	40.3	I	04/01/2018
	Ravenswood 3-4	J	35.8	45.5	31.2	40.8	I	04/01/2018
Lyonsdale Biomass, LLC	Lyonsdale	E	20.2	20.2	19.3	19.7	R	07/18/2019
Exelon Generation Company LLC	Monroe Livingston	B	2.4	2.4	2.4	2.4	R	09/01/2019
Innovative Energy Systems, Inc.	Steuben County LF	C	3.2	3.2	3.2	3.2	R	09/01/2019
Consolidated Edison Co. of NY, Inc	Hudson Ave 4	J	13.9	18.2	14.0	16.3	R	09/10/2019
New York State Elec. & Gas Corp.	Auburn - State St	C	5.8	6.2	4.1	7.3	R	10/01/2019
Somerset Operating Company, LLC	Somerset	A	686.5	686.5	676.4	684.4	R	02/15/2020
Entergy Nuclear Power Marketing, LLC	Indian Point 2	H	1,026.5	1,026.5	1,011.5	1,029.4	R	04/30/2020
Cayuga Operating Company, LLC	Cayuga 1	C	154.1	154.1	151.0	152.0	R	05/15/2020
Cayuga Operating Company, LLC	Cayuga 2	C	154.7	154.7	139.6	158.0	R	05/15/2020
Albany Energy, LLC	Albany LFGE (3)	F	4.5	4.5	5.6	5.6	I	07/01/2020
National Grid	West Babylon 4	K	49.0	64.0	50.2	65.4	R	12/11/2020 (2)
Eastern Generation, LLC	Gowanus 1-8 (4)	J	16.1	21.0	15.3	21.7	I	02/01/2021
National Grid	Glenwood GT 01 (3)	K	14.6	19.1	11.4	14.5	R	2/28/2021 (2)
Entergy Nuclear Power Marketing, LLC	Indian Point 3	H	1040.4	1040.4	1036.3	1038.3	R	04/30/2021
		Total	3,536.4	3,651.0	3,423.2	3,582.3		

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 facility is included in the 2020 Quarter 3 STAR
(4) The Generator Deactivation Assessment for this facility is included in the 2021 Quarter 1 STAR

[20] Short-Term Assessment of Reliability: 2021 Q4 Key Study Assumptions

Figure 9: Generator Return-to-Service

Generator Name	Zone	MW (Nameplate)	Returned to Service	STAR Assessment	Notes
Hudson Ave 3	J	16.3	10-Jul-20	2020 Q4	1

Notes

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

Figure 10: Generator Additions

Queue	Proposed Generator Project	Zone	STAR COD	Requested CRIS (MW)	Summer (MW)	STAR Assessment
387	Cassadaga Wind	A	In-Service	126.0	126.5	2020 Q3
396	Baron Winds	C	Jul-23	300.0	238.4	2020 Q3
422	Eight Point Wind Enery Center	B	Sep-22	101.2	101.8	2020 Q3
505	Ball Hill Wind	A	Dec-22	100.0	100.0	2020 Q3
430	Cedar Rapids Transmission Upgrade	D	Oct-21	80.0	N/A	2020 Q3
546	Roaring Brook Wind	E	Dec-21	79.7	78.0	2020 Q3
678	Calverton Solar Energy Center	K	Dec-20	22.9	22.9	2020 Q3
758	Sithe Independence	C	In-Service	56.6	10.9 (2)	2020 Q4 (1)
N/A	Ontario Landfill	B	In-Service	N/A	3.6	2021 Q3
N/A	Fulton County Landfill	F	In-Service	N/A	3.2	2021 Q3
N/A	Dahowa Hydroelectric	F	In-Service	N/A	10.5	2021 Q3
N/A	Fenner Wind	C	06/2021	N/A	30.0	2021 Q3
N/A	Bowline 1	G	06/2021	N/A	16.3	2021 Q3
N/A	Bowline 2	G	06/2021	N/A	7.6	2021 Q3
0564	Rock District Solar	F	04/2021	N/A	20.0	2021 Q3
0768	Janis Solar	C	07/2021	N/A	20.0	2021 Q3
0513	Orangeville Battery	C	08/2021	N/A	20.0	2021 Q3
0775	Puckett Solar	E	08/2021	N/A	20.0	2021 Q3
0565	Tayandenega Solar	F	09/2021	N/A	20.0	2021 Q3
0589	North Country Solar	E	11/2021	N/A	15.0	2021 Q3
0570	Albany County 1	F	11/2021	N/A	20.0	2021 Q3
0598	Albany County 2	F	11/2021	N/A	20.0	2021 Q3
0731	Branscomb Solar	F	11/2021	N/A	20.0	2021 Q3
0730	Darby Solar	F	11/2021	N/A	20.0	2021 Q3
0735	ELP Stillwater Solar	F	11/2021	N/A	20.0	2021 Q3
0638	Pattersonville	F	11/2021	N/A	20.0	2021 Q3
0572	Greene County 1	G	11/2021	N/A	20.0	2021 Q3
0573	Greene County 2	G	11/2021	N/A	10.0	2021 Q3
0682	Grissom Solar	F	12/2021	N/A	20.0	2021 Q3
0748	Regan Solar	F	12/2021	N/A	20.0	2021 Q3
0670	Skyline Solar	E	04/2022	N/A	20.0	2021 Q3
0584	Dog Corners Solar	C	05/2022	N/A	20.0	2021 Q3
0545	Sky High Solar	C	08/2022	N/A	20.0	2021 Q3
0531	Number 3 Wind Energy	E	09/2022	N/A	103.9	2021 Q3
0667	Bakerstand Solar	A	10/2022	N/A	20.0	2021 Q3
0666	Martin Solar	A	10/2022	N/A	20.0	2021 Q3
0592	Niagara Solar	B	12/2022	N/A	20.0	2021 Q3
0590	Scipio Solar	C	12/2022	N/A	18.0	2021 Q3
0586	Watkins Road Solar	E	06/2023	N/A	20.0	2021 Q3

Notes

(1) CRIS increase for this unit was included in the 2021 Q4 STAR. The Summer MW increase was included in the 2021 Q3 STAR.

(2) MW increase has an in-service date of March 2022.

Load Assumptions

The 2021 Quarter 3 STAR the NYISO used the base load forecasts for the study years consistent with the 2021 Gold Book with the addition of 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).[21] Figure 11 provides a summary of the load and energy forecasts for these additional loads used in this assessment.

Figure 11: Load and Energy Forecast of Additional Queue Projects

Year	Annual Energy GWh Delta				Summer Peak MW Delta				Winter Peak MW Delta			
	A	C	D	Total	A	C	D	Total	A	C	D	Total
2021	0	0	0	0	0	0	0	0	50	0	0	50
2022	860	160	620	1,640	90	10	75	175	180	40	125	345
2023	2,130	570	1,120	3,820	265	70	135	470	295	80	145	520
2024	2,490	740	1,280	4,510	325	90	155	570	355	100	165	620
2025	2,840	900	1,450	5,190	385	110	175	670	415	110	185	710
2026	3,210	900	1,620	5,730	445	110	195	750	465	110	205	780

Transmission Assumptions

Figure 12: Existing Transmission Facilities Modeled Out-of-Service

From	To	kV	ID	Out-of-Service Through	STAR
Marion	Farragut	345	B3402	Long-Term	2020 Q3
Marion	Farragut	345	C3403	Long-Term	2020 Q3
Moses	St. Lawrence	230	L33P	Oct-22	2020 Q3
Plattsburg (1)	Plattsburg	230/115	AT1	Dec-22	2021 Q4 (3)
Moses	Moses	230/115	AT2	Dec-22	2021 Q4 (4)
Newbridge	Newbridge	345/138	BK1	Feb-22	2021 Q1

Notes
(1) A spare transformer is placed in-service during the outage
(2) Prior STARs assumed this element out-of-service through December 2021
(3) Prior STARs assumed this element out-of-service through October 2022

Figure 13 shows the Con Edison series reactor status utilized in the 2020 RNA and STARs (2020 Quarters 3 and 4).

[21] As an SIS had not been completed for Q0979 by the start of this STAR it was only evaluated from a resource adequacy perspective.

Figure 13: 2020 Reliability Planning Studies Series Reactor Status

Terminals		ID	kV	Series Reactor Status in 2020 Quarter 3 STAR
Dunwoodie	Mott Haven	71	345	Series Reactor By-Passed
Dunwoodie	Mott Haven	72	345	Series Reactor By-Passed
Sprainbrook	W. 49th Street	M51	345	Series Reactor By-Passed
Sprainbrook	W. 49th Street	M52	345	Series Reactor By-Passed
Farragut	Gowanus	41	345	Series Reactor In-Service
Farragut	Gowanus	42	345	Series Reactor In-Service
Sprainbrook	East Garden City	Y49	345	Series Reactor In-Service

On December 3, 2020, the NYISO issued a solution solicitation requesting the submission of proposed STRP Solutions to address 2023 near-term reliability needs. In consideration of all proposed solutions, the NYISO selected the Con Edison proposal regarding the status of several series reactors within their service territory. The Con Edison proposed planned series reactor status is shown in Figure 14. The planned status changes are for the summer period and would become effective starting in summer 2023.

Figure 14: Con Edison Proposed Series Reactor Status From 2020 Q3 Needs Solicitation

Terminals		ID	kV	Proposed Series Reactor Status
Dunwoodie	Mott Haven	71	345	Series Reactor In-Service
Dunwoodie	Mott Haven	72	345	Series Reactor In-Service
Sprainbrook	W. 49th Street	M51	345	Series Reactor In-Service
Sprainbrook	W. 49th Street	M52	345	Series Reactor In-Service
Farragut	Gowanus	41	345	Series Reactor By-Passed
Farragut	Gowanus	42	345	Series Reactor By-Passed
Sprainbrook	East Garden City	Y49	345	Series Reactor By-Passed

At the July 23, 2021 ESPWG/TPAS Con Edison updated the operational status of the 41 and 42 series reactors as part of an LTP update to further address local reliability deficiencies. However, based on the findings from the 2021 Quarter 3 STAR, Con Edison updated its LTP at the November 19, 2021 ESPWG/TPAS which no longer includes the plan to place in-service the Gowanus-Farragut 345 kV 41 and 42 series reactors in summer 2025. Figure 15 provides a summary of the status of the Con Edision series reactors in consideration of all proposed changes.

Figure 15: 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 16: Firm Transmission Plans (from the 2021 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 (2) Year		Nominal Voltage in kV Operating/Design		# Of ckts	Thermal Ratings (4) Summer/Winter		Project Description / Conductor Size	Class Year / Type of Construction
TIP Projects (19) (included in FERC 715 Base Case)													
[430]	H.Q. Energy Services U.S. Inc.	Dennison	Alcoa	3	W	2020	115	115	1	1513	1851	954 ACSR	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	NGRID	Porter	Rotterdam	-71.8	S	2022	230	230	1	1105	1284	AC Transmission Project Segment A/1-795 ACSR/1-1431 ACSR	
556	NGRID	Porter	Rotterdam	-72.0	S	2022	230	230	1	1105	1284	AC Transmission Project Segment A/1-795 ACSR/1-1431 ACSR	
556	NGRID	Edic	New Scotland	-83.5	S	2022	345	345	1	2228	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)	69.0	S	2022	345	345	1	2228	2718	AC Transmission Project Segment A/2-795 ACSR/2-954 ACSS	
556	LSP/NGRID	Gordon Rd (New Station)	New Scotland	25.0	S	2022	345	345	1	2228	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	-25.0	S	2023	345	345	1	2228	2718	AC Transmission Project Segment A/2-795 ACSR/2-954 ACSS	
556	LSP	Gordon Rd (New Station)	Princetown (New Station)	5.2	S	2023	345	345	1	3410	3709	AC Transmission Project Segment A/2-954 ACSS	
556	LSP	Princetown (New Station)	New Scotland	20.2	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	2228	2718	AC Transmission Project Segment A/2-795 ACSR	
556	LSP/NYPA/NGRID	Edic	Princetown (New Station)	66.9	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	

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to (2) Year		Nominal Voltage in kV Operating/Design		# Of ckts	Thermal Ratings (4) Summer/Winter		Project Description / Conductor Size	Class Year / Type of Construction
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	
543	New York Transco	Schodack	Churchtown	26.7	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	54.2	W	2023	345	345	1	3862	4103	AC Transmission Project Segment B	
543	New York Transco	Knickerbocker (New Station)	Knickerbocker (New Station)	series capacitor	W	2023	345	345	1	3862	4103	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	

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to (2) Year		Nominal Voltage in kV Operating/Design		# Of ckts	Thermal Ratings (4) Summer/Winter		Project Description / Conductor Size	Class Year / Type of Construction
543	NGRID	Knickerbocker (New Station)	Alps	18.1	W	2023	345	345	1	2552	3134	AC Transmission Project Segment B	
543	New York Trannsco	Rock Tavern	Sugarloaf	12.0	W	2023	115	115	1	328	402	AC Transmission Project Segment B; 1-1590 ACSR	OH
543	New York Transco	Sugarloaf	Sugarloaf	Transformer	W	2023	138/115	138/115	---	329	329	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/Con Ed	Van Wagner (New Station)	Pleasant Valley	0.75	W	2023	345	345	1	3126	3704	Loop Line into new Van Wagner Substation/Reconductor w/2-795 ACSS	OH
543	New York Transco/Con Ed	Van Wagner (New Station)	Pleasant Valley	0.75	W	2023	345	345	1	3126	3704	Loop Line into new Van Wagner Substation/Reconductor w/2-795 ACSS	OH
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
	-												
Firm Plans (5) (included in FERC 715 Base Case)													

