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Independent System Operator

# Transmission Security Margins and Statewide System Margin


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## NYSRC Reliability Rules Subcommittee

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# Background

# Reliability Planning Practices

- The 2021-2030 Comprehensive Reliability Plan (CRP), published December 2021, concluded that while the state's bulk electric system is expected to meet current reliability requirements, risks to reliability and resilience remain. The CRP included recommendations for enhancements to rules and procedures to maintain reliability and resiliency.
- In May 2022, the NYISO presented to TPAS/ESPWG proposed enhancements regarding generation availability and operating reserves to reflect "credible combinations of system conditions."
- Following discussions with stakeholders and NYSRC, the enhancements were captured in the Reliability Planning Process Manual, approved by the Operating Committee on June 23, 2022.
- The enhancements were first reflected in the 2022 Reliability Needs Assessment (RNA) and the 2022 Q3 Short Term Assessment of Reliability (STAR), with results presented as "margins" or "tipping points."

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# NYSRC Reliability Definition: Two Parts

- ***Reliability*** **– The degree of performance of the bulk electric system that results in electricity being delivered to customers within accepted standards and in the amount desired. Reliability may be measured by the frequency, duration, and magnitude of adverse effects on the electric supply. Electric system reliability can be addressed by considering two basic and functional aspects of the electric system – adequacy and security.**
  - *Adequacy* – The ability of the electric system to supply the aggregate electrical *demand* and energy requirements of the customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system *element*s.
  - *Security* – The ability of the electric system to withstand *disturbance*s such as electric short circuits or unanticipated loss of system *element*s.

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# Transmission System Planning Performance Requirements

- NERC Standards, NPCC Criteria, NYSRC Rules all specify the analysis to be performed and contingency events to be evaluated
- NYSRC Reliability Rule B.1-R1.1:
  - "Credible combinations of system conditions which stress the system shall be modeled, including load forecast, internal NYCA and inter-Area and transfers, transmission configuration, active and reactive resources, generation availability, and other dispatch scenarios."
- All contingencies listed in Table B2 "NYSRC Planning Design Criteria: Contingency Event," in the reliability rules apply under normal transfer criteria.

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# NYSRC Rules Section E excerpts

- At all times sufficient ten (10) minute operating reserve shall be maintained to cover the energy loss due to the most severe Normal Transfer Criteria contingency within the NYCA or the energy loss caused by the cancellation of an interruptible energy purchase from another system, whichever is greater multiplied by the Contingency Reserve Adjustment Factor.
- Following a contingency, the ten (10) minute operating reserve shall be restored within thirty (30) minutes of the time that the contingency occurred, or sooner if possible.

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# NYSRC Rules: Operating States

- **Section 1.2.9: NYS Bulk Power System Operating States**
  - **An objective of the Reliability Rules is to provide for the operation of the NYS Bulk Power System within the normal state.** It is recognized, however, that certain system conditions may cause the system to depart from the normal state to four other system operating states: Warning, Alert, Major Emergency, and Restoration.
  - Examples of system conditions that could cause departure from the normal state are: capacity deficiencies, energy deficiencies, loss of generation or transmission facilities, transmission facility overloads and high or low voltages, abnormal power system frequency, and environmental episodes.
  - When the system enters an operating state other than the normal state, **the primary objective of the NYISO shall be to return the system to the normal state as soon as possible** by achieving the criteria set forth in the above referenced NYS Bulk Power System operating state document.

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# New York City Transmission Security Margin

# 2023-Q2 Reliability Findings

- The planned system through the study period meets the resource adequacy criterion
- Beginning in summer 2025, the transmission security margin within New York City is deficient by 306 MW under expected weather conditions with baseline demand
  - This deficiency may last over a period of 7 hours
- Depending on the realization of various policy objectives and the level of economic growth impacting the projected demand, the deficiency could be as large as 446 MW
  - This deficiency may last over a period of 9 hours
- Beyond 2025, the reliability margins within New York City may not be sufficient if (i) the CHPE project experiences a delay from Spring 2026, (ii) there are additional generator deactivations beyond what is already planned, or (iii) demand is greater than forecasted.
- The statewide system margin is projected to be deficient by nearly 150 MW when accounting for large load projects. Depending on the nature of the solution to the New York City need identified in this STAR, that solution may also address the statewide system margin deficiency.

