New York ISO
Independent System Operator

2022 RNA Scenarios Results

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Agenda

- 2022-2023 Reliability Planning Process (RPP) background and scenarios
- 2022 RNA scenarios results

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2022-2023 RPP Background and Scenarios

2022-2023 RPP Background

- **The 2022 Reliability Planning Process (RPP) starts with the 2022 Reliability Needs Assessment (2022 RNA) followed by the 2023-2032 Comprehensive System Plan (CRP)**
  - 2022 RNA Study Period: year 4 = 2026 through year 10 = 2032
  - Note: year 1 through year 5 are assessed quarterly in the Short-Term Reliability Process (STRP)
- **The RPP is part of the Comprehensive System Planning Process and is performed pursuant to the Attachment Y of the NYISO OATT; see Section 31.2.**
  - Additional implementation details, including recently updated RNA Base Case inclusion rules, are captured in the RPP Manual
- **2022 RNA will be based on the information from the Gold Book 2022, the 2022 FERC 715 filing (power flow cases and auxiliary files), historical data, and market participant data**
- **Reliability evaluations on the 2022 RNA Base Case: transmission security and resource adequacy**
  - NERC, NPCC, NYSRC Reliability Rules application on the Bulk Power Transmission Facilities (BPTFs)

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2022 RNA: Scenarios Background

- **One of the objectives of the Reliability Planning Process is to identify, through the development of appropriate scenarios, factors and issues that might adversely impact the reliability of the Bulk Power Transmission Facilities (BPTF)**
  - The scenarios results are for information only
  - Generally, the scenarios will be built off the preliminary ("1st pass") RNA Base Case, unless specifically identified
- **Proposed scenarios were presented at the April 26 ESPWG/TPAS [link]**

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2022 RNA Resource Adequacy Scenarios Results

2022 RNA: High Load

High Load Forecast: Resource Adequacy

	2022 RNA 1st Pass Base Case vs High Load Scenario					
Study Year	Baseline Forecast Load (MW)	High Load Scenario Forecast Load (MW)	Delta MW	RNA Base Case LOLE (days/year)	High Load Scenario LOLE (days/year)	Delta LOLE
2023	32,018	32,780	762	0.025	0.044	0.018
2024	31,778	32,849	1,071	0.018	0.039	0.021
2025	31,505	32,854	1,349	0.024	0.068	0.045
2026	31,339	32,946	1,607	0.004	0.027	0.023
2027	31,292	33,133	1,841	0.005	0.035	0.030
2028	31,317	33,464	2,147	0.004	0.052	0.047
2029	31,468	33,915	2,447	0.005	0.079	0.074
2030	31,684	34,475	2,791	0.006	0.149	0.143
2031	31,946	35,080	3,134	0.010	0.342	0.332
2032	32,214	35,698	3,484	0.022	0.676	0.654

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2022 RNA: Status Quo

"Status-quo" scenario: Transmission Security and Resource Adequacy

- Removal of proposed major transmission and generation projects assumed in the RNA Base Case based on application of the inclusion rules
- Inclusion Rules presented at the April 26 ESPWG/TPAS [link]
  - Note: The Western NY and ACPPTPP projects were kept in service due to their advanced status

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Status-Quo LOLE Results

Study Year		2022 RNA 1st Pass Base Case vs Status-Quo Scenario LOLE *(days/year)*			2022 RNA 1st Pass Base Case vs Remove CHPE Sensitivity LOLE *(days/year)*		
		RNA Base Case	Status Quo	Delta	RNA Base Case	TDI/CHPE Removed	Delta
y1	2023	0.025	0.028	0.003	0.025	0.025	0.000
y2	2024	0.018	0.024	0.007	0.018	0.018	0.000
y3	2025	0.024	0.033	0.010	0.024	0.024	0.001
y4	2026	0.004	0.022	0.018	0.004	0.017	0.013
y5	2027	0.005	0.026	0.021	0.005	0.019	0.014
y6	2028	0.004	0.020	0.015	0.004	0.015	0.011
y7	2029	0.005	0.021	0.017	0.005	0.016	0.012
y8	2030	0.006	0.042	0.036	0.006	0.037	0.031
y9	2031	0.010	0.041	0.031	0.010	0.034	0.024
y10	2032	0.022	0.068	0.046	0.022	0.056	0.034

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Resource Adequacy - Zonal Resource Adequacy Margins (ZRAM)

- **Tipping Points: Resource Adequacy - Zonal Resource Adequacy Margins (ZRAM)**
  - On the 2022 RNA Base Case: identification of the maximum MW level of zonal "perfect capacity" that can be removed from each zone without either causing NYCA LOLE violations, or exceeding the zonal capacity
    - "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

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ZRAM MW Results

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

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Resource Adequacy: CLCPA Scenarios

- Using the Policy Case Scenario #2 for study year 2030 from the 2021 System & Resource Outlook
- Assumptions matrix is posted under the meeting materials and discussed at this meeting

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2022 RNA Transmission Security Scenarios Results

1-in-10-Year Heatwave and 1-in-100-Year Extreme Heatwave Tipping Point Analysis

Heatwave & Extreme Heatwave Tipping Point Analysis

- The July 1, 2022 ESPWG/TPAS meeting RNA preliminary results presentation included the tipping point charts for the statewide system margin as well as the transmission security margins for the Lower Hudson Valley, New York City, and Long Island localities.
- Details of the statewide system margin and transmission security margins of the Lower Hudson Valley, New York City, and Long Island localities under 1-in-10-year heatwave and 1-in-100-year extreme heatwave conditions are shown in the following slides.