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3	CHGE	North Chelsea	North Chelsea	xfmr	In-Service	2020	115/69	115/69	1	564	728	Replace Transformer 1	-
3	CHGE	Fishkill Plains	East Fishkill	2.05	In-Service	2020	115	115	1	1172	1434	1-1033 ACSR	OH
3	CHGE	North Catskill	North Catskill	xfmr	In-Service	2020	115/69	115/69	2	560	726	Replace Transformer 4	-
	CHGE	North Catskill	North Catskill	xfmr	S	2021	115/69	115/69	1	560	726	Replace Transformer 5	-
14	CHGE	Hurley Avenue	Leeds	Static synchronous series compensator	S	2022	345	345	1	2336	2866	21% Compensation	-
	CHGE	Rock Tavern	Sugarloaf	12.10	W	2022	115	115	1	N/A	N/A	Retire SL Line	OH
	CHGE	Sugarloaf	NY/NJ State Line	10.30	W	2022	115	115	2	N/A	N/A	Retire SD/SJ Lines	OH
11	CHGE	St. Pool	High Falls	5.61	W	2023	115	115	1	1010	1245	1-795 ACSR	OH
11	CHGE	High Falls	Kerhonkson	10.03	W	2023	115	115	1	1010	1245	1-795 ACSR	OH
11	CHGE	Modena	Galeville	4.62	W	2023	115	115	1	1010	1245	1-795 ACSR	OH
11	CHGE	Galeville	Kerhonkson	8.96	W	2023	115	115	1	1010	1245	1-795 ACSR	OH
	CHGE	Hurley Ave	Saugerties	11.40	W	2023	69	115	1	1114	1359	1-795 ACSR	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	Saugerties	North Catskill	12.46	W	2024	69	115	1	1114	1359	1-795 ACSR	OH
	CHGE	Knapps Corners	Spackenkill	2.36	W	2025	115	115	1	1280	1563	1-1033 ACSR	
	ConEd	Buchanan North	Buchanan North	Reconfiguration	S	2022	345	345		N/A	N/A	Reconfiguration (bus work related to decommissioning of Indian Point 2)	-
	ConEd	Rainey	Rainey	xfmr	S	2022	345	345		N/A	N/A	Replacing xfmr 3W	-
	ConEd	Hudson Ave East	New Vinegar Hill Distribution Switching Station	xfmrs/PARs/Feeders	S	2022	138/27	138/27		N/A	N/A	New Vinegar Hill Distribution Switching Station	UG
	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

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	ConEd	Goethals	Fox Hills	xfmr/PAR/Feeder	S	2025	345/138	345/138		N/A	N/A	New PAR regulated feeder	UG
3	LIPA	Deer Park	Deer Park	-	In-Service	2019	69	69	1	N/A	N/A	Install 27 MVAR Cap Bank	
3	LIPA	MacArthur	MacArthur	-	In-Service	2019	69	69	1	N/A	N/A	Install 27 MVAR Cap Bank	
6/7/3	LIPA	Meadowbrook	East Garden City	-3.11	In-Service	2020	69	69	1	458	601	4/0 CU	OH+UG
6/7/3	LIPA	East Garden City	Lindbergh	2.11	In-Service	2020	69	69	1	575	601	750 kcmil CU	OH+UG
6/7/3	LIPA	Lindbergh	Meadowbrook	2.50	In-Service	2020	69	69	1	458	601	4/0 CU	OH+UG
6/7/3	LIPA	Elmont	Floral Park	-1.59	In-Service	2020	34.5	34.5	1	644	816	477 AL	OH+UG
6/7/3	LIPA	Elmont	Belmont	1.82	In-Service	2020	34.5	34.5	1	342	457	2/0 CU	OH+UG
6/7/3	LIPA	Belmont	Floral Park	2.04	In-Service	2020	34.5	34.5	1	644	816	477 AL	OH+UG
3	LIPA	Valley Stream	East Garden City	7.36	In-Service	2020	138	138	1	1128	1195	New line / 2000 SQMM XLPE	UG
6/7	LIPA	Amagansett	Montauk	-13.00	S	2021	23	23	1	577	657	750 kcmil CU	UG
6/7	LIPA	Amagansett	Navy Road	12.74	S	2021	23	23	1	577	657	750 kcmil CU	UG
6/7	LIPA	Navy Road	Montauk	0.26	S	2021	23	23	1	577	657	750 kcmil CU	UG
9	LIPA	Riverhead	Wildwood	10.63	S	2021	138	138	1	1399	1709	1192ACSR	
13	LIPA	Riverhead	Canal	16.49	S	2021	138	138	1	1000	1110	2368 KCMIL (1200 mm^2) Copper XLPE	
	LIPA	Barrett	Barrett	-	S	2021	34.5	34.5	1	N/A	N/A	Barrett 34.5kV Bus Tie Reconfiguration	-
3	NGRID	Rosa Rd	Rosa Rd	-	In-Service	2020	115	115		N/A	N/A	Install 35.2MVAR Cap Bank at Rosa Rd	-
6/3	NGRID	Rotterdam	Curry Rd	7	In-Service	2020	115	115	1	1105	1347	Replace 7.0 miles of mainly 4/0 Cu conductor with 795kcmil ACSR 26/7	OH
3	NGRID	Elm St	Elm St	xfmr	In-Service	2020	230/23	230/23	1	118MVA	133MVA	Add a fourth 230/23kV transformer	
3	NGRID	West Ashville	West Ashville		In-Service	2020	115	115		N/A	N/A	New Distribution Station at West Ashville	
7/3	NGRID	Spier	Rotterdam (#2)	-32.74	In-Service	2020	115	115	1	1168	1416	New Lasher Rd Switching Station	OH
7/3	NGRID	Spier	Lasher Rd (New Station) (#2)	21.69	In-Service	2020	115	115	1	1168	1416	New Lasher Rd Switching Station	OH

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7/3	NGRID	Lasher Rd (New Station)	Rotterdam	11.05	In-Service	2020	115	115	1	2080	2392	New Lasher Rd Switching Station	OH
7/3	NGRID	Spier	Luther Forest (#302)	-34.21	In-Service	2020	115	115	1	916	1070	New Lasher Rd Switching Station	OH
7/3	NGRID	Spier	Lasher Rd (New Station) (#302)	21.72	In-Service	2020	115	115	1	916	1118	New Lasher Rd Switching Station	OH
3	NGRID	Lasher Rd (New Station)	Luther Forest	12.49	In-Service	2020	115	115	1	990	1070	New Lasher Rd Switching Station	OH
3	NGRID	Rotterdam	Rotterdam	-	In-Service	2020	115	115	2	N/A	N/A	Install Series Reactors at Rotterdam Station on lines 17 & 19	
3	NGRID	Huntley	Lockport	6.9	In-Service	2020	115	115	2	1303	1380	Replace 6.9 miles of 36 and 37 lines	OH
3	NGRID	Two Mile Creek	Two Mile Creek		In-Service	2020	115	115		N/A	N/A	New Distribution Station at Two Mile Creek	
6/3	NGRID	GE	Geres Lock	7.14	In-Service	2020	115	115	1	785	955	Reconductoring 4/0CU & 336 ACSR to 477 ACCR (Line #8)	
3	NGRID	Gardenville 230kV	Gardenville 115kV	xfmr	In-Service	2020	230/115	230/115	-	347 MVA	422 MVA	Replacement of 230/115kV TB#4 stepdown with larger unit	
3	NGRID	Gardenville 115kV	Gardenville 115kV	-	In-Service	2020	-	-	-	-	-	Rebuild of Gardenville 115kV Station to full breaker and a half	
	NGRID	Oswego	Oswego	-	W	2020	115	115		N/A	N/A	Rebuild of Oswego 115kV Station	
6	NGRID	Clay	Dewitt	10.24	S	2021	115	115	1	220MVA	268MVA	Reconductor 4/0 CU to 795ACSR	OH
6	NGRID	Clay	Teall	12.75	S	2021	115	115	1	220 MVA	268MVA	Reconductor 4/0 CU to 795ACSR	OH
	NGRID	Gardenville 230kV	Gardenville 115kV	xfmr	S	2021	230/115	230/115	-	347 MVA	422 MVA	Replacement of 230/115kV TB#3 stepdown with larger unit	
	NGRID	Huntley 115kV	Huntley 115kV	-	S	2021	115	115	-	N/A	N/A	Rebuild of Huntley 115kV Station	
	NGRID	Mortimer	Mortimer	xfmr	S	2021	115	115		50MVA	50MVA	Replace Mortimer 115/69kV Transformer	
	NGRID	Mortimer	Mortimer	-	S	2021	115	115		N/A	N/A	Second 115kV Bus Tie Breaker at Mortimer Station	
	NGRID	Royal Ave	Royal Ave	-	S	2021	115/13.2	115/13.2	-	-	-	Install new 115-13.2 kV distribution substation	-

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												in Niagara Falls (Royal Ave)	
	NGRID	Niagara	Packard	3.4	W	2021	115	115	1	344MVA	449MVA	Replace 3.4 miles of 192 line	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	Lockport	Mortimer	56.5	S	2022	115	115	3	-	-	Replace Cables Lockport-Mortimer #111, 113, 114	
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	Cortland	Clarks Corners	0.2	S	2023	115	115	1	147MVA	170MVA	Replace 0.2 miles of 1(716) line and series equipment	OH
	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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	NGRID	Wolf Rd	Menands	1.34	W	2023	115	115	1	182 MVA	222 MVA	Reconductor 1.34 miles betw Wolf Rd- Everett tap (per EHI)	OH
	NGRID	Packard	Huntley	9.1	W	2023	115	115	1	262MVA	275MVA	Walck-Huntley #133, Packard-Huntley #130 Reconductor	OH
	NGRID	Walck	Huntley	9.1	W	2023	115	115	1	262MVA	275MVA	Walck-Huntley #133, Packard-Huntley #130 Reconductor	OH
	NGRID	Kensington Terminal	Kensington Terminal	-	W	2023	115/23	115/23	-	50MVA	50MVA	Replace TR4 and TR5	
	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	Station 56	Pannell		W	2023	115	115	1	649	788	Mortimer-Pannell #24 Loop in-and-out of NYSEG's Station 56	
	NGRID	Dunkirk	Laona	-	S	2024	115	115	2	N/A	N/A	Remove series reactors from New Road Switch Station and install new to Moons Switch Station	
	NGRID	Laona	Moons	-	S	2024	115	115	2	N/A	N/A	Remove series reactors from New Road Switch Station and install new to Moons Switch Station	
	NGRID	Golah	Golah	Reconfiguration	S	2024	115	115		-	-	Add a Golah 115kV bus tie breaker	
	NGRID	Dunkirk	Dunkirk	-	S	2024	115	115		N/A	N/A	Rebuild of Dunkirk 115kV Station	
6	NGRID	Gardenville	Dunkirk	20.5	S	2024	115	115	2	1105	1346	Replace 20.5 miles of 141 and 142 lines	OH
	NGRID	Homer Hill	Homer Hill	-	S	2024	115	115	-	116MVA	141MVA	Homer Hill Replace five OCB	
	NGRID	Golah	Golah		S	2024				N/A	N/A	Golah substation rebuild	
	NGRID	Pannell	Geneva		W	2024	115	115	2	755	940	Critical Road crossings replace on Pannell-Geneva 4/4A	
	NGRID	Oswego	Oswego	-	S	2025	345	345		N/A	N/A	Rebuild of Oswego 345kV Station	
	NGRID	Mortimer	Golah	9.7	S	2025	115	115	1	657	797	Refurbish 9.7 miles Single Circuit Wood H-Frames on Mortimer-Golah 110	

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	NGRID	Huntley	Lockport	1.2	S	2025	115	115	2	747	934	Rebuild 1.2 miles of (2) single circuit taps on Huntley-Lockport 36/37 at Ayer Rd	
	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	Mortimer	Pannell	15.7	S	2026	115	115	2	221MVA	270MVA	Reconductor existing Mortimer – Pannell 24 and 25 lines with 795 ACSR	
	NGRID	Lockport	Batavia	20	S	2026	115	115	1	646	784	Rebuild 20 miles of Lockport-Batavia 112	
	NGRID	Mountain	Lockport		S	2026	115	115	2	847	1000	Reinsulating Mountain-Lockport 103/104	
	NGRID	SE Batavia	Golah	27.8	S	2026	115	115	1	648	846	Refurbish 27.8 miles Single Circuit Wood H-Frames on SE Batavia-Golah 119	
	NGRID	Packard	Packard		S	2026	115	115				Packard replace three OCB's	
	NGRID	Brockport	Brockport	3.5	W	2026	115	115	2	648	650	Refurbish 111/113 3.5 mile single circuit taps to Brockport Station	
	NGRID	Gardenville	Homer Hill	37.5	S	2027	115	115	2	649	788	Refurbish 37.5 miles double circuit Gardenville-Homer Hill 151/152	
	NGRID	Huntley	Gardenville	23.4	W	2027	115	115	2	731	887	Refurbish 23.4 miles double circuit on Huntley-Gardenville 38/39	
	NGRID	Lockport	Lockport		W	2027				N/A	N/A	Rebuild of Lockport Substation and control house	
781/3	NYPA	Fraser Annex	Fraser Annex	SSR Detection	In-Service	2020	345	345	1	1793 MVA	1793 MVA	MSSC SSR Detection Project	

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3	NYPA	Niagara 230 kV	Niagara 230 kV	Breaker	In-Service	2020	230	230	1	N/A	N/A	Add a new breaker	
3	NYPA	Niagara 230 kV	Niagara 115 kV	Autotransformer	In-Service	2020	230	115	1	240 MVA	240 MVA	Replace Niagara AT #1	
3	NYPA	Astoria 138 kV	Astoria 13.8 kV	Astoria CC GSU Refurbishment	In-Service	2020	138	18	1	234	234	Astoria CC GSU Refurbishment	
3	NYPA	Niagara	Rochester	-70.20	In-Service	2020	345	345	1	2177	2662	2-795 ACSR	
339/7/3	NYPA	Somerset	Rochester	-44.00	In-Service	2020	345	345	1	2177	2662	2-795 ACSR	
339/7/3	NYPA	Niagara	Station 255 (New Station)	66.40	In-Service	2020	345	345	1	2177	2662	2-795 ACSR	
339/7/3	NYPA	Somerset	Station 255 (New Station)	40.20	In-Service	2020	345	345	1	2177	2662	2-795 ACSR	
339/7/3	NYPA	Station 255 (New Station)	Rochester	3.80	In-Service	2020	345	345	2	2177	2662	2-795 ACSR	
	NYPA	East Garden City	East Garden City	Shunt Reactor	S	2021	345	345	1	N/A	N/A	Swap with the spare unit	
566/6	NYPA	Moses	Adirondack	78	S	2023	230	345	2	1088	1329	Replace 78 miles of both Moses-Adirondack 1&2	
3	NYSEG	Watercure Road	Watercure Road	xfmr	In-Service	2020	345/230	345/230	1	426 MVA	494 MVA	Transformer #2 and Station Reconfiguration	-
	NYSEG	Willet	Willet	xfmr	S	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	-
	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	Meyer	Meyer	xfmr	W	2026	115/34.5	115/34.5	2	59.2MVA	66.9MVA	Transformer #2	-
3	O & R	West Nyack	West Nyack	Cap Bank	In-Service	2020	138	138	1	-	-	Capacitor Bank	