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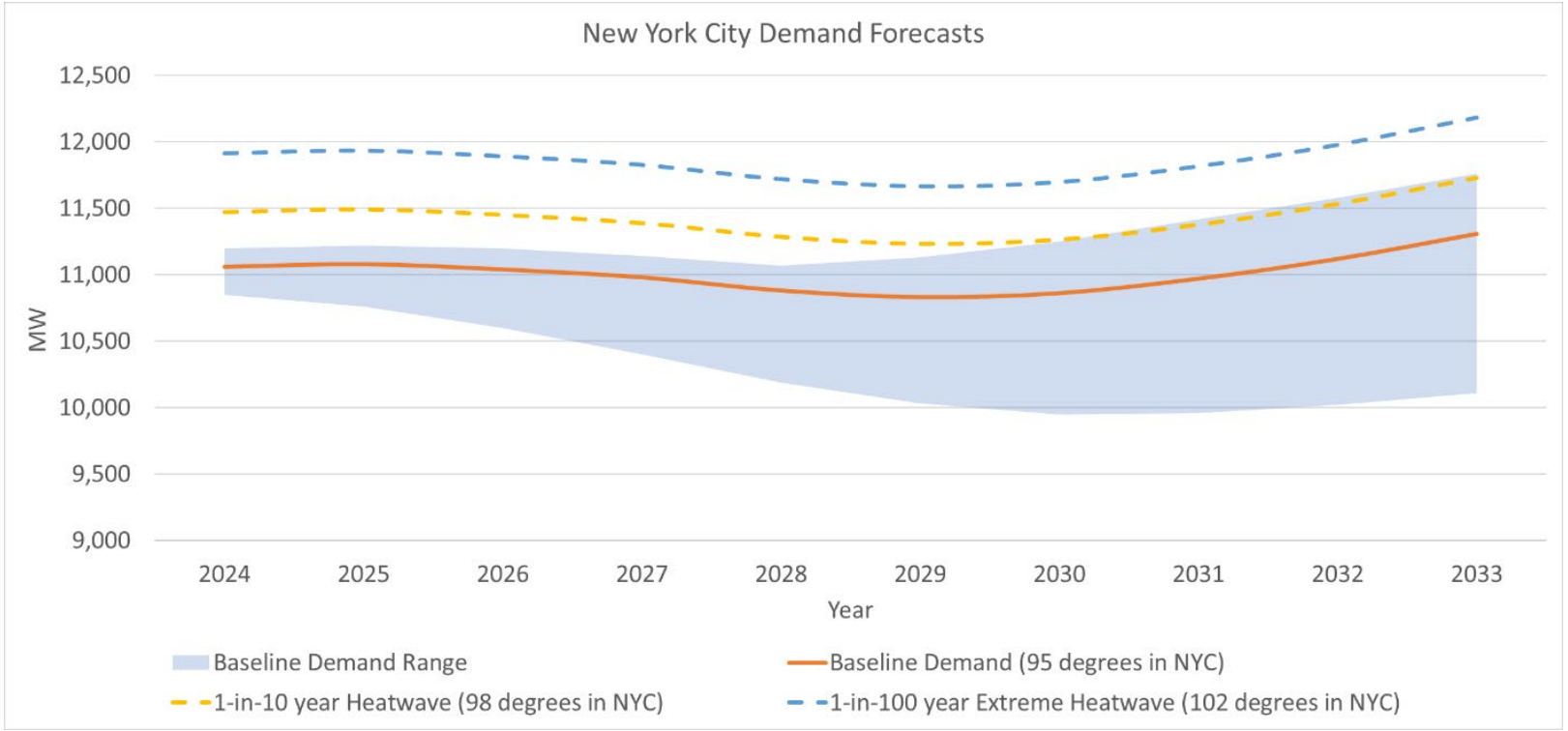
# New York City Demand Forecasts