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Heatwave – Statewide System Margin

Line	Item	Summer Peak - 1-in-10-Year Heatwave, Emergency Transfer Criteria									
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	NYCA Generation (1)	38,147	38,832	38,323	38,323	38,323	38,323	38,323	38,323	38,323	38,323
B	NYCA Generation Derates (2)	(5,818)	(6,434)	(6,458)	(6,471)	(6,485)	(6,498)	(6,511)	(6,525)	(6,538)	(6,552)
C	Temperature Based Generation Derates	(193)	(193)	(184)	(184)	(184)	(184)	(184)	(184)	(184)	(184)
D	External Area Interchanges (3)	1,844	1,844	1,844	3,094	3,094	3,094	3,094	3,094	3,094	3,094
E	SCRs (4), (5)	860	860	860	860	860	860	860	860	860	860
F	**Total Resources (A+B+C+D+E)**	34,841	34,909	34,385	35,622	35,608	35,595	35,582	35,568	35,555	35,541
G	Load Forecast	(34,016)	(33,758)	(33,467)	(33,288)	(33,238)	(33,263)	(33,422)	(33,649)	(33,926)	(34,209)
H	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
I	**Total Capability Requirement (G+H)**	(35,326)	(35,068)	(34,777)	(34,598)	(34,548)	(34,573)	(34,732)	(34,959)	(35,236)	(35,519)
J	**Statewide System Margin (F+I)**	(485)	(159)	(392)	1,024	1,060	1,022	850	609	319	22
K	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
L	**Statewide System Margin with Full Operating Reserve (J+K)**	(1,795)	(1,469)	(1,702)	(286)	(250)	(288)	(460)	(701)	(991)	(1,288)

Notes:

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

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Extreme Heatwave – Statewide System Margin

Line	Item	Summer Peak - 1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria									
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	NYCA Generation (1)	38,147	38,832	38,323	38,323	38,323	38,323	38,323	38,323	38,323	38,323
B	NYCA Generation Derates (2)	(5,818)	(6,434)	(6,458)	(6,471)	(6,485)	(6,498)	(6,511)	(6,525)	(6,538)	(6,552)
C	Temperature Based Generation Derates	(405)	(405)	(386)	(386)	(386)	(386)	(386)	(386)	(386)	(386)
D	External Area Interchanges (3)	1,844	1,844	1,844	3,094	3,094	3,094	3,094	3,094	3,094	3,094
E	SCRs (4), (5)	860	860	860	860	860	860	860	860	860	860
F	**Total Resources (A+B+C+D+E)**	34,629	34,697	34,183	35,420	35,406	35,393	35,380	35,366	35,353	35,339
G	Load Forecast	(35,713)	(35,443)	(35,138)	(34,951)	(34,897)	(34,921)	(35,088)	(35,326)	(35,617)	(35,910)
H	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
I	**Total Capability Requirement (G+H)**	(37,023)	(36,753)	(36,448)	(36,261)	(36,207)	(36,231)	(36,398)	(36,636)	(36,927)	(37,220)
J	**Statewide System Margin (F+I)**	(2,394)	(2,056)	(2,265)	(841)	(801)	(838)	(1,018)	(1,270)	(1,574)	(1,881)
K	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
L	**Statewide System Margin with Full Operating Reserve (J+K)**	(3,704)	(3,366)	(3,575)	(2,151)	(2,111)	(2,148)	(2,328)	(2,580)	(2,884)	(3,191)

Notes:

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

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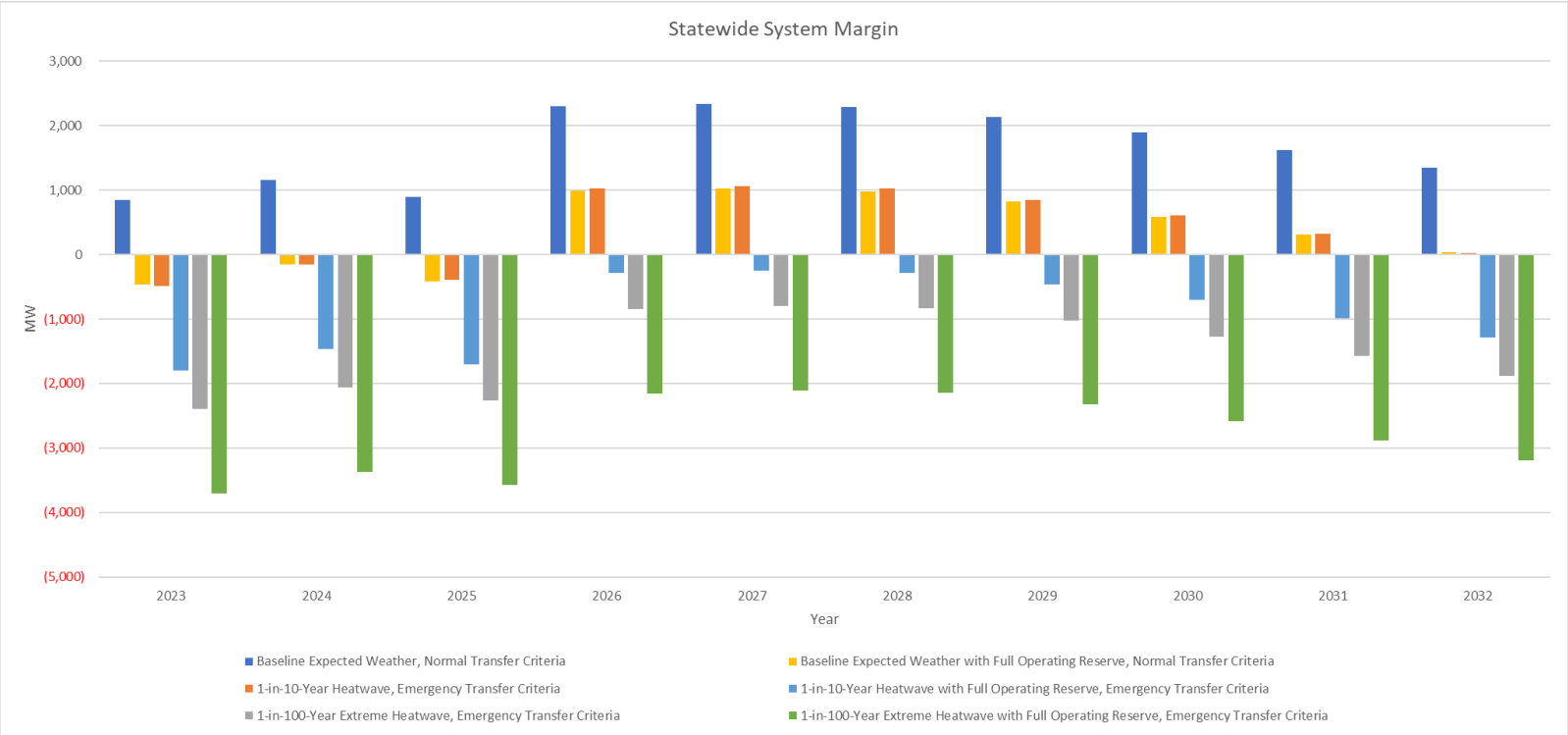
Statewide System Margin



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Heatwave: Lower Hudson Valley Transmission Security Margin

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

Notes:

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

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Extreme Heatwave: Lower Hudson Valley Transmission Security Margin

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

Notes:

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

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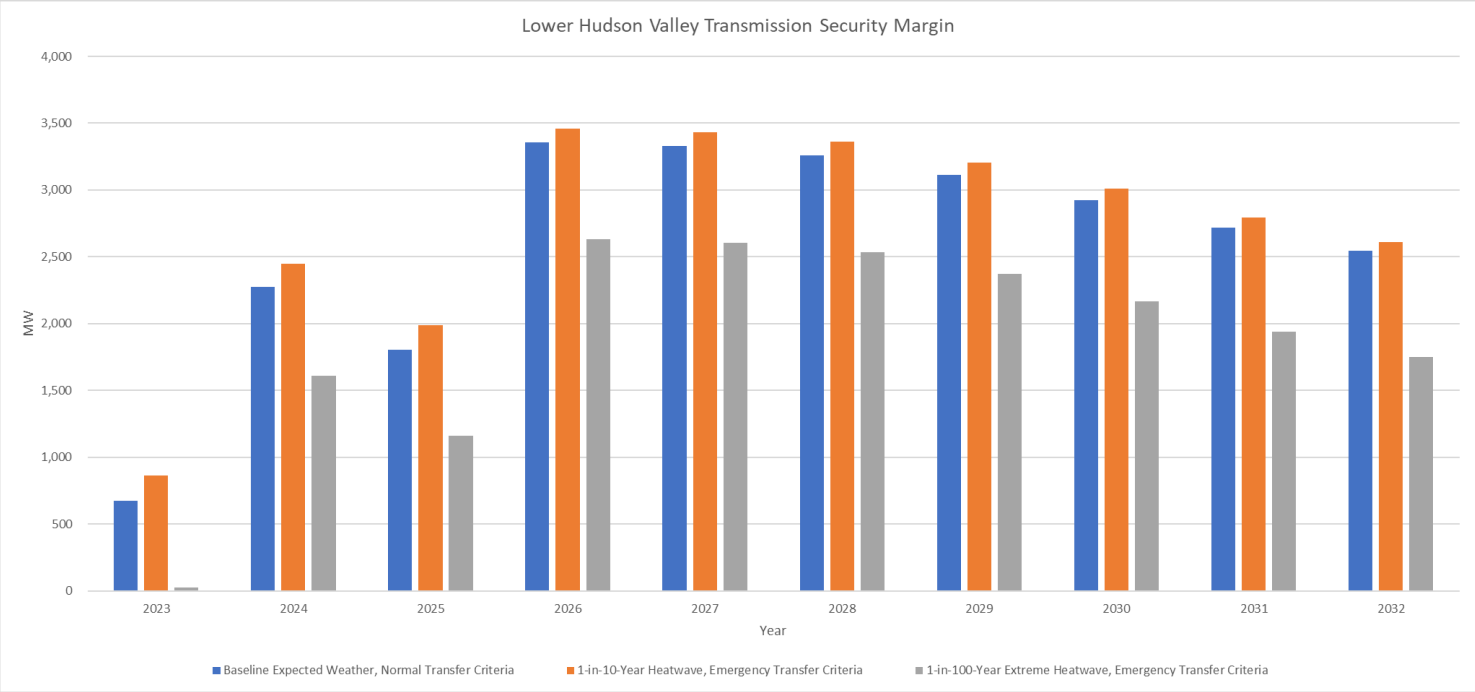
Lower Hudson Valley Transmission Security Margin