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3	O & R	Harings Corner (RECO)	Closter (RECO)	3.20	In-Service	2020	69	69	1	1098	1312	UG Cable	
3	O & R	Ramapo	Ramapo	xfmr	In-Service	2020	345/138	345/138	1	731	731	New transformer replacement Bank 1300	
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	2023	345	345	1	3000	3211	2-2493 ACAR	
	O & R	Lovett 345 kV Station (New Station)	Lovett	xfmr	S	2023	345/138	345/138	1	562 MVA	562 MVA	Transformer	
3	RGE	Station 23	Station 23	xfmr	In-Service	2019	115/34.5	115/34.5	2	75 MVA	84 MVA	Transformer	-
3	RGE	Station 122-Pannell-PC1	Station 122-Pannell-PC1 and PC2		In-Service	2020	345	345	1	1314 MVA-LTE	1314 MVA-LTE	Relay Replacement	
3	RGE	Station 255 (New Station)	Rochester	3.80	In-Service	2020	345	345	1	2177	2662	2-795 ACSR	OH
3	RGE	Station 255 (New Station)	Station 255 (New Station)	xfmr	In-Service	2020	345/115	345/115	1	400 MVA	450 MVA	Transformer	-
3	RGE	Station 255 (New Station)	Station 255 (New Station)	xfmr	In-Service	2020	345/115	345/115	2	400 MVA	450 MVA	Transformer	-
3	RGE	Station 255 (New Station)	Station 418	10.49	In-Service	2020	115	115	1	300 MVA	300 MVA	New 115kV Line	OH
3	RGE	Station 255 (New Station)	Station 23	11.96	In-Service	2020	115	115	1	300 MVA	300 MVA	New 115kV Line	OH+UG
	RGE	Station 262	Station 23	1.46	S	2021	115	115	1	2008	2008	Underground Cable	
	RGE	Station 33	Station 262	2.97	S	2021	115	115	1	2008	2008	Underground Cable	
	RGE	Station 262	Station 262	xfmr	S	2021	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

[Project Queue Position] / Project Notes	Transmission Owner	Terminals		Line Length in Miles (1)	Expected In-Service Date/Yr Prior to (2) Year		Nominal Voltage in kV Operating/Design		# Of ckts	Thermal Ratings (4) Summer/Winter		Project Description / Conductor Size	Class Year / Type of Construction
	RGE	Station 33	Station 251 (Upgrade Line #942)		S	2026	115	115	1	400MVA	400MVA	Line Upgrade	
	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	

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, Queue #458 or 631 includes, as an elective System Upgrade Facility, an Astoria-Rainey 345kV cable. Modifying Q631 from a three-terminal HVdc project to a two-terminal HVdc project has determined to be non-material; however, Q458 and Q631 may not enter the same Class Year Study. Q887 CH Uprate is a 250 MW uprate of Q458 or Q631 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 17: Updates to Local Transmission Plans Not Included in 2021 Load and Capacity Data Report

From Bus	To Bus	ID	Voltage (kV)	Project Description	Planned In-Service Date
Clay	Volney	6	345	Upgrade terminal equipment	6/1/2022
Clay	Woodard	17	115	3% series reactor	12/31/2023

Appendix D: Resource Adequacy Assumptions

2021 Q4 STAR MARS Assumptions Matrix

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
Load Parameters				
1	**Peak** Load Forecast	Adjusted 2020 Gold Book NYCA baseline peak load forecast. The GB 2020 baseline peak load forecast includes the impact (reduction) of behind-the-meter (BtM) solar at the time of NYCA peak. For the Resource Adequacy load model, the deducted BtM solar MW was added back to the NYCA zonal loads, which then allows for a discrete modeling of the BtM solar resources.	Adjusted NYCA baseline peak load forecast based on the November 19, 2020 Load Forecast Update. Reference: Nov 19, 2020 ESPWG/LFTF/TPAS presentation: [link] Same method.	Adjusted 2021 Gold Book NYCA baseline peak load forecast. It includes five large loads from the queue. The GB 2021 baseline peak load forecast includes the impact (reduction) of behind-the-meter (BtM) solar at the time of NYCA peak. For the Resource Adequacy load model, the deducted BtM solar MW was added back to the NYCA zonal loads, which then allows for a discrete modeling of the BtM solar resources.

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
2	Load **Shapes** (Multiple Load Shapes)	Used Multiple Load Shape MARS Feature 8,760-hour historical load shapes were used as base shapes for LFU bins: Bin 1: 2006 Bin 2: 2002 Bins 3-7: 2007 Peak adjustments on a seasonal basis. For the BtM Solar adjustment, the BtM shape is added back to account for the impact of the BtM generation on both on-peak and off-peak hours.	Same	Same method
3	Load Forecast Uncertainty (LFU) The LFU model captures the impacts of weather conditions on future loads.	2020 Updated via Load Forecast Task Force (LFTF) process Reference: April 13, 2020, LFTF presentation: https://www.nyiso.com/documents/20142/11883362/LFU_Summary.pdf	Same	Updated LFU values resulted from bin structure method change in representing the load bins (*i.e.,* using 'equal area' instead of 'equal distance' for Zscore calculation) Additional details: May 24, 2021, LFTF presentation: https://www.nyiso.com/documents/20142/21707507/04%20LFU_IRM_2022.pdf
Generation Parameters				

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
1	**Existing** Generating Unit Capacities (*e.g., thermal units, large hydro)*	2020 Gold Book values. Use summer min (DMNC vs. CRIS). Use winter min (DMNC vs. CRIS). Adjusted for RNA inclusion rules.	Same	2021 Gold Book values. Use summer min (DMNC vs. CRIS). Use winter min (DMNC vs. CRIS). Adjusted for RNA inclusion rules. Note: Units with CRIS rights and 0 DMNC are modeled at 0 MW
2	**Proposed New Units Inclusion** Determination	GB2020 with Inclusion Rules Applied	Same	GB2021 with Inclusion Rules Applied
3	Retirement, Mothballed Units, IIFO	GB2020 with Inclusion Rules Applied	Same	GB2021 with Inclusion Rules Applied
4	Forced and Partial Outage Rates (*e.g., thermal units, large hydro)*	Five-year (2015-2019) 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	Five-year (2016-2020) 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.

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
5	Planned Outages	Based on schedules received by the NYISO and adjusted for history	Same	Same method with updated data
6	Fixed and Unplanned Maintenance	Scheduled maintenance from operations. Unplanned maintenance based on GADS data average maintenance time – average time in weeks is modeled	Scheduled maintenance from operations. Unplanned maintenance based on GADS data average maintenance time – average time in weeks is modeled	Scheduled maintenance from operations. Unplanned maintenance based on GADS data average maintenance time – average time in weeks is modeled
7	Summer Maintenance	None	Same	None
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	Same method
8	Existing Landfill Gas (LFG) Plants	Actual hourly plant output over the period 2015-2019. Program randomly selects an LFG shape of hourly production over the 2015-2019 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	Actual hourly plant output over the period 2016-2020. Program randomly selects an LFG shape of hourly production over the 2016-2020 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.

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
9	Existing **Wind** Units (>5 years of data)	Actual hourly plant output over the period 2015-2019. Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process	Same	Actual hourly plant output over the period 2016-2020. Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process
10	Existing **Wind** Units (<5 years of data)	For existing data, the actual hourly plant output over the period 2016-2020 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	For existing data, the actual hourly plant output over the period 2016-2020 is used. For missing data, the nameplate normalized average of units in the same load zone is scaled by the unit's nameplate rating.
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	Same method
11b	Proposed **Offshore Wind** Units	None passed inclusion rules	Same	None passed inclusion rules
12a	Existing **Utility-scale Solar Resources**	The 31.5 MW Upton metered solar capacity: probabilistic model chooses from 5 years of production data output shapes covering the period 2015-2019 (one shape per replication is	Same	Probabilistic model chooses from 5 years of production data output shapes covering the period 2016-2020 (one shape per replication is randomly selected in Monte Carlo process.)

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
		randomly selected in Monte Carlo process.)		
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	Same method For new units in zones that do not yet have existing solar plants: model based on the BtM solar profiles from that zone
13	Projected **BtM Solar Resources**	Will use 5-year of inverter production data and apply the 2020 Gold Book energy forecast. Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process **Reference**: April 6, 2020 TPAS/ESPWG meeting materials	Same	Same method

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
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	Same method
15	Existing **Small Hydro** Resources (e.g., run-of-river)	Actual hourly plant output over the past 5 years period (i.e., 2015-2019). 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	Same method
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 (2015-2019). Methodology consistent with thermal unit transition rates.	Same	Same method
17	Proposed front-of-meter **Battery Storage**	None passed inclusion rules Behind-the-meter impacts at peak demand are captured in the baseline load forecast.	Same	Inclusion Rules: none passed Behind-the-meter impacts at peak demand are captured in the baseline load forecast

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
18	Existing Energy Limited Resources (**ELRs)**	N/A	Existing gens' elections were made by August 1st of each year and are incorporated into the model as hourly shapes consistent with operational capabilities. Resource output is aligned with the NYISO's peak load window, when most loss-of-load events are expected to occur.	Same method
Transaction – Imports/ Exports				
1	Capacity Purchases	Grandfathered Rights and other awarded long-term rights Modeled using MARS explicit contracts feature.	Same	Same method
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	Same method

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
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	Same method
4	UDRs	Updated with most recent elections/awards information (VFT, HTP, Neptune, CSC)	Same	Same method
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. References: 1. March 16, 2020 ESPWG/TPAS 2. April 6, 2020 TPAS/ESPWG	Same	Same

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
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	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	Same method
2	New Transmission	Based on TO- provided firm plans (via Gold Book 2020 process) and proposed merchant transmission; inclusion rules applied	Same	Same method
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	Same method
4	UDR unavailability	Five-year history of forced outages	Same	Same method
5	Other		Topology changes implemented due to the Post-RNA (CRP) Base Case updates [link]: 1. ConEdison's LTP updates January 23, 2021 ESPWG [link] 2. Status change of seven ConEdison Series Reactors proposed as backstop solution to the 2020 Q3 STAR needs solicitation: [link]	2021 Q3 STAR key assumptions presented at the July 23, 2021 ESPWG [link] 2021 Q3 STAR key assumptions presented at the July 23, 2021 ESPWG [link] 2021 Q4 STAR key assumptions presented at the October 25, 2021 ESPWG [link]

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
			3. 2021 Q2 STAR key assumptions: [link]	
Emergency Operating Procedures				
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, held constant for all years of study. **15 calls/year** Note: also, combined the two SCR steps (generation and load zonal MW)	Same method Based on the July 2020 SCR enrollment	Same method Based on the July 2021 SCR enrollment
2	EDRP Resources	Not modeled: the values are less than 2 MW.	Same	Same
3	Other EOPs *e.g., Operating reserves, manual voltage reduction, voltage curtailments,*	Based on TO information, measured data, and NYISO forecasts	Same. Used 2020 updated elections, as applicable	Same method Used 2021 updated elections, as applicable

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
	public appeals, external assistance			

External Control Areas

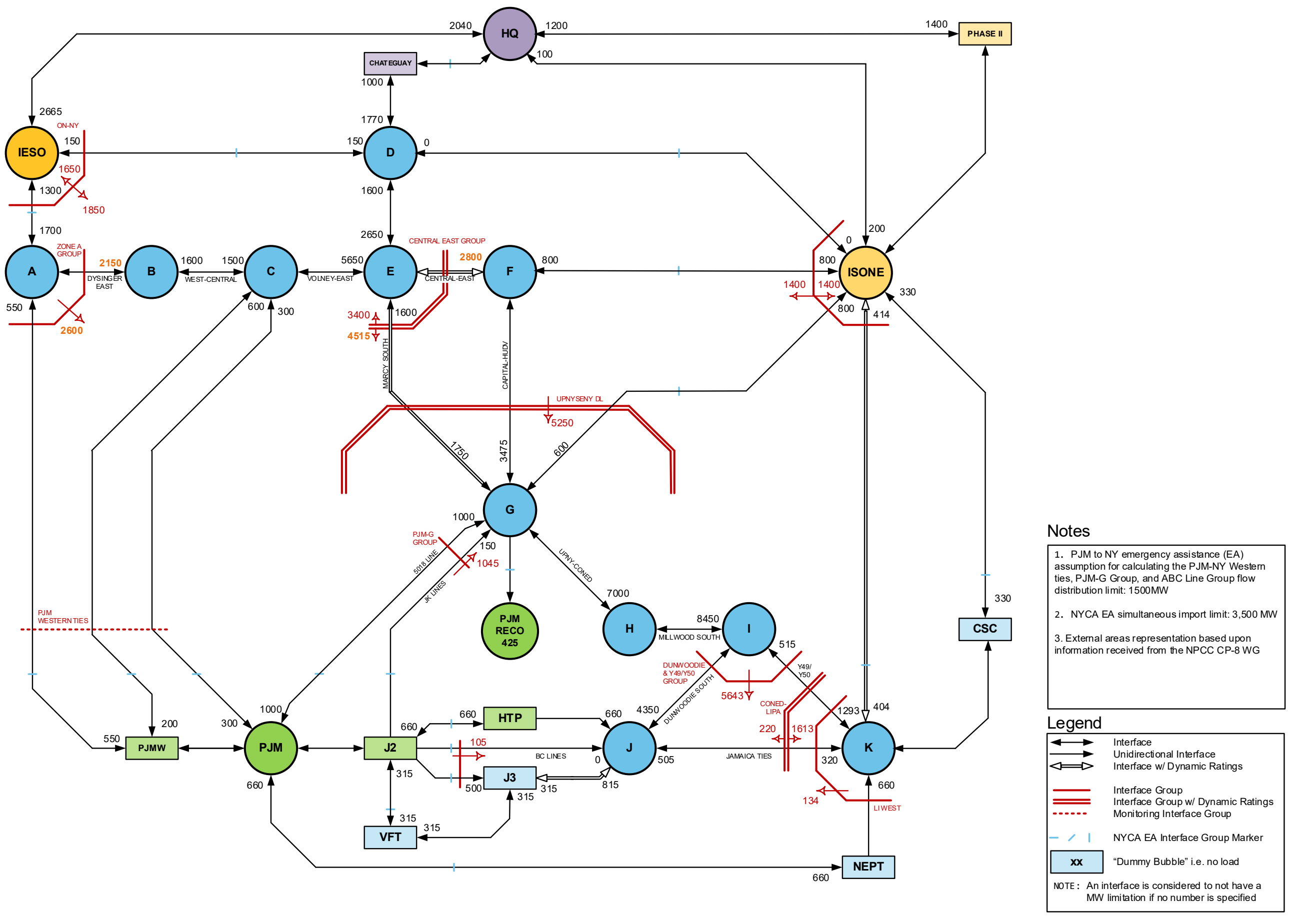
- The top three summer peak load days of an external Control Area is modeled as coincident with the NYCA top three peak load days.
- Load and capacity fixed through the study years.
- The top three summer peak load days of an external Control Area is modeled as coincident with the NYCA top three peak load days.
- 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 limit of 3500 MW