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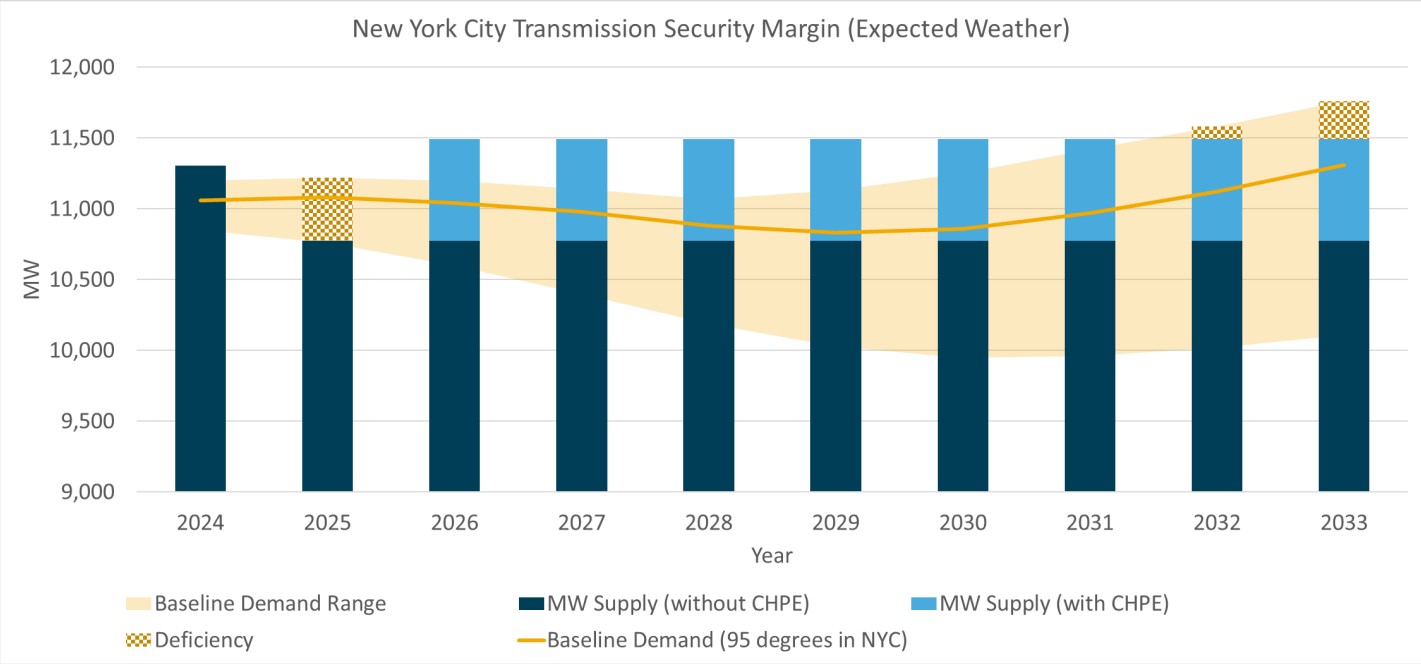
# NYC Supply vs. Demand

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# New York City Transmission Security Margin Calculation

**Figure 62: New York City Transmission Security Margin (Summer Peak – Expected Weather, Normal Transfer Criteria with CHPE)**