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Heatwave: New York City Transmission Security Margin

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

Notes:

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

New York ISO

Extreme Heatwave: New York City Transmission Security Margin

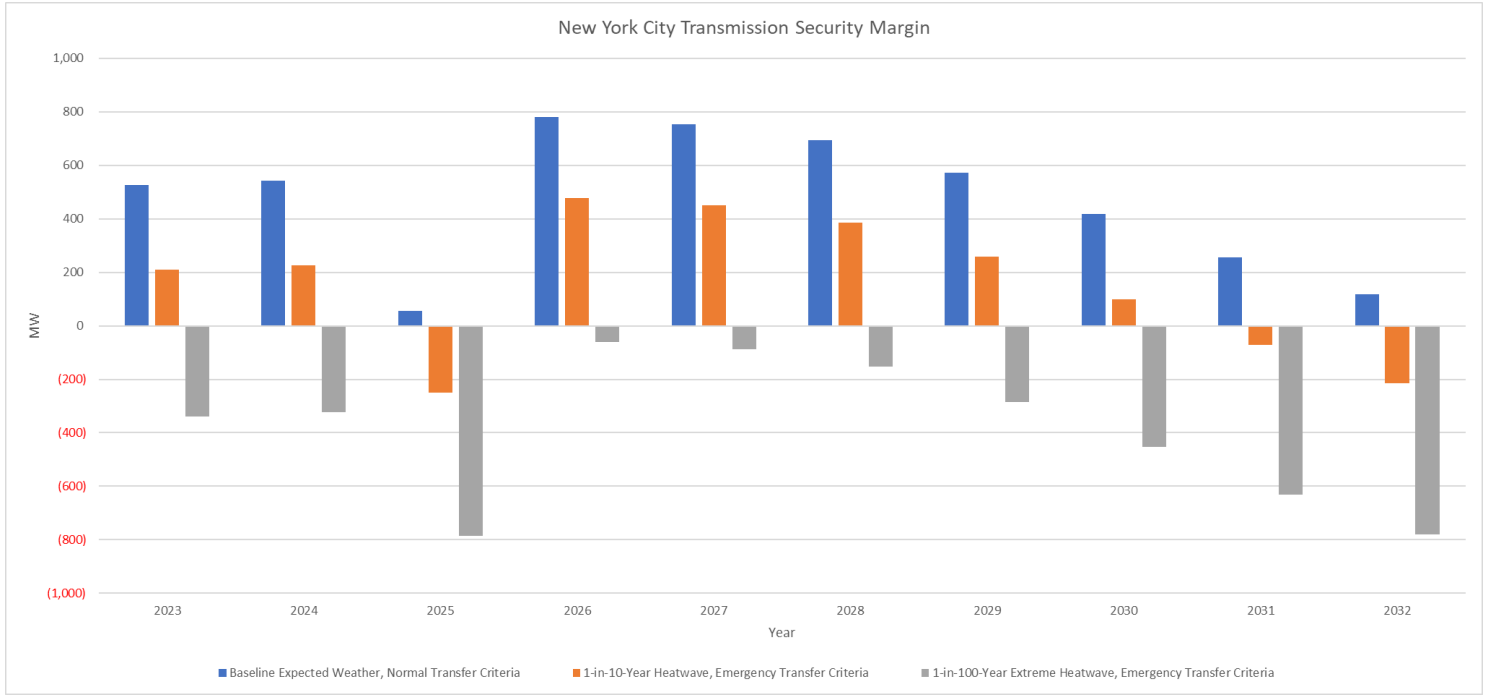
Summer Peak - 1-in-100-Year Extreme Heatwave, Emergency Transfer Criteria											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	**Zone J Load Forecast**	(11,802)	(11,785)	(11,729)	(11,721)	(11,749)	(11,814)	(11,947)	(12,114)	(12,292)	(12,442)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

Notes:

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

New York ISO

New York City Transmission Security Margin



New York ISO

Heatwave: Long Island Transmission Security Margin

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

Notes:

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

New York ISO

Extreme Heatwave: Long Island Transmission Security Margin

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

Notes:

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

New York ISO

Long Island Transmission Security Margin

New York ISO

Status-Quo Tipping Point Analysis

Status-Quo: Transmission Security Results

- Steady state thermal overloads are observed in Zones A, C, I, J, and K
  - None of these thermal overloads are observed in the RNA base case
- Details of the statewide system margin and transmission security margins of the Lower Hudson Valley, New York City, and Long Island localities are shown in the following slides
- Margins are calculated for expected, heatwave, and extreme heatwave conditions