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
1	PJM	Simplified model: The 5 PJM MARS areas (bubbles) were consolidated into one	Same	Same method
2	ISONE	Simplified model: The 8 ISO-NE MARS areas (bubbles) were consolidated into one	Same	Same method
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.	Same	Same method
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	Same method

#	Parameter	2020 RNA *(2020 GB)* Study Period: 2024 (y4) -2030 (y10)	2021-2030 CRP and 2021 Q2 STAR *(2020 GB updated as applicable)* Study Period: 2024-2030 and 2021(y1) -2025 (y5), respectively	Q3 and Q4 STAR *(2021 GB)* Study Period: 2022 (y1) -2026 (y5)
5	Reserve Sharing	All NPCC Control Areas indicate that they will share reserves **equally** among all members before sharing with PJM.	Same	Same method
6	NYCA Emergency Assistance Limit	Implemented a statewide limit of **3,500 MW**	Same	Same method
Miscellaneous				
1	MARS Model Version	3.29.1499	3.30.1531	4.3.1796

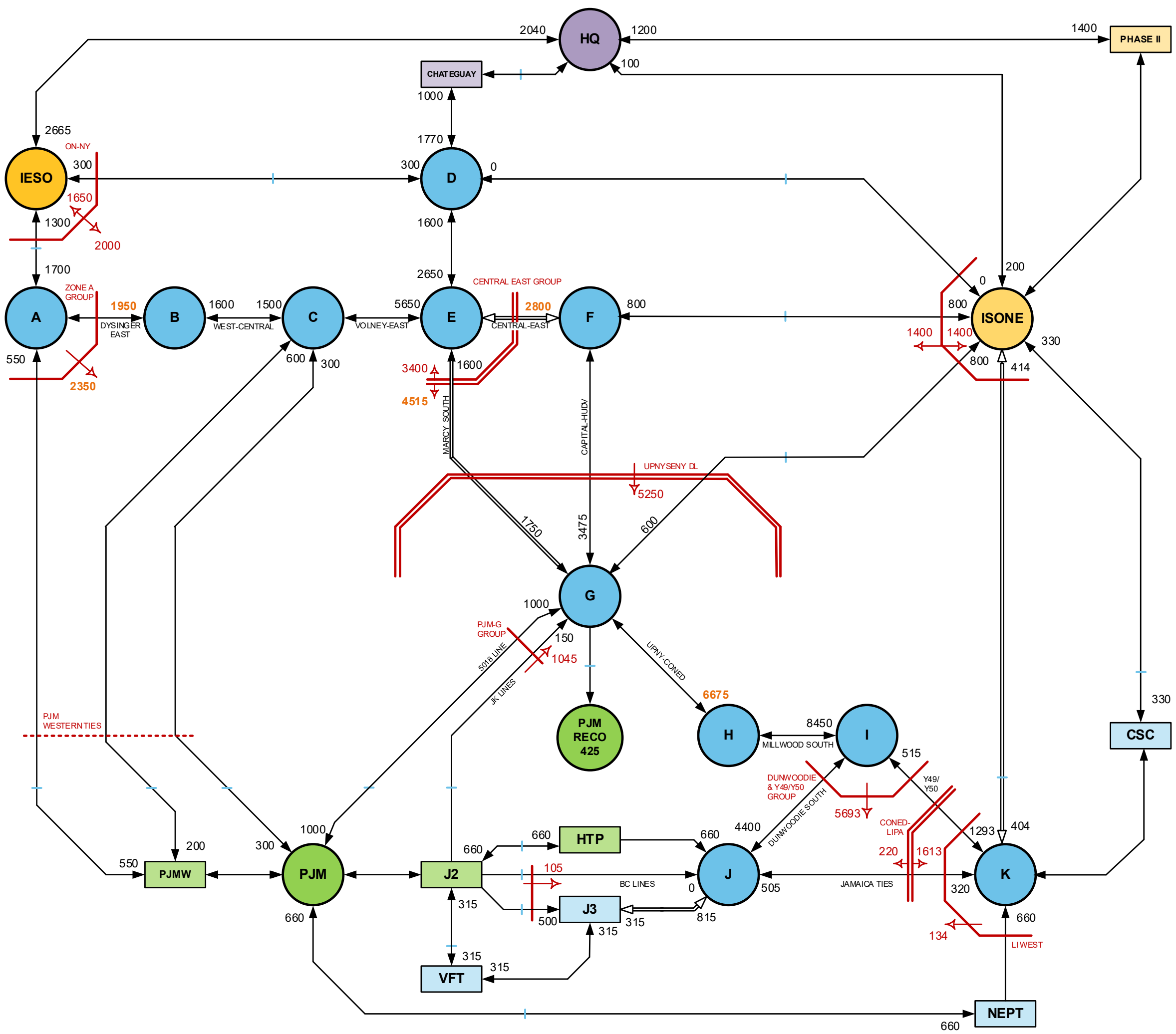
Resource Adequacy Topology from the 2021 Reliability Planning Models[22]

MARS Topology Study Year 1 (2022)



[22] This is the MARS topology used for post 2020-2021 Reliability Planning Process studies and is not fully re-evaluated for each quarterly STAR.

MARS Topology Study Year 2 (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

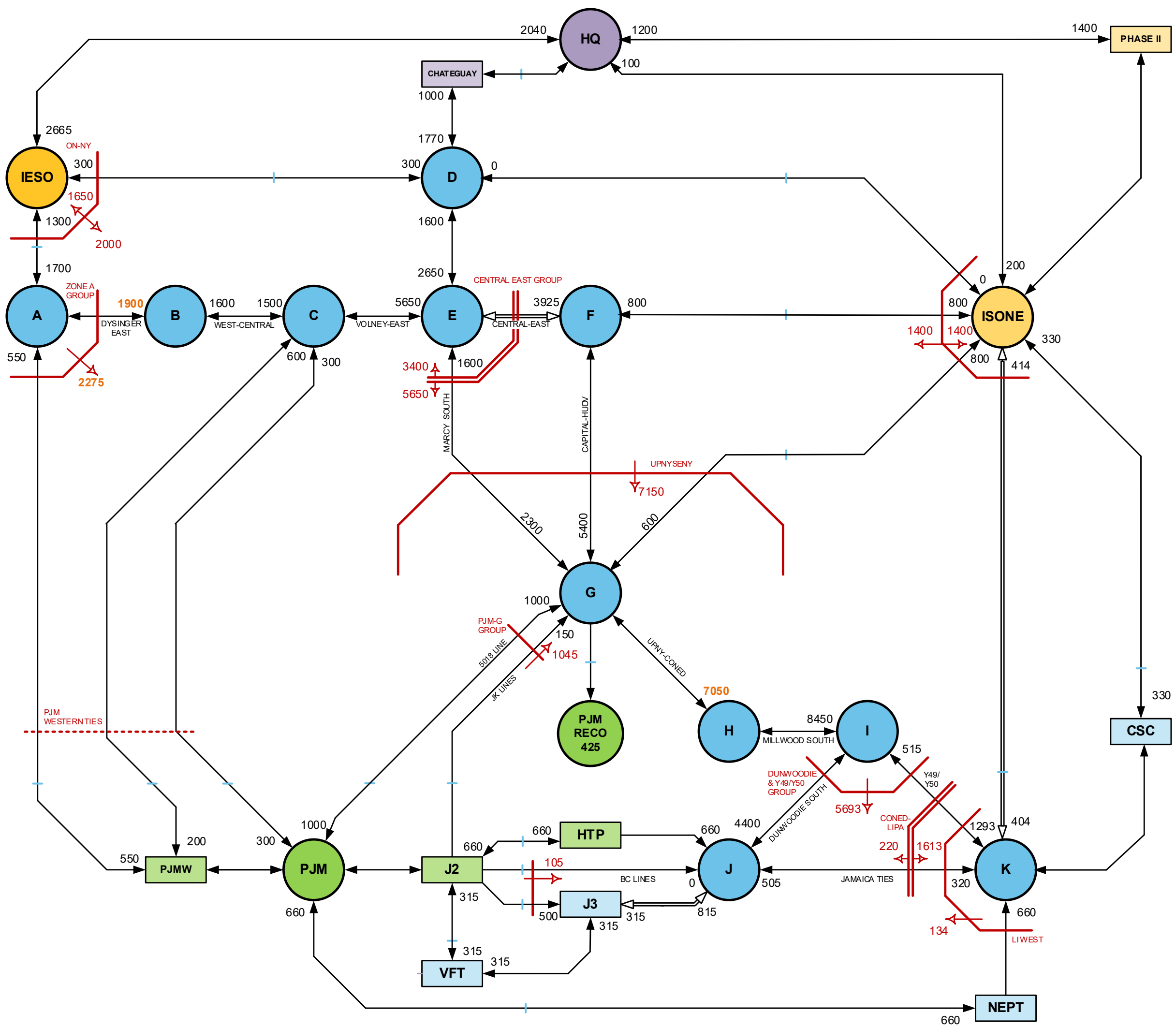
3. External areas representation based upon information received from the NPCC CP-8 WG

Legend

- 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 (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

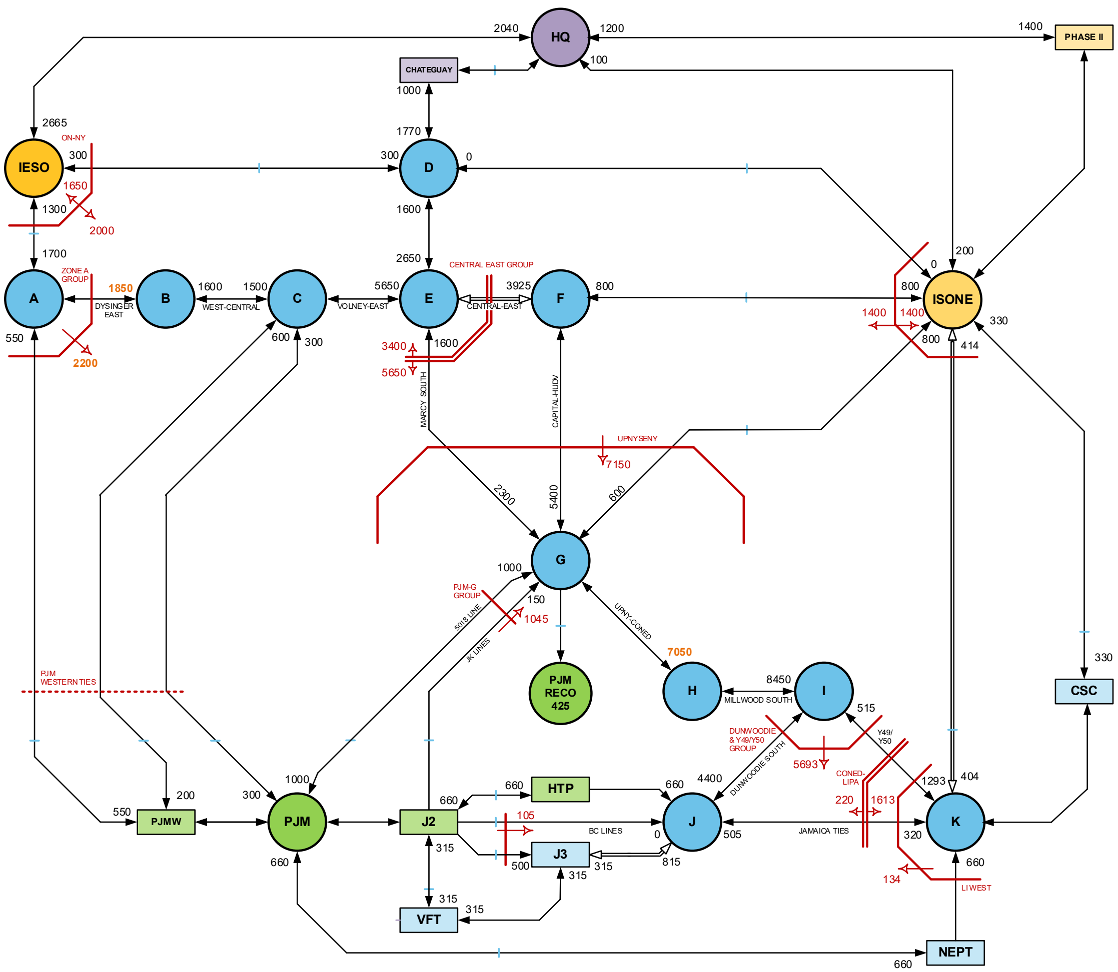
3. External areas representation based upon information received from the NPCC CP-8 WG

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 Years 4 (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