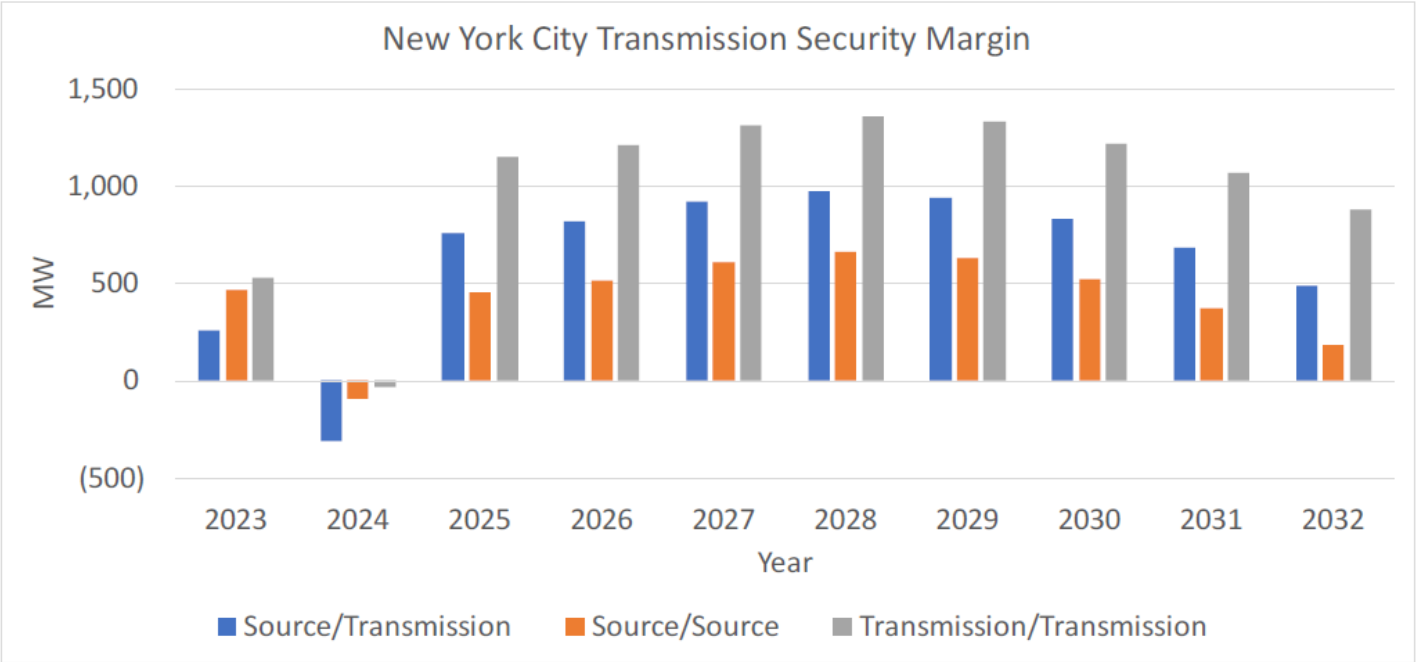
| Summer Peak - Baseline Expected Weather, Normal Transfer Criteria (MW) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Item | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
| A | **Zone J Demand Forecast (4)** | (11,060) | (11,080) | (11,040) | (10,980) | (10,880) | (10,830) | (10,860) | (10,970) | (11,120) | (11,310) |
| | | | | | | | | | | | |
| B | I+K to J (3) | 3,904 | 3,904 | 4,622 | 4,622 | 4,622 | 4,622 | 4,622 | 4,622 | 4,622 | 4,622 |
| C | ABC PARs to J | (11) | (11) | (11) | (11) | (11) | (11) | (11) | (11) | (11) | (11) |
| D | **Total J AC Import (B+C)** | 3,893 | 3,893 | 4,611 | 4,611 | 4,611 | 4,611 | 4,611 | 4,611 | 4,611 | 4,611 |
| | | | | | | | | | | | |
| E | Loss of Source Contingency | (987) | (987) | (2,237) | (2,237) | (2,237) | (2,237) | (2,237) | (2,237) | (2,237) | (2,237) |
| F | **Resource Need (A+D+E)** | (8,154) | (8,174) | (8,666) | (8,606) | (8,506) | (8,456) | (8,486) | (8,596) | (8,746) | (8,936) |
| | | | | | | | | | | | |
| G | J Generation (1) | 8,749 | 8,159 | 8,159 | 8,159 | 8,159 | 8,159 | 8,159 | 8,159 | 8,159 | 8,159 |
| H | J Generation Derates (2) | (665) | (605) | (605) | (605) | (605) | (605) | (605) | (605) | (605) | (605) |
| I | Temperature Based Generation Derates | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| J | Net ICAP External Imports | 315 | 315 | 1,565 | 1,565 | 1,565 | 1,565 | 1,565 | 1,565 | 1,565 | 1,565 |
| K | **Total Resources Available (G+H+I+J)** | 8,399 | 7,868 | 9,118 | 9,118 | 9,118 | 9,118 | 9,118 | 9,118 | 9,118 | 9,118 |
| | | | | | | | | | | | |
| L | **Baseline Transmission Security Margin (F+K)** | 244 | (306) | 452 | 512 | 612 | 662 | 632 | 522 | 372 | 182 |
| M | Higher Policy Demand Impact | (140) | (140) | (160) | (160) | (190) | (300) | (390) | (450) | (460) | (450) |
| N | **Higher Policy Transmission Security Margin (L+M)** | 104 | (446) | 292 | 352 | 422 | 362 | 242 | 72 | (88) | (268) |