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

New York ISO

Status-Quo: Statewide System Margin

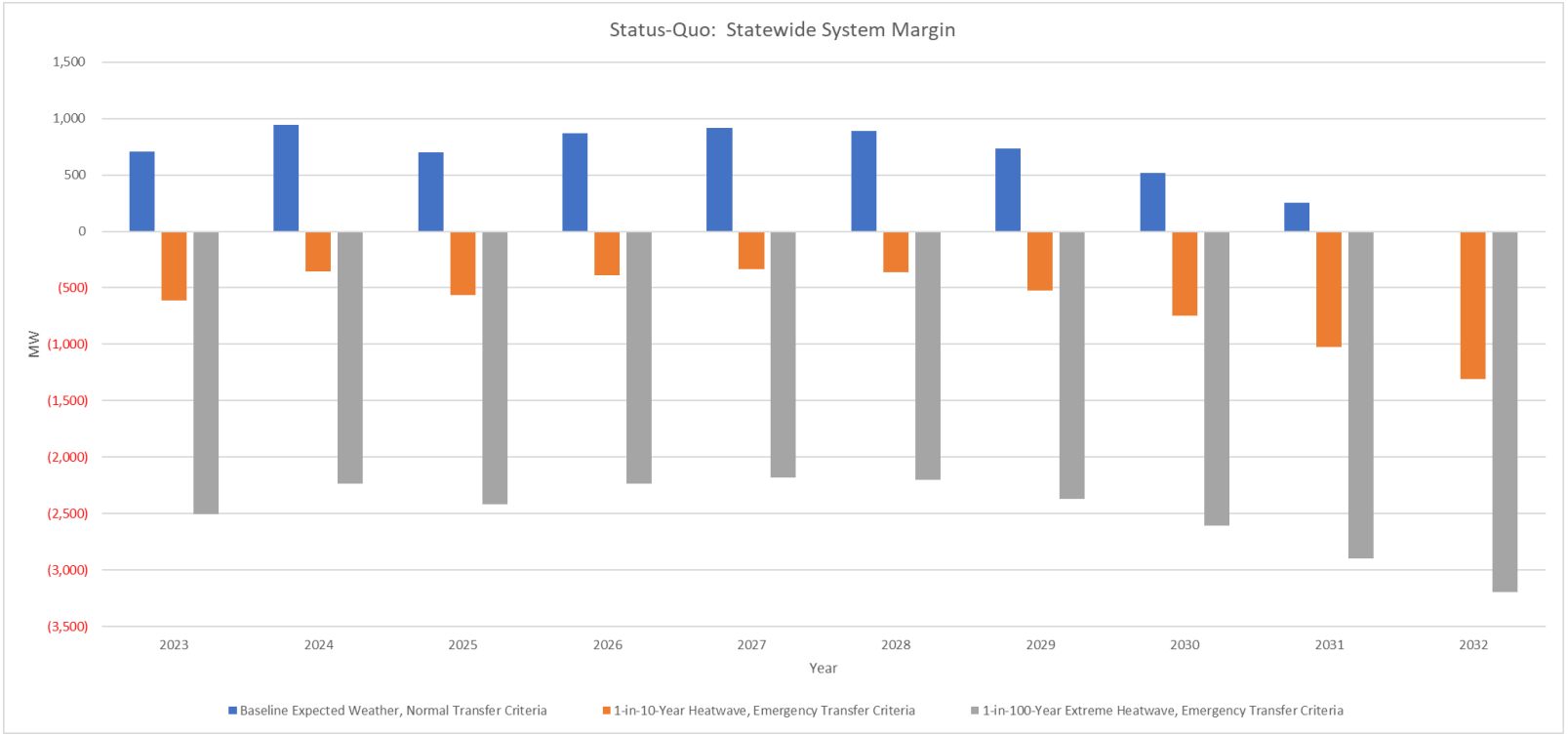
Line	Item	Summer Peak - Baseline Expected Summer Weather, Normal Transfer Criteria									
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	NYCA Generation (1)	36,730	36,730	36,130	36,130	36,130	36,130	36,130	36,130	36,130	36,130
B	NYCA Generation Derates (2)	(4,541)	(4,542)	(4,458)	(4,459)	(4,459)	(4,460)	(4,460)	(4,461)	(4,461)	(4,462)
C	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
D	External Area Interchanges (3)	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844	1,844
E	**Total Resources (A+B+C+D)**	34,033	34,032	33,516	33,516	33,515	33,514	33,514	33,513	33,513	33,512
F	Load Forecast	(32,018)	(31,778)	(31,505)	(31,339)	(31,292)	(31,317)	(31,468)	(31,684)	(31,946)	(32,214)
G	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
H	**Total Capability Requirement (F+G)**	(33,328)	(33,088)	(32,815)	(32,649)	(32,602)	(32,627)	(32,778)	(32,994)	(33,256)	(33,524)
I	**Statewide System Margin (E+H)**	705	944	701	867	913	887	736	519	257	(12)
J	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
K	**Statewide System Margin with Full Operating Reserve (I+J)**	(605)	(366)	(609)	(443)	(397)	(423)	(574)	(791)	(1,053)	(1,322)

Notes:

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

New York ISO

Status-Quo: Statewide System Margin



New York ISO

Status-Quo: Lower Hudson Valley Transmission Security Margin

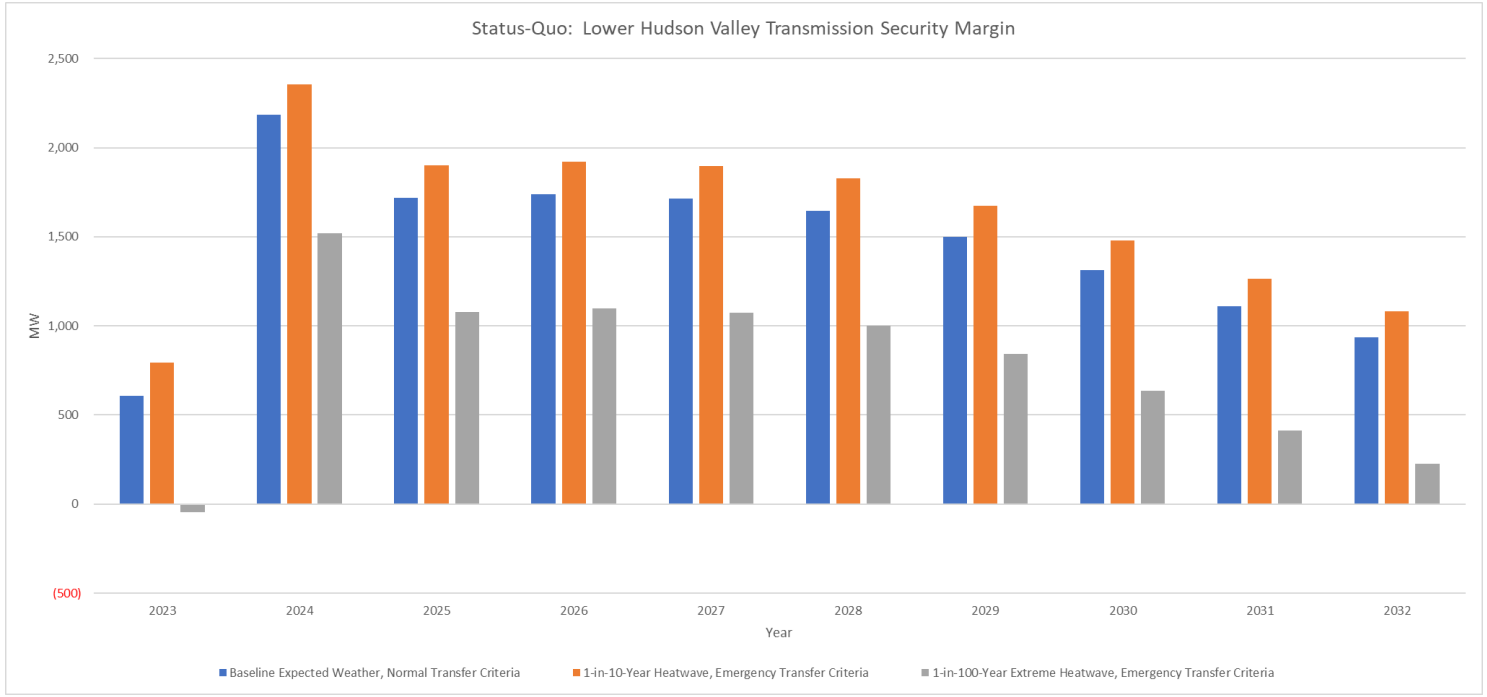
Summer Peak - Baseline Expected Weather, Normal Transfer Criteria											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	G-J Load Forecast	(15,061)	(15,026)	(14,957)	(14,936)	(14,959)	(15,027)	(15,173)	(15,360)	(15,560)	(15,735)
B	RECO Load	(394)	(394)	(394)	(394)	(394)	(394)	(394)	(394)	(397)	(397)
C	**Total Load (A+B)**	(15,455)	(15,420)	(15,351)	(15,330)	(15,353)	(15,421)	(15,567)	(15,754)	(15,957)	(16,132)
D	UPNY-SENY Limit (3)	3,200	5,725	5,725	5,725	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	5,809	5,809	5,809	5,809	5,809	5,809	5,809	5,809	5,809
H	Loss of Source Contingency	0	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)	(980)
I	**Resource Need (C+G+H)**	(12,171)	(10,591)	(10,522)	(10,501)	(10,524)	(10,592)	(10,738)	(10,925)	(11,128)	(11,303)
J	G-J Generation (1)	13,484	13,484	12,884	12,884	12,884	12,884	12,884	12,884	12,884	12,884
K	G-J Generation Derates (2)	(1,022)	(1,022)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)
L	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
M	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
N	**Total Resources Available (J+K+L+M)**	12,777	12,777	12,239	12,239	12,239	12,239	12,239	12,239	12,239	12,239
O	**Transmission Security Margin (I+N)**	606	2,186	1,717	1,738	1,715	1,647	1,501	1,314	1,111	936

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the de-rates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). De-rates for run-of-river hydro are included as well as the Oswego
3. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based also based on the summer peak 2025 representations evaluated in the post-2020 RNA analysis.

New York ISO

Status-Quo: Lower Hudson Valley Transmission Security Margin



New York ISO

Status-Quo: New York City Transmission Security Margin (Removal of CHPE)