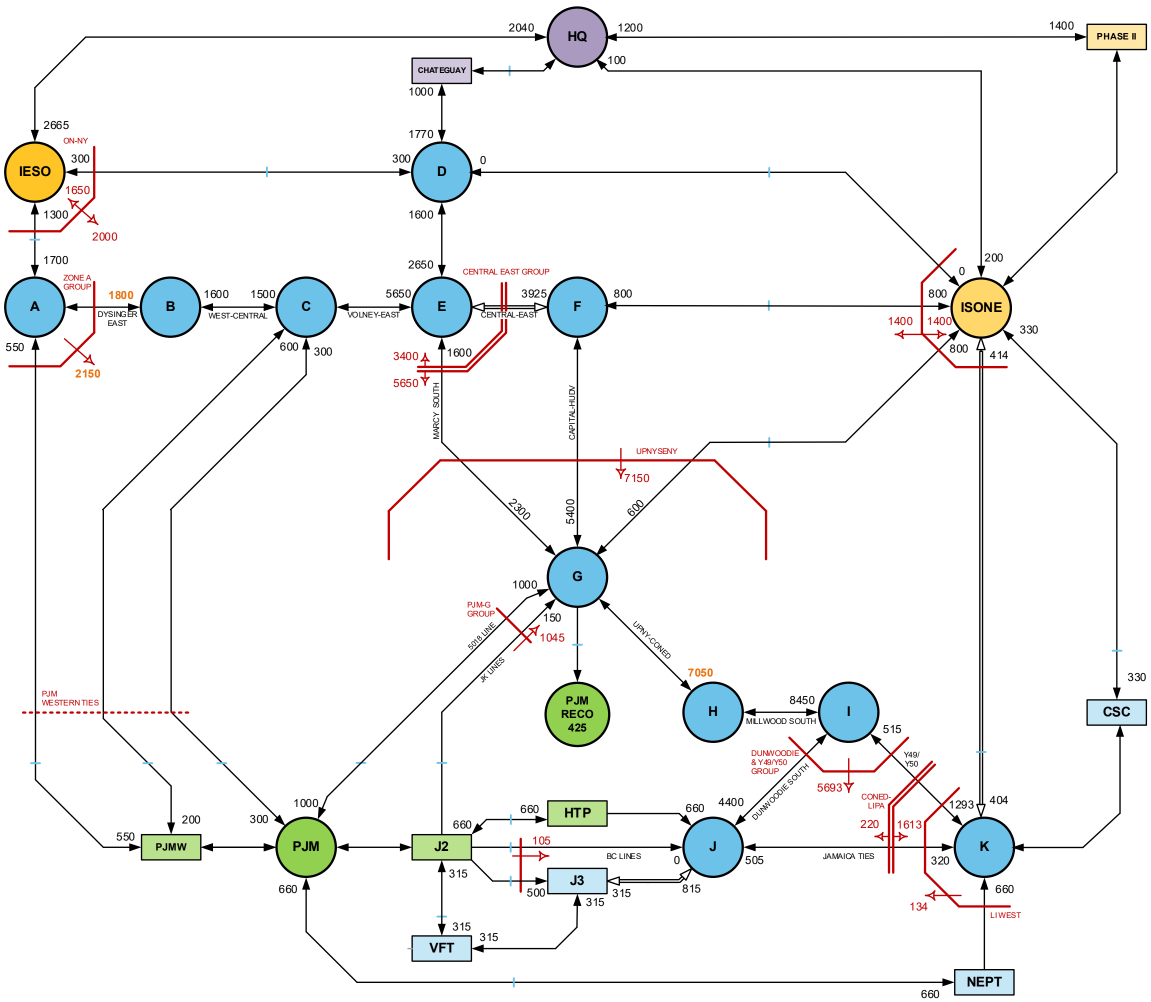
3. External areas representation based upon information received from the NPCC CP-8 WG

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 Years 5 (2026)



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)

The purpose of this assessment is to identify plausible changes in conditions or assumptions that might adversely impact the reliability of the Bulk Power Transmission Facilities (BPTF) or "tip" the system into violation of a transmission security criterion. This assessment is performed using a deterministic approach through a spreadsheet-based methods based on input from the 2021 Load and Capacity Data Report (Gold Book) and 2021 Quarter 4 STAR base case updates. For this assessment, "tipping points" are evaluated for the NYCA as well as Zone G-J, J, and K localities. For this evaluation the system tips when the transmission security margin is less than 0 or when a condition could change that is larger than the security margin.

New York Control Area (NYCA) Tipping Points

The tipping points for the NYCA are evaluated under summer peak conditions. A tipping point occurs when the transmission security margin is a negative value. The transmission security margin is the ability to meet load plus losses and system reserve (*i.e.,* total capacity requirement) against the NYCA generation, interchanges, and temperature-based generation de-rates (total resources). 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 removals of deactivating generation and peaker units. Consistent with transmission planning practices for transmission security, (1) wind generation is assumed at a 0 MW output, (2) run-of-river hydro is reduced consistent with its average capacity factor, and (3) solar is dispatched based on the ratio of its nameplate capacity and solar PV peak reductions stated in the 2021 Gold Book. Additionally, the NYCA generation includes the Oswego export limit for all lines in-service. Figure 18 provides a summary of the NYCA transmission security margin. Under current applicable reliability rules and procedures, a violation would be identified when the transmission security margin is negative for the base case assumptions (e.g., baseline load forecast, no pre-contingency unscheduled forced outages, etc.)

As shown in **Figure 18**, under baseline load conditions the statewide system margin (line-item H) ranges between 2,128 MW in 2022 to 508 MW in 2031. The annual fluctuations are driven by the decreases in NYCA generation (line-item A) and in the load forecast (line-item E). In consideration of the transmission security margin (line-item H), the values show that it is feasible to tip with the largest source of 1,310 MW (loss of Nine Mile Unit 2) as early as 2025.[23] However, in 2024 this combination of conditions results in a transmission security margin of 0 MW.[24]

It is feasible for other combinations of events to tip the system over its margin, such as increased load or a combination of reductions in total resources and load. An additional evaluation shown in **Figure 18** is the impact of the historical forced outage rate of NYCA thermal generation on the transmission security margin. Also, while SCRs are not included for transmission security analysis under normal conditions, they are used for this forced outage rate evaluation. The adjusted statewide system margin (line-item K) shows that insufficient margin exists as early as 2025 under this condition.

Figure 19 shows the statewide system margin for the 1-in-10-year load conditions (also known as 90/10 or 90th percentile load) under the assumption that the system is in an emergency condition. Although the system is not designed under Transmission Security for the 90th percentile forecast, **Figure 19** shows insufficient margin occurring as early as summer 2023 (Line-item I). As shown in **Figure 19** under the 90th percentile load conditions the inclusion of the historical forced outage rate of thermal generation (line-item J) shows that the system tips in 2022 (line-item K) and remains below the transmission security margin through 2031.

Under transmission security for the 1 in 100-year forecast, **Figure 20** shows that there is insufficient statewide system margin as early as 2022 (line-item I). This deficiency is exacerbated with the inclusion of forced outages (line-item K). The adjusted statewide system margin is deficient beyond the point of meeting the total capability requirement without reserves.

Figure 21 provides a summary of the statewide system margins under each load level.

[23] https://www.nyiso.com/documents/20142/3691300/Summer-2020-Operating-Study-Draft-Final-OC-Approved.pdf/

[24] This value is calculated as 1,310 MW – 1,310 MW = 0 MW.

Figure 18: Statewide System Margin (Summer Baseline Peak Forecast - Normal)

Line	Item	Peak Load Forecast									
		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
A	NYCA Generation (1)	35,257	34,307	34,297	33,684	33,679	33,679	33,674	33,669	33,664	33,659
B	External Area Interchanges (2)	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844
C	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
D	**Total Resources (A+B+C) (3)**	37,101	36,151	36,141	35,528	35,523	35,523	35,518	35,513	35,508	35,503
E	Load Forecast	(32,353)	(32,380)	(32,211)	(32,140)	(32,076)	(32,088)	(32,094)	(32,158)	(32,263)	(32,375)
F	Operating Reserve Requirement	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)
G	**Total Capability Requirement (E+F)**	(34,973)	(35,000)	(34,831)	(34,760)	(34,696)	(34,708)	(34,714)	(34,778)	(34,883)	(34,995)
H	**Statewide System Margin (D+G)**	2,128	1,151	1,310	768	827	815	804	735	625	508
I	SCRs (4), (5)	822	822	822	822	822	822	822	822	822	822
J	Forced Outages (3)	(2,164)	(1,952)	(1,952)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)
K	**Adjusted Statewide System Margin (H+I+J) (4)**	786	21	180	(277)	(218)	(230)	(241)	(310)	(420)	(537)

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service.
2. Interchanges are based on ERAG MMWG values.
3. Includes de-rates for thermal resources.
4. Special Case Resources (SCRs) are not applied for transmission security analysis of normal operations.
5. Includes a de-rate of 373 MW for SCRs.

Figure 19: Statewide System Margin (1-in-10 (90/10) Peak Forecast - Emergency)

Line	Item	90th Percentile Forecast									
		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
A	NYCA Generation (1)	35,257	34,307	34,297	33,684	33,679	33,679	33,674	33,669	33,664	33,659
B	External Area Interchanges (2)	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844
C	SCRs (4), (5)	822	822	822	822	822	822	822	822	822	822
D	Temperature Based Generation Derates	(208)	(195)	(195)	(185)	(185)	(185)	(185)	(185)	(185)	(185)
E	**Total Resources (A+B+C+D)**	37,715	36,778	36,768	36,164	36,159	36,159	36,154	36,149	36,144	36,139
F	Load Forecast	(34,333)	(34,341)	(34,152)	(34,069)	(33,996)	(34,001)	(34,005)	(34,072)	(34,183)	(34,300)
G	Operating Reserve Requirement	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)
H	**Total Capability Requirement (F+G)**	(36,953)	(36,961)	(36,772)	(36,689)	(36,616)	(36,621)	(36,625)	(36,692)	(36,803)	(36,920)
I	**Statewide System Margin (E+H)**	762	(183)	(4)	(525)	(457)	(462)	(471)	(543)	(659)	(781)
J	Forced Outages (3)	(2,164)	(1,952)	(1,952)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)
K	**Adjusted Statewide System Margin (I+J)**	(1,402)	(2,135)	(1,956)	(2,392)	(2,324)	(2,329)	(2,338)	(2,410)	(2,526)	(2,648)

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service.
2. Interchanges are based on ERAG MMWG values.
3. Includes de-rates for thermal resources.
4. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
5. Includes a de-rate of 373 MW for SCRs.

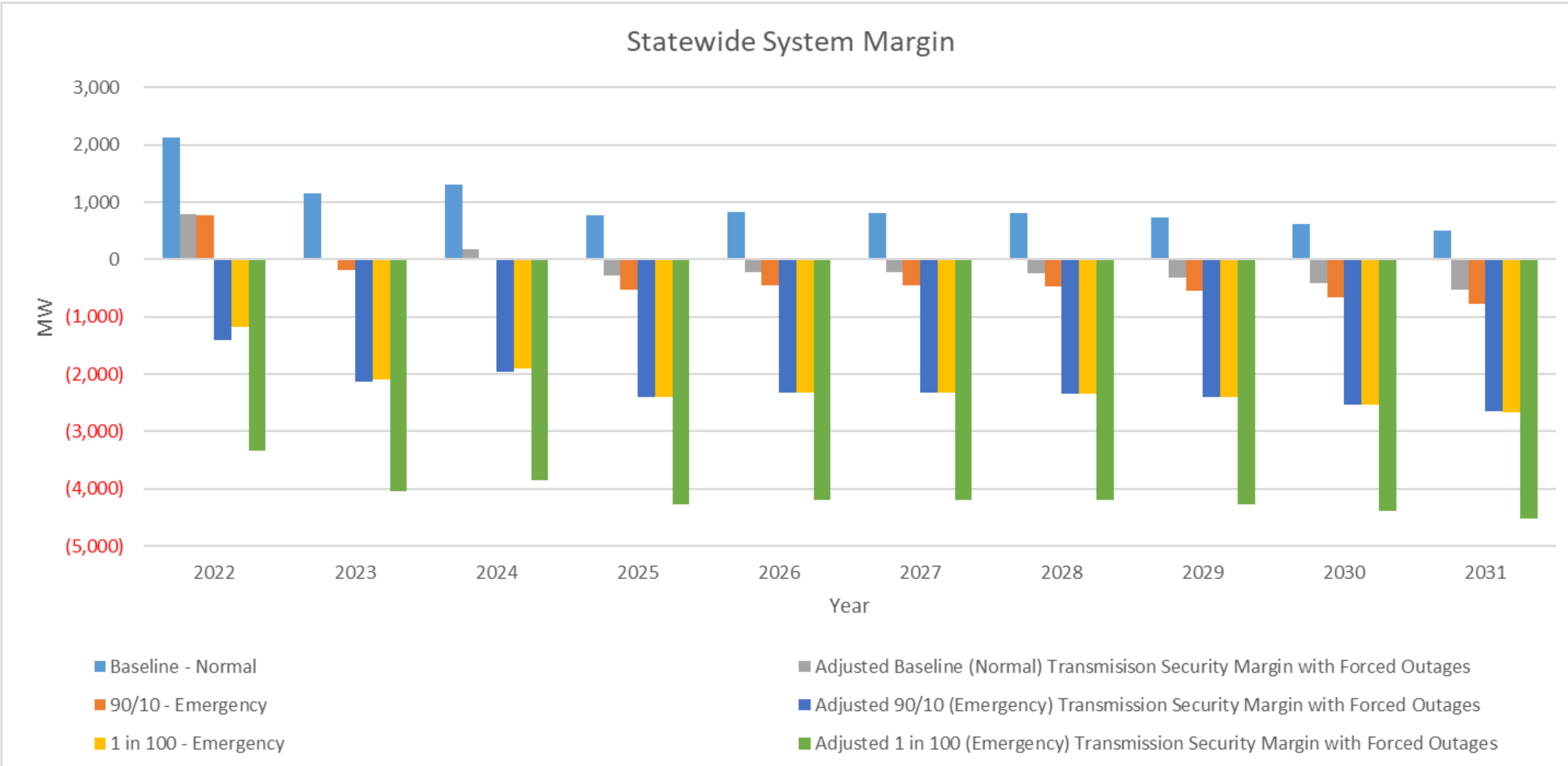
Figure 20: Statewide System Margin (Summer 1-in-100 Peak Forecast - Emergency)

Line	Item	1 in 100 Forecast									
		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
A	NYCA Generation (1)	35,257	34,307	34,297	33,684	33,679	33,679	33,674	33,669	33,664	33,659
B	External Area Interchanges (2)	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844
C	SCRs (4), (5)	822	822	822	822	822	822	822	822	822	822
D	Temperature Based Generation Derates	(437)	(410)	(410)	(390)	(390)	(390)	(390)	(390)	(390)	(390)
E	**Total Resources (A+B+C+D)**	37,486	36,563	36,553	35,959	35,954	35,954	35,949	35,944	35,939	35,934
F	Load Forecast	(36,045)	(36,039)	(35,834)	(35,743)	(35,659)	(35,662)	(35,666)	(35,734)	(35,849)	(35,974)
G	Operating Reserve Requirement	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)	(2,620)
H	**Total Capability Requirement (F+G)**	(38,665)	(38,659)	(38,454)	(38,363)	(38,279)	(38,282)	(38,286)	(38,354)	(38,469)	(38,594)
I	**Statewide System Margin (E+H)**	(1,179)	(2,096)	(1,901)	(2,404)	(2,325)	(2,328)	(2,337)	(2,410)	(2,530)	(2,660)
J	Forced Outages (3)	(2,164)	(1,952)	(1,952)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)	(1,867)
K	**Adjusted Statewide System Margin (I+J)**	(3,343)	(4,048)	(3,853)	(4,271)	(4,192)	(4,195)	(4,204)	(4,277)	(4,397)	(4,527)

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service.
2. Interchanges are based on ERAG MMWG values.
3. Includes de-rates for thermal resources.
4. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
5. Includes a de-rate of 373 MW for SCRs.

Figure 21: Summary of Statewide System Margin



Lower Hudson Valley (Zones G-J) Tipping Points

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 tipping point 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 22** shows how the transmissions security margin changes through time in consideration of the most limiting contingency combination for the year being evaluated. In years 2022 and 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). For the remainder of the years the contingency combination changes to the loss of Ravenswood 3 followed by the loss of Pleasant Valley-Wood St. 345 kV (F30/F31).

Figure 22: Lower Hudson Valley Transmission Security Margin (Summer Baseline Peak Forecast - Normal)

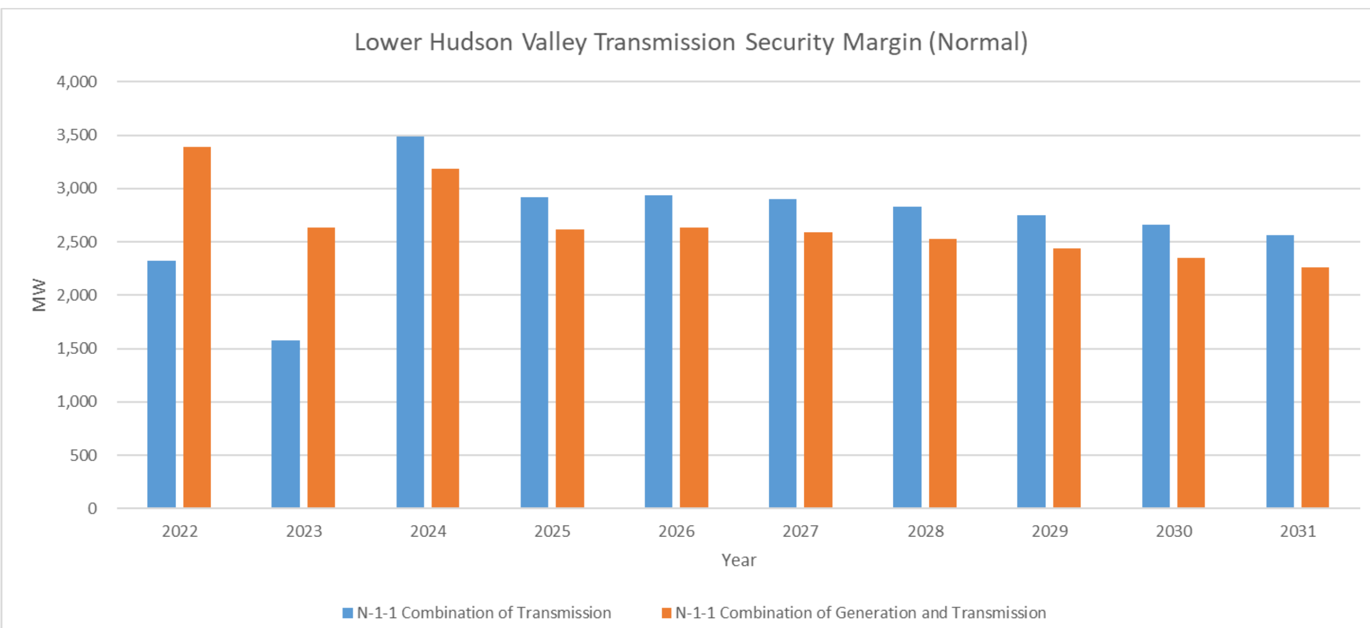


Figure 23 shows the calculation of the lower Hudson Valley transmission security margin for summer baseline peak load (normal) conditions. The transmission security margin ranges from 2,325 MW (2022) to 2,260 MW (2031). Considering the baseline peak load transmission security margin, multiple outages the lower Hudson Valley would be required to tip the system over its security margin.

An additional evaluation shown in **Figure 23** is the impact of the historical forced outage rate of thermal generation on the transmission security margin. Also, while SCRs are not included for an evaluation of transmission security under normal transfer criteria, the impact of SCRs is accounted for in this adjusted transmission security margin. The adjusted transmission security margin (line-item S) shows that generation outages consistent with the historical forced outage rates would not result in "tipping" beyond transmission security limits, with a margin of 1,274 MW in 2022 growing to 1,450 MW in 2031.

Figure 24 and **Figure 25** show the transmission security margin for the 1-in-10-year load conditions (also known as 90/10 or 90th percentile load) and 1-in-100-year load conditions (respectively) under the assumption that the system is in an emergency condition. An additional evaluation shown in each figure is the impact of the historical forced outage rate of thermal generation on the transmission security margin. Under 1-in-10-year load conditions the adjusted transmission security margin (line-item S) shows that generation outages consistent with the historical forced outage rates would not result in "tipping" beyond transmission security limits, with a margin of 1,228 MW in 2022 growing to 1,402 MW in 2031. Under 1-in-100 load conditions the historical forced outage rate does "tip" the system in 2023. However, the remaining years of the study period is sufficient primarily due to the additional transmission capability of the Segment B public policy project.

Figure 26 provides a summary of the transmission security margins under each load level.

Figure 23: Lower Hudson Valley Transmission Security Margin (Summer Baseline Peak Forecast - Normal)

		Peak Load Forecast									
Line	**Item**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
A	G-J Load Forecast	(15,311)	(15,231)	(15,163)	(15,120)	(15,100)	(15,142)	(15,210)	(15,294)	(15,381)	(15,474)
B	RECO Load	(397)	(397)	(397)	(397)	(397)	(397)	(397)	(397)	(397)	(397)
C	**Total Load (A+B)**	(15,708)	(15,628)	(15,560)	(15,517)	(15,497)	(15,539)	(15,607)	(15,691)	(15,778)	(15,871)
D	UPNY-SENY Limit (5)	3,200	3,200	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	95	95	95	95	95	95	95	95	95	95
G	**Total SENY AC Import (D+E+F)**	3,284	3,284	5,809	5,809	5,809	5,809	5,809	5,809	5,809	5,809
H	Loss of Source Contingency	0	0	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)
I	**Resource Need (C+G+H)**	(12,424)	(12,344)	(10,731)	(10,688)	(10,668)	(10,710)	(10,778)	(10,862)	(10,949)	(11,042)
J	*Resources needed after N-1-1 (C+G)*	(12,424)	(12,344)	(9,751)	(9,708)	(9,688)	(9,730)	(9,798)	(9,882)	(9,969)	(10,062)
K	G-J Generation (1)	14,434	13,603	13,602	12,988	12,988	12,988	12,988	12,988	12,987	12,987
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 (K+L+M)**	14,749	13,918	13,917	13,303	13,303	13,303	13,303	13,303	13,302	13,302
O	*Resources available after N-1-1 (H+N)*	14,749	13,918	12,937	12,323	12,323	12,323	12,323	12,323	12,322	12,322
P	**Transmission Security Margin (I+N)**	2,325	1,574	3,186	2,615	2,635	2,593	2,525	2,441	2,353	2,260
Q	SCRs (3), (4)	288	288	288	288	288	288	288	288	288	288
R	Forced Outages (2)	(1,339)	(1,182)	(1,182)	(1,098)	(1,098)	(1,098)	(1,098)	(1,098)	(1,098)	(1,098)
S	**Adjusted Transmission Security Margin (P+Q+R) (3)**	1,274	680	2,292	1,805	1,825	1,783	1,715	1,631	1,543	1,450

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources.
3. Special Case Resources (SCRs) are not applied for transmission security analysis of normal operations.
4. Includes a de-rate of 242 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations. Limits for 2024 through 2031 are based on the summer peak 2025 representations.

Figure 24: Lower Hudson Valley Transmission Security Margin (Summer 1-in-10 (90/10) Peak Forecast - Emergency)

	90th Percentile Load Forecast										
Line	**Item**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
A	G-J Load Forecast	(16,046)	(15,961)	(15,888)	(15,843)	(15,822)	(15,865)	(15,935)	(16,023)	(16,115)	(16,212)
B	RECO Load	(397)	(397)	(397)	(397)	(397)	(397)	(397)	(397)	(397)	(397)
C	**Total Load (A+B)**	(16,443)	(16,358)	(16,285)	(16,240)	(16,219)	(16,262)	(16,332)	(16,420)	(16,512)	(16,609)
D	UPNY-SENY Limit (5)	3,925	3,925	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	155	155	155	155	155	155	155	155	155	155
G	**Total SENY AC Import (D+E+F)**	4,069	4,069	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)**	(12,374)	(12,289)	(10,691)	(10,646)	(10,625)	(10,668)	(10,738)	(10,826)	(10,918)	(11,015)
J	*Resources needed after N-1-1 (C+G)*	(12,374)	(12,289)	(10,691)	(10,646)	(10,625)	(10,668)	(10,738)	(10,826)	(10,918)	(11,015)
K	G-J Generation (1)	14,434	13,603	13,602	12,988	12,988	12,988	12,988	12,988	12,987	12,987
L	Temperature Based Generation Derates	(96)	(85)	(85)	(75)	(75)	(75)	(75)	(75)	(75)	(75)
M	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
N	SCRs (3), (4)	288	288	288	288	288	288	288	288	288	288
O	**Total Resources Available (K+L+M+N)**	14,941	14,121	14,120	13,516	13,516	13,516	13,516	13,515	13,515	13,515
P	*Resources available after N-1-1 (H+O)*	14,941	14,121	14,120	12,225	12,225	12,225	12,224	12,224	12,224	12,224
Q	**Transmission Security Margin (I+O)**	2,567	1,832	3,429	2,870	2,891	2,848	2,778	2,689	2,597	2,500
R	Forced Outages (2)	(1,339)	(1,182)	(1,181)	(1,098)	(1,098)	(1,098)	(1,098)	(1,098)	(1,098)	(1,098)
S	**Adjusted Transmission Security Margin (Q+R)**	1,228	650	2,248	1,772	1,793	1,750	1,680	1,591	1,499	1,402

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources.
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 242 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations. Limits for 2024 through 2031 are based on the summer peak 2025 representations.

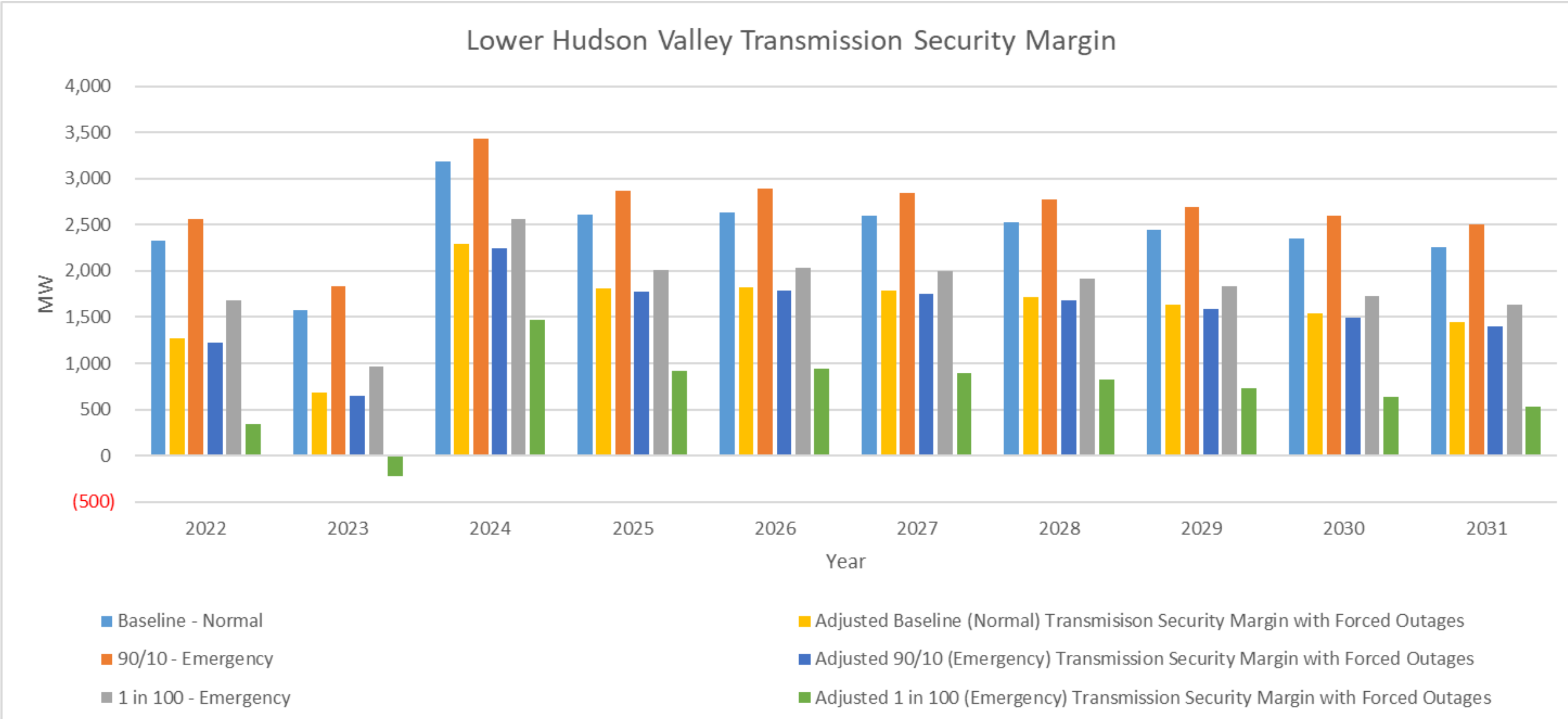
Figure 25: Lower Hudson Valley Transmission Security Margin (Summer 1-in-100 Peak Forecast - Emergency)

1 in 100 Forecast											
Line	**Item**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
A	G-J Load Forecast	(16,778)	(16,690)	(16,614)	(16,568)	(16,545)	(16,590)	(16,663)	(16,754)	(16,849)	(16,951)
B	RECO Load	(443)	(443)	(443)	(443)	(443)	(443)	(443)	(443)	(443)	(443)
C	**Total Load (A+B)**	(17,221)	(17,133)	(17,057)	(17,011)	(16,988)	(17,033)	(17,106)	(17,197)	(17,292)	(17,394)
D	UPNY-SENY Limit (5)	3,925	3,925	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	155	155	155	155	155	155	155	155	155	155
G	**Total SENY AC Import (D+E+F)**	4,069	4,069	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)**	(13,152)	(13,064)	(11,463)	(11,417)	(11,394)	(11,439)	(11,512)	(11,603)	(11,698)	(11,800)
J	*Resources needed after N-1-1 (C+G)*	(13,152)	(13,064)	(11,463)	(11,417)	(11,394)	(11,439)	(11,512)	(11,603)	(11,698)	(11,800)
K	G-J Generation (1)	14,434	13,603	13,602	12,988	12,988	12,988	12,988	12,988	12,987	12,987
L	Temperature Based Generation Derates	(201)	(179)	(179)	(159)	(159)	(159)	(159)	(159)	(159)	(159)
M	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
N	SCRs (3), (4)	288	288	288	288	288	288	288	288	288	288
O	**Total Resources Available (K+L+M+N)**	14,836	14,027	14,026	13,432	13,432	13,432	13,432	13,431	13,431	13,431
P	*Resources available after N-1-1 (H+O)*	14,836	14,027	14,026	13,432	13,432	13,432	13,432	13,431	13,431	13,431
Q	**Transmission Security Margin (I+O)**	1,685	963	2,564	2,016	2,038	1,993	1,920	1,829	1,733	1,631
R	Forced Outages (2)	(1,339)	(1,182)	(1,098)	(1,098)	(1,098)	(1,098)	(1,098)	(1,098)	(1,098)	(1,098)
S	**Adjusted Transmission Security Margin (Q+R)**	346	(219)	1,466	918	940	895	822	731	635	533

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources.
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 242 MW for SCRs.
5. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations. Limits for 2024 through 2031 are based on the summer peak 2025 representations.

Figure 26: Summary of Lower Hudson Valley Summer Transmission Security Margin



New York City (Zone J) Tipping Points

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.[25] The analysis for this is noted as N-1-1-0, and the CRP notes a transmission security margin of 50 MW in Zone J.[26] **Figure 27** provides a summary of the zone J transmission security margin.

The tipping points for Zone J are evaluated under the most limiting N-1-1-0 contingency combination to the transmission security margin, which is loss of Ravenswood 3 followed by the loss of Mott Haven – Rainey 345 kV (Q12). **Figure 28** shows the transmission security margin under baseline load conditions with this contingency combination, which ranges from 1,174 MW in 2022 to 42 MW in 2031). The most limiting contingency combination to transmission security margin in Zone J is the loss of Ravenswood 3 and Mott Haven — Rainey (Q12) 345 kV. The power flowing into J from other NYCA zones is shown in line-item B. Other contingency combinations result in changing the power flowing into 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 27** 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, and Sprain Brook-W. 49th St. 345 kV (M51 and M52). For Ravenswood 3 and Bayonne Energy Center the power flowing into J from other NYCA zones is 4,717 MW. For Sprain Brook-W. 49th St. 345 kV (M51 and M52) the power flowing into J from other NYCA zones is 3,191 MW. As seen in **Figure 27**, 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. In this specific example, all year's show the loss of M51/M52 with the largest transmission security margin.

Considering the baseline peak load transmission security margin (42 MW observed in 2031), many different losses of generation or load increases will exceed the transmission security margin.

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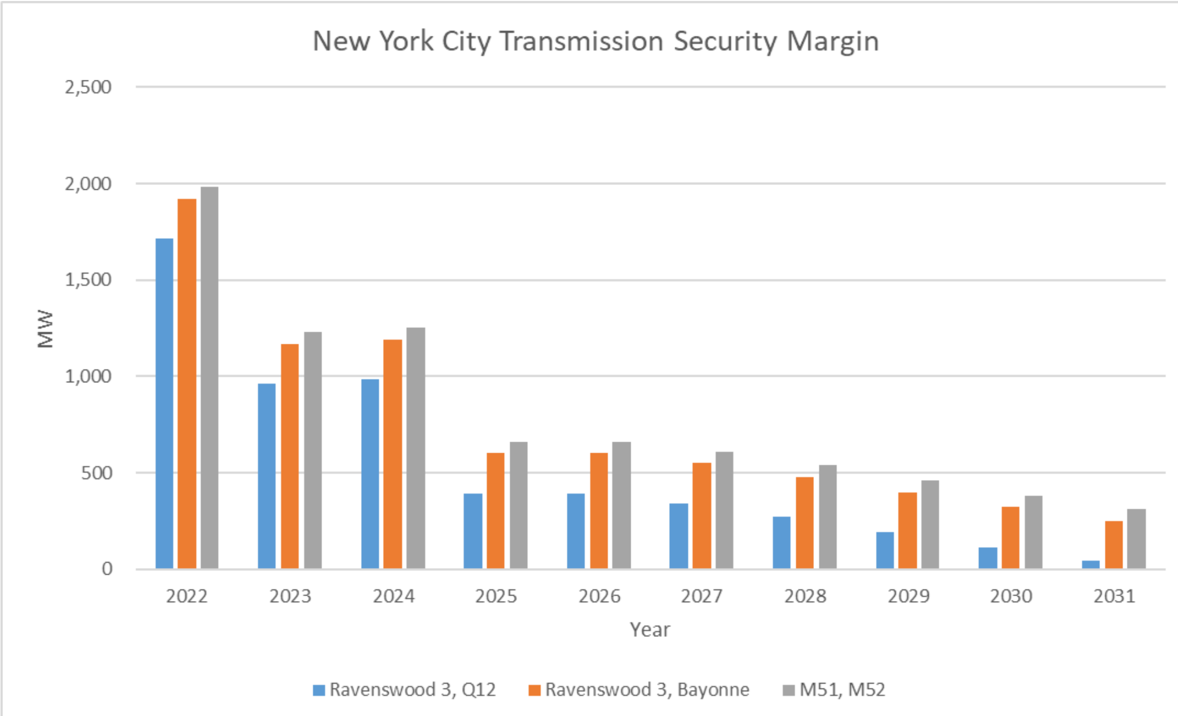
[25] Con Edison, TP-7100-18 Transmission Planning Criteria, dated August 2019.

[26] https://www.nyiso.com/documents/20142/19415353/07 2020-2021RPP_PostRNABaseCaseUpdates.pdf/

Figure 27: Impact of Contingency Combination on Zone J Transmission Security Margin



An additional evaluation shown in **Figure 28** is the impact of the historical forced outage rate of thermal generation on the transmission security margin. Also, while SCRs are not included for an evaluation of transmission security under normal transfer criteria, the impact of SCRs is accounted for in this adjusted transmission security margin. The adjusted transmission security margin (line-item P) shows that generation outages consistent with the historical forced outage rates of thermal generation would "tip" beyond the transmission security limits in 2028 with a 20 MW deficiency which grows to a deficiency of 250 MW by 2031.

Figure 29 shows the transmission security margin for the 1-in-10-year load conditions under the assumption that the system is in an emergency condition. Insufficient transmission security margin is observed in 2028 (Line-item N). As shown in **Figure 29** under the 90th percentile load conditions the inclusion of the historical forced outage rate of thermal generation (line-item O) shows that the system tips in 2025 (line-item P) and remains deficient through the study period.

Under transmission security for the 1 in 100-year forecast, **Figure 30** shows that there is insufficient transmission security margin (line-item N) starting in 2025. The adjusted transmission security margin (line-item P), which includes the historical forced outage rate of thermal generation, exacerbates the insufficiency of the transmission security margin and the system tips as early as 2023.

Figure 31 provides a summary of the transmission security margins under each load level.

Figure 28: New York City Transmission Security Margin (Summer Baseline Peak Forecast - Normal)

		Peak Load Forecast									
Line	**Item**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
A	**Zone J Load Forecast**	(11,116)	(11,075)	(11,052)	(11,029)	(11,031)	(11,082)	(11,151)	(11,232)	(11,308)	(11,381)
B	I+K to J (5)	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	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)
F	**Resource Need (A+D+E)**	(8,203)	(8,162)	(8,139)	(8,116)	(8,118)	(8,169)	(8,238)	(8,319)	(8,395)	(8,468)
G	*Resources needed after N-1-1 (A+D)*	(7,223)	(7,182)	(7,159)	(7,136)	(7,138)	(7,189)	(7,258)	(7,339)	(7,415)	(7,488)
H	J Generation (1)	9,602	8,809	8,809	8,195	8,195	8,195	8,195	8,195	8,195	8,195
I	Temperature Based Generation Derates (2)	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 (H+I+J)**	9,917	9,124	9,124	8,510	8,510	8,510	8,510	8,510	8,510	8,510
L	*Resources available after N-1-1 (E+K)*	8,937	8,144	8,144	7,530	7,530	7,530	7,530	7,530	7,530	7,530
M	**Transmission Security Margin (F+K)**	1,714	962	985	394	392	341	272	191	115	42
N	SCRs (3), (4)	223	223	223	223	223	223	223	223	223	223
O	Forced Outages (2)	(744)	(599)	(599)	(515)	(515)	(515)	(515)	(515)	(515)	(515)
P	**Adjusted Transmission Security Margin (M+N+O) (3)**	1,193	586	609	102	100	49	(20)	(101)	(177)	(250)

Notes:
1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources.
3. Special Case Resources (SCRs) are not applied for transmission security analysis of normal operations.
4. Includes a de-rate of 205 MW for SCRs.
5. The I+K to J flows are based on N-1-1-0 analysis in the post-RNA updates utilizing the models representing summer peak 2030.

Figure 29: New York City Transmission Security Margin (Summer 1-in-10 (90/10) Peak Forecast - Emergency)

		90th Percentile Load Forecast									
Line	**Item**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
A	**Zone J Load Forecast**	(11,577)	(11,534)	(11,510)	(11,486)	(11,488)	(11,541)	(11,613)	(11,697)	(11,777)	(11,853)
B	I+K to J (5)	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	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)
F	**Resource Need (A+D+E)**	(8,664)	(8,621)	(8,597)	(8,573)	(8,575)	(8,628)	(8,700)	(8,784)	(8,864)	(8,940)
G	*Resources needed after N-1-1 (A+D)*	(7,684)	(7,641)	(7,617)	(7,593)	(7,595)	(7,648)	(7,720)	(7,804)	(7,884)	(7,960)
H	J Generation (1)	9,602	8,809	8,809	8,195	8,195	8,195	8,195	8,195	8,195	8,195
I	Temperature Based Generation Derates	(72)	(61)	(61)	(52)	(52)	(52)	(52)	(52)	(52)	(52)
J	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
K	SCRs (3), (4)	223	223	223	223	223	223	223	223	223	223
L	**Total Resources Available (H+I+J+K)**	10,069	9,285	9,285	8,681	8,681	8,681	8,681	8,681	8,681	8,681
M	*Resources available after N-1-1 (E+L)*	9,089	8,305	8,305	7,701	7,701	7,701	7,701	7,701	7,701	7,701
N	**Transmission Security Margin (F+L)**	1,405	664	688	108	106	53	(19)	(103)	(183)	(259)
O	Forced Outages (2)	(744)	(599)	(599)	(515)	(515)	(515)	(515)	(515)	(515)	(515)
P	**Adjusted Transmission Security Margin (N+O)**	661	65	89	(407)	(409)	(462)	(534)	(618)	(698)	(774)

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources.
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 205 MW for SCRs.
5. The I+K to J flows are based on N-1-1-0 analysis in the post-RNA updates utilizing the models representing summer peak 2030.

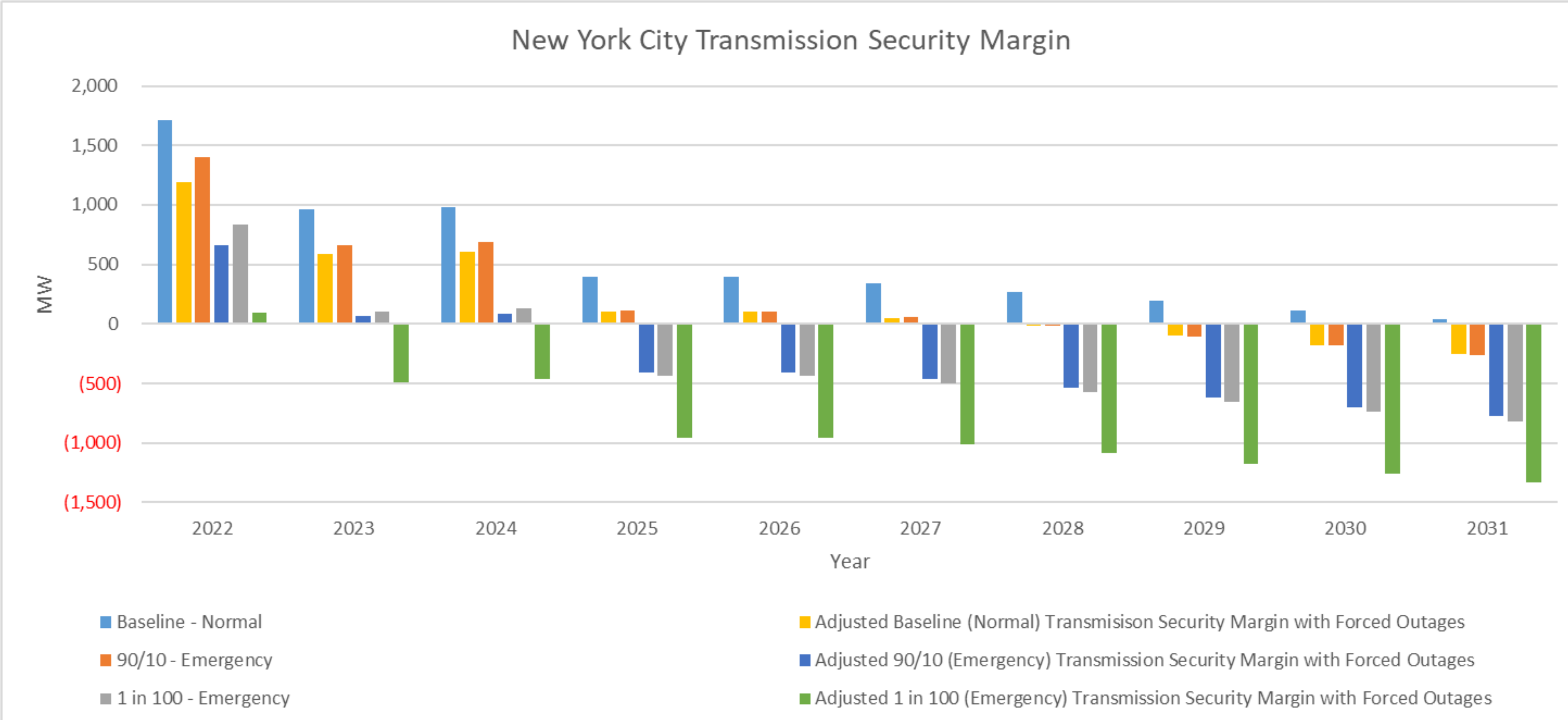
Figure 30: New York City Transmission Security Margin (Summer 1-in-100 Peak Forecast - Emergency)

1 in 100 Forecast											
Line	**Item**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
A	**Zone J Load Forecast**	(12,068)	(12,023)	(11,998)	(11,974)	(11,976)	(12,031)	(12,106)	(12,194)	(12,276)	(12,356)
B	I+K to J (5)	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	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)
F	**Resource Need (A+D+E)**	(9,155)	(9,110)	(9,085)	(9,061)	(9,063)	(9,118)	(9,193)	(9,281)	(9,363)	(9,443)
G	*Resources needed after N-1-1 (A+D)*	(8,175)	(8,130)	(8,105)	(8,081)	(8,083)	(8,138)	(8,213)	(8,301)	(8,383)	(8,463)
H	J Generation (1)	9,602	8,809	8,809	8,195	8,195	8,195	8,195	8,195	8,195	8,195
I	Temperature Based Generation Derates	(151)	(130)	(130)	(110)	(110)	(110)	(110)	(110)	(110)	(110)
J	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
K	SCRs (3)	223	223	223	223	223	223	223	223	223	223
L	**Total Resources Available (H+I+J+K)**	9,989	9,217	9,217	8,623	8,623	8,623	8,623	8,623	8,623	8,623
M	*Resources available after N-1-1 (E+L)*	9,009	8,237	8,237	7,643	7,643	7,643	7,643	7,643	7,643	7,643
N	**Transmission Security Margin (F+L)**	834	107	132	(438)	(440)	(495)	(570)	(658)	(740)	(820)
O	Forced Outages (2)	(744)	(599)	(599)	(515)	(515)	(515)	(515)	(515)	(515)	(515)
P	**Adjusted Transmission Security Margin (N+O)**	90	(492)	(467)	(953)	(955)	(1,010)	(1,085)	(1,173)	(1,255)	(1,335)

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources.
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 205 MW for SCRs.
5. The I+K to J flows are based on N-1-1-0 analysis in the post-RNA updates utilizing the models representing summer peak 2030.

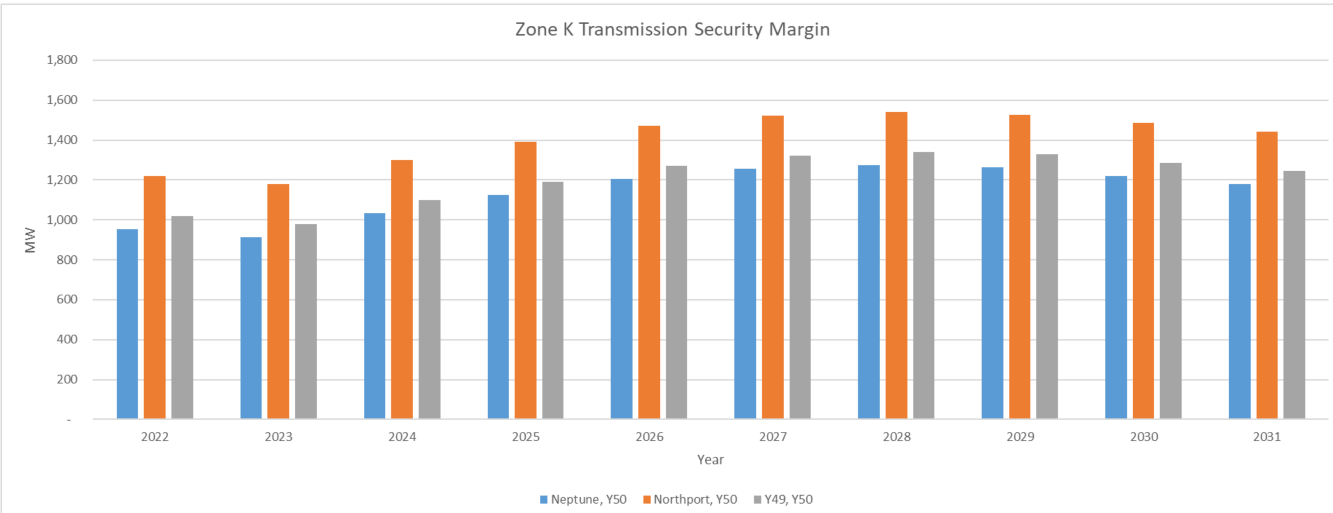
Figure 31: Summary of New York City Transmission Security Margin



Long Island (Zone K) Tipping Points

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 32,** 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 32: Impact of Contingency Combination on Zone K Transmission Security Margin



As seen in **Figure 33** the transmission security margin (line-item M) in Zone K under baseline conditions ranges from 954 MW in 2022 growing to 1,179 MW in 2031 due to a forecasted decrease in peak demand through time. Considering the baseline peak load transmission security margin, multiple outages in Zone K would be required to tip the system over its security margin, beyond the outage of Neptune.

An additional evaluation included in **Figure 33** is the impact of the historical forced outage rate of thermal generation on the transmission security margin. Also, while SCRs are not included for an evaluation of transmission security under normal transfer criteria, the impact of SCRs is accounted for in this adjusted transmission security margin. The adjusted transmission security margin (line-item P) shows that generation outages consistent with the historical forced outage rates would not result in "tipping" beyond transmission security limits, with a margin of 549 MW in 2022 growing to 829 MW in 2031. This assumes no transmission outages beyond the outage of Neptune.

Figure 34 shows the transmission security margin for the 1-in-10-year load conditions (90/10) under the assumption that the system is in an emergency condition (line-item N). Under emergency conditions, higher line ratings are allowed to be utilized, fewer contingency events are secured for, and SCRs are accounted for as available resources. The limiting contingency combination under emergency conditions is the outage of Sprain Brook — East Garden City 345 kV (Y49) followed by securing for the loss of Dunwoodie — Shore Road 345 kV (Y50). An additional evaluation shown in this figure is the impact of the historical forced outage rate of Zone K thermal generation on the transmission security margin (line-item P). Under both conditions there is sufficient transmission security margin.

For the 1-in-100-year forecast shown in **Figure 35** sufficient transmission security margin is observed for all years assuming that the system is in an emergency condition. An additional evaluation shown in this figure is the impact of the historical forced outage rate of Zone K generation on the transmission security margin (line-item P). Under both conditions there is sufficient transmission security margin. However, if a large facility such as Neptune is also lost in addition to the generator outages, there would be insufficient transmission security margin (line-item P) in years 2022 through 2025.

Figure 36 provides a summary of the transmission security margins under each load level.

Figure 33: Long Island Transmission Security Margin (Summer Baseline Peak Forecast - Normal)

		Peak Load Forecast									
Line	**Item**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
A	**Zone K Load Forecast**	(5,136)	(5,039)	(4,919)	(4,826)	(4,746)	(4,695)	(4,676)	(4,689)	(4,729)	(4,771)
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)**	(4,867)	(4,770)	(4,650)	(4,557)	(4,477)	(4,426)	(4,407)	(4,420)	(4,460)	(4,502)
G	*Resources needed after N-1-1 (A+D)*	(4,207)	(4,110)	(3,990)	(3,897)	(3,817)	(3,766)	(3,747)	(3,760)	(3,800)	(3,842)
H	K Generation (1)	5,161	5,024	5,023	5,023	5,023	5,023	5,022	5,022	5,021	5,021
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)**	5,821	5,684	5,683	5,683	5,683	5,683	5,682	5,682	5,681	5,681
L	*Resources available after N-1-1 (E+K)*	5,161	5,024	5,023	5,023	5,023	5,023	5,022	5,022	5,021	5,021
M	**Transmission Security Margin (F+K)**	954	914	1,033	1,126	1,206	1,257	1,275	1,262	1,221	1,179
N	SCRs (3), (4)	25	25	25	25	25	25	25	25	25	25
O	Forced Outages (2)	(430)	(375)	(375)	(375)	(375)	(375)	(375)	(375)	(375)	(375)
P	**Adjusted Transmission Security Margin (M+N+O) (3)**	549	564	683	776	856	907	925	912	871	829

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources.
3. Special Case Resources (SCRs) are not applied for transmission security analysis of normal operations.
4. Includes a de-rate of 18 MW for SCRs.

Figure 34: Long Island Transmission Security Margin (Summer 1-in-10 (90/10) Peak Forecast - Emergency)

		90th Percentile Load Forecast									
Line	**Item**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
A	**Zone K Load Forecast**	(5,530)	(5,425)	(5,296)	(5,196)	(5,110)	(5,055)	(5,035)	(5,049)	(5,092)	(5,137)
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)**	(4,643)	(4,538)	(4,409)	(4,309)	(4,223)	(4,168)	(4,148)	(4,162)	(4,205)	(4,250)
G	*Resources needed after N-1-1 (A+D)*	(4,643)	(4,538)	(4,409)	(4,309)	(4,223)	(4,168)	(4,148)	(4,162)	(4,205)	(4,250)
H	K Generation (1)	5,161	5,024	5,023	5,023	5,023	5,023	5,022	5,022	5,021	5,021
I	Temperature Based Generation Derates	(38)	(36)	(36)	(36)	(36)	(36)	(36)	(36)	(36)	(36)
J	Net ICAP External Imports	660	660	660	660	660	660	660	660	660	660
K	SCRs (3), (4)	25	25	25	25	25	25	25	25	25	25
L	**Total Resources Available (H+I+J+K)**	5,808	5,674	5,672	5,672	5,672	5,672	5,671	5,671	5,670	5,670
M	*Resources available after N-1-1 (E+L)*	5,808	5,674	5,672	5,672	5,672	5,672	5,671	5,671	5,670	5,670
N	**Transmission Security Margin (F+L)**	1,165	1,136	1,263	1,363	1,449	1,504	1,523	1,509	1,465	1,420
O	Forced Outages (2)	(430)	(375)	(375)	(375)	(375)	(375)	(375)	(375)	(375)	(375)
P	**Adjusted Transmission Security Margin (N+O)**	735	761	888	988	1,074	1,129	1,148	1,134	1,090	1,045

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources.
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 18 MW for SCRs.

Figure 35: Long Island Transmission Security Margin (Summer 1-in-100 Peak Forecast - Emergency)

		1 in 100 Forecast									
Line	**Item**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
A	**Zone K Load Forecast**	(5,843)	(5,733)	(5,596)	(5,490)	(5,399)	(5,341)	(5,320)	(5,334)	(5,380)	(5,428)
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)**	(4,956)	(4,846)	(4,709)	(4,603)	(4,512)	(4,454)	(4,433)	(4,447)	(4,493)	(4,541)
G	*Resources needed after N-1-1 (A+D)*	(4,956)	(4,846)	(4,709)	(4,603)	(4,512)	(4,454)	(4,433)	(4,447)	(4,493)	(4,541)
H	K Generation (1)	5,161	5,024	5,023	5,023	5,023	5,023	5,022	5,022	5,021	5,021
I	Temperature Based Generation Derates	(82)	(77)	(77)	(77)	(77)	(77)	(77)	(77)	(77)	(77)
J	Net ICAP External Imports	660	660	660	660	660	660	660	660	660	660
K	SCRs (3), (4)	25	25	25	25	25	25	25	25	25	25
L	**Total Resources Available (H+I+J+K)**	5,764	5,632	5,631	5,631	5,631	5,631	5,630	5,630	5,629	5,629
M	*Resources available after N-1-1 (E+L)*	5,764	5,632	5,631	5,631	5,631	5,631	5,630	5,630	5,629	5,629
N	**Transmission Security Margin (F+L)**	808	786	922	1,028	1,119	1,177	1,197	1,183	1,136	1,088
O	Forced Outages (2)	(430)	(375)	(375)	(375)	(375)	(375)	(375)	(375)	(375)	(375)
P	**Adjusted Transmission Security Margin (N+O)**	378	411	547	653	744	802	822	808	761	713

Notes:

1. Reflects the 2021 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation wind generation is assumed to have 0 MW output, solar generation is based on the ratio of solar PV nameplate capacity (2021 Gold Book Table I-9a) and solar PV peak reductions (2021 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources.
3. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
4. Includes a de-rate of 18 MW for SCRs.

Figure 36: Summary of Long Island Transmission Security Margin