Notes:

1. Reflects the 2023 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at
3. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2033 are based on the summer peak 2032 represenations evalauted in the 2022 RNA.
4. Reflects the he final 10-year peak forecasts presented to stakeholders at the April 5, 2023 LFTF/ESPWG (No large load projects included in this assessment are within this locality).

# Most Limiting N-1-1-0 combinations

**Figure 58: Impact of Contingency Combination on Zone J Transmission Security Margin**

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# Thermal Unit Derates

**Figure 7: NERC Five-Year Class Average Outage Rate**

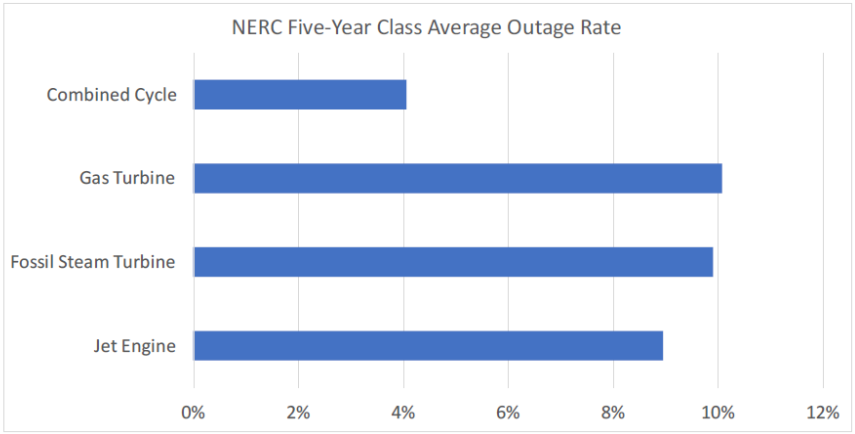
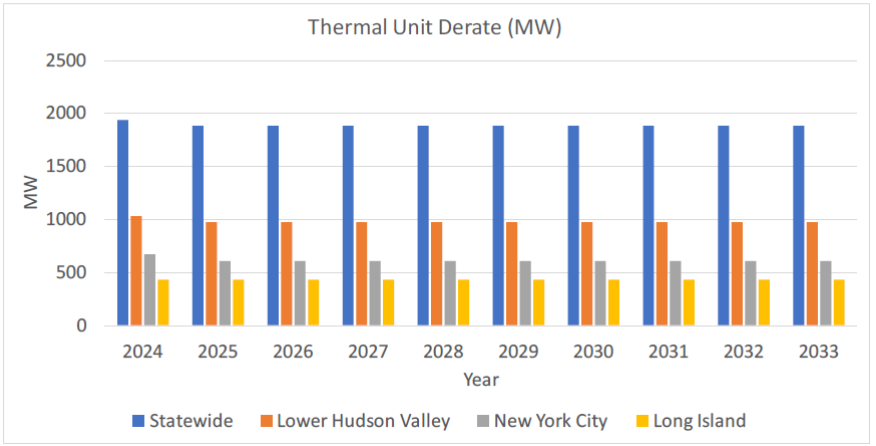



**Figure 8: Thermal Unit Derate (MW) for New York**

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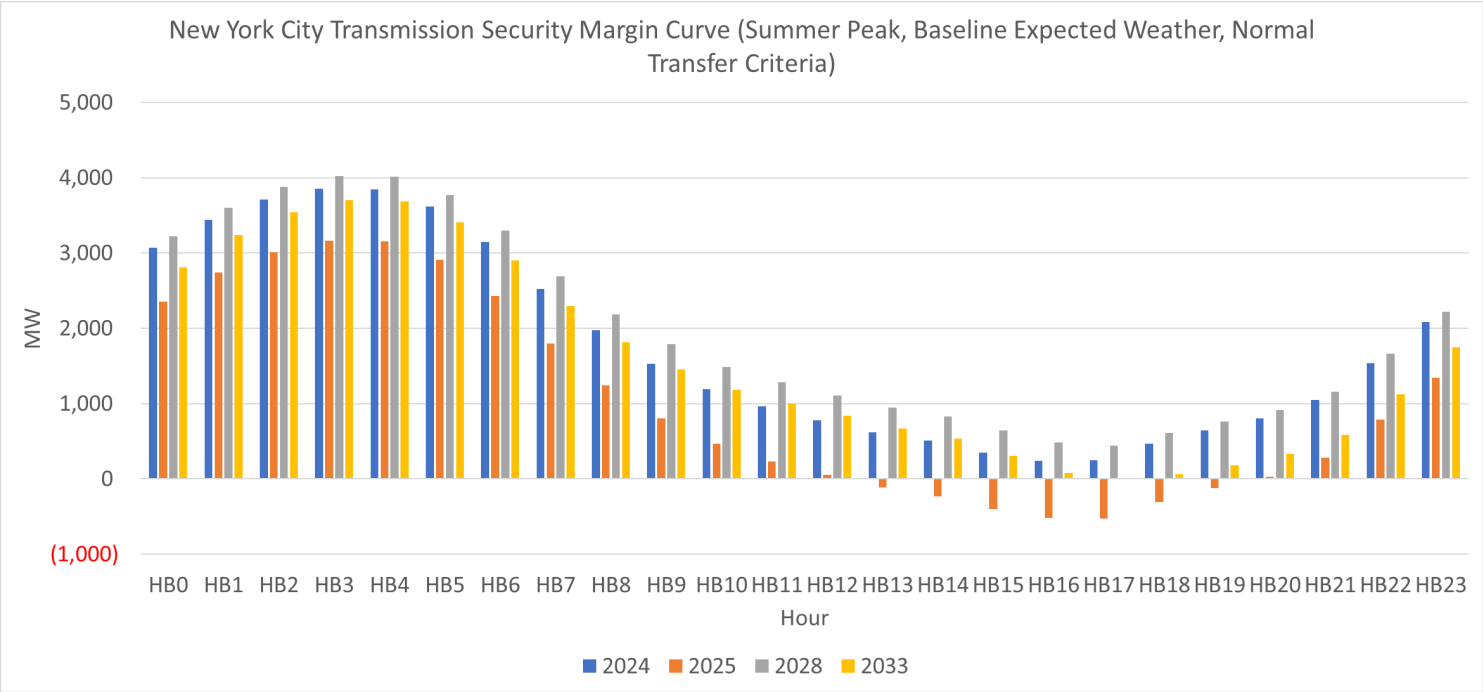
# New York City Transmission Security Margin Curve

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# Need to Retain Peakers

- No viable or sufficient solutions were offered to address the 2025 need. Zone J is deficient by as much as 446 MW for a duration of nine hours
- Peaker MW available (contribution to the need, accounting for outage derate)
  - Gowanus 2 = 127.8 MW
  - Gowanus 3 = 123.1 MW
  - Narrows 1 = 128.4 MW
  - Narrows