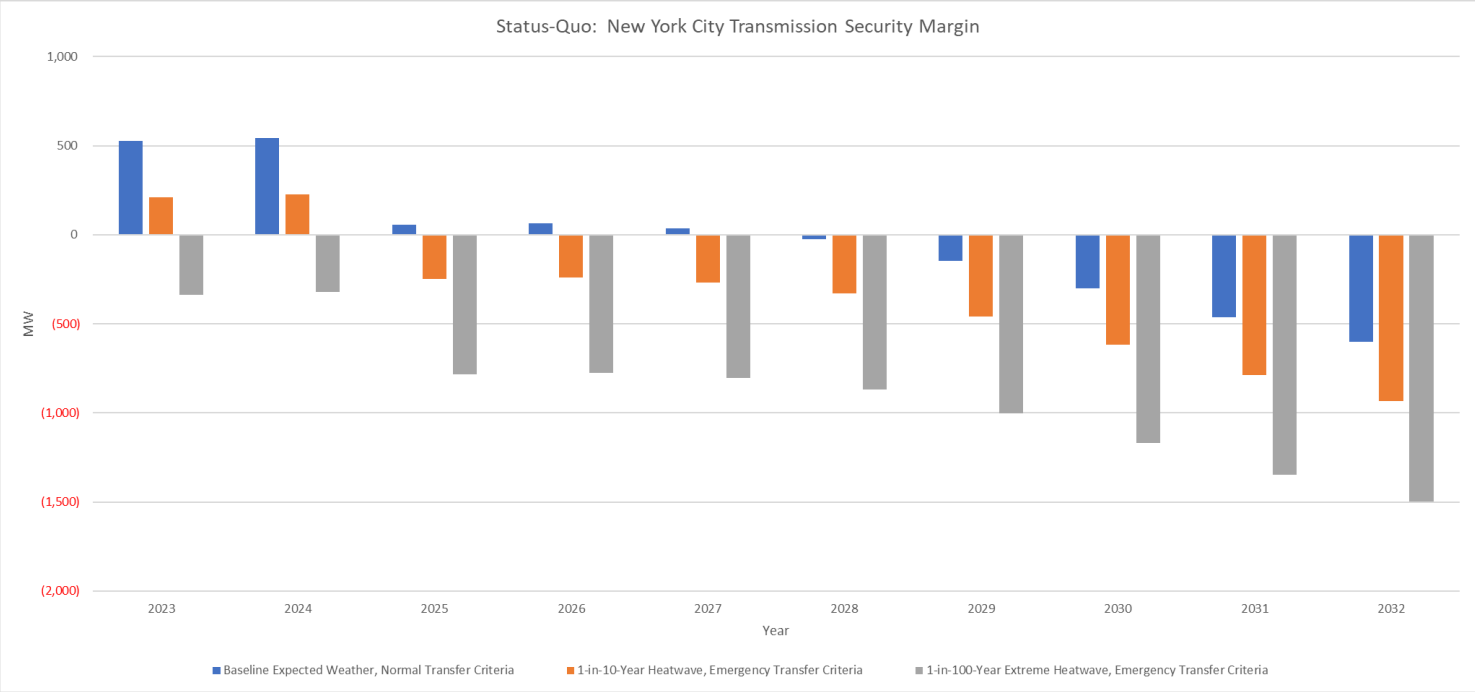
Summer Peak - Baseline Expected Weather, Normal Transfer Criteria											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	**Zone J Load Forecast**	(10,853)	(10,837)	(10,786)	(10,778)	(10,804)	(10,864)	(10,986)	(11,140)	(11,303)	(11,441)
B	I+K to J (3)	3,904	3,904	3,904	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)**	(7,940)	(7,924)	(7,873)	(7,865)	(7,891)	(7,951)	(8,073)	(8,227)	(8,390)	(8,528)
G	J Generation (1)	8,796	8,796	8,197	8,197	8,197	8,197	8,197	8,197	8,197	8,197
H	J Generation Derates (2)	(645)	(645)	(584)	(584)	(584)	(584)	(584)	(584)	(584)	(584)
I	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
K	**Total Resources Available (H+I+J)**	8,466	8,466	7,928	7,928	7,928	7,928	7,928	7,928	7,928	7,928
L	**Transmission Security Margin (F+K)**	526	542	54	62	36	(24)	(146)	(300)	(463)	(601)

Notes:

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

New York ISO

Status-Quo: New York City Transmission Security Margin (Removal of CHPE)



New York ISO

Status-Quo: Long Island Transmission Security Margin

Summer Peak - Baseline Expected Weather, Normal Transfer Criteria										
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	**Zone K Load Forecast**	(4,951)	(4,870)	(4,782)	(4,746)	(4,768)	(4,806)	(4,857)	(4,907)	(4,956)	(5,007)
B	I+J to K	929	929	929	929	929	929	929	929	929	929
C	New England Import (NNC)	0	0	0	0	0	0	0	0	0	0
D	**Total K AC Import (B+C)**	929	929	929	929	929	929	929	929	929	929
E	Loss of Source Contingency	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)
F	**Resource Need (A+D+E)**	(4,682)	(4,601)	(4,513)	(4,477)	(4,499)	(4,537)	(4,588)	(4,638)	(4,687)	(4,738)
G	K Generation (1)	4,089	4,089	3,865	3,865	3,865	3,865	3,865	3,865	3,865	3,865
H	K Generation Derates (2)	(374)	(375)	(352)	(353)	(353)	(353)	(354)	(354)	(354)	(354)
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)**	4,375	4,374	4,173	4,172	4,172	4,171	4,171	4,171	4,170	4,170
L	**Transmission Security Margin (F+K)**	(307)	(227)	(340)	(305)	(327)	(366)	(417)	(467)	(517)	(568)

Notes:

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

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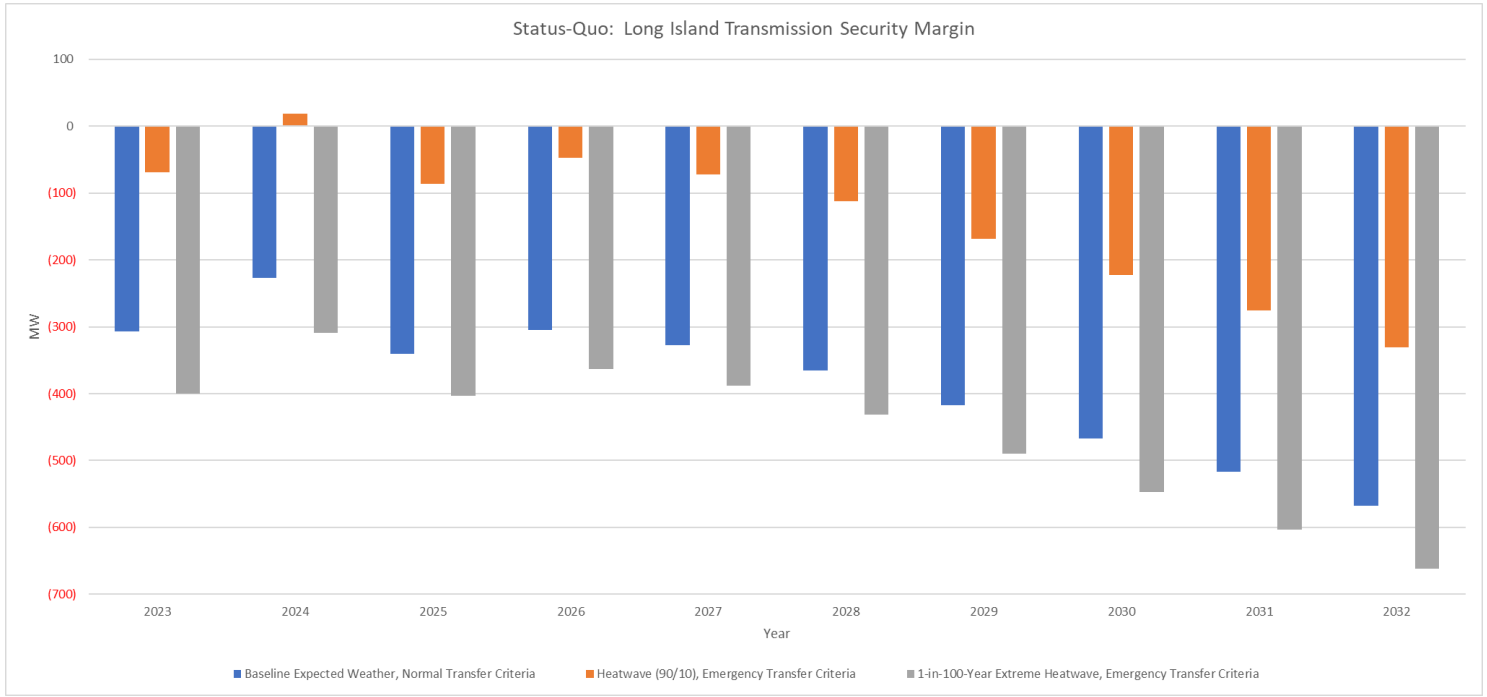
Status-Quo: Long Island Transmission Security Margin



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Comparison of RNA Base Case and Status Quo Margins

Statewide System Margin - Baseline Expected Weather, Normal Transfer Criteria											
Line	Item	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	RNA Base Case	845	1,154	894	2,296	2,330	2,292	2,127	1,898	1,622	1,341
B	Status Quo Sensitivity Case	705	944	701	867	913	887	736	519	257	(12)
C	Margin Benefit of Planned Projects (A-B)	140	210	193	1,430	1,417	1,404	1,391	1,378	1,365	1,352

Lower Hudson Valley Transmission Security Margin - Baseline Expected Weather, Normal Transfer Criteria											
Line	Item	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	RNA Base Case	676	2,277	1,806	3,356	3,331	3,261	3,113	2,925	2,721	2,546
B	Status Quo Sensitivity Case	606	2,186	1,717	1,738	1,715	1,647	1,501	1,314	1,111	936
C	Margin Benefit of Planned Projects (A-B)	70	91	89	1,617	1,616	1,613	1,612	1,611	1,609	1,609

New York City Transmission Security Margin - Baseline Expected Weather, Normal Transfer Criteria											
Line	Item	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	RNA Base Case	526	542	54	780	754	694	572	418	255	117
B	Status Quo Sensitivity Case	526	542	54	62	36	(24)	(146)	(300)	(463)	(601)
C	Margin Benefit of Planned Projects (A-B)	0	0	0	718	718	718	718	718	718	718

Long Island Transmission Security Margin - Baseline Expected Weather, Normal Transfer Criteria											
Line	Item	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	RNA Base Case	478	571	659	694	672	633	581	531	481	430
B	Status Quo Sensitivity Case	(307)	(227)	(340)	(305)	(327)	(366)	(417)	(467)	(517)	(568)
C	Margin Benefit of Planned Projects (A-B)	785	798	999	999	999	998	998	998	998	998

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Questions?

Roles of the NYISO

- **Reliable operation of the bulk electricity grid**
  - Managing the flow of power on 11,000 circuit-miles of transmission lines from hundreds of generating units
- **Administration of open and competitive wholesale electricity markets**
  - Bringing together buyers and sellers of energy and related products and services
- **Planning for New York's energy future**
  - Assessing needs over a 10-year horizon and evaluating projects proposed to meet those needs
- **Advancing the technological infrastructure of the electric system**
  - Developing and deploying information technology and tools to make the grid smarter

New York ISO

Our Mission & Vision

Mission

Ensure power system reliability and competitive markets for New York in a clean energy future

Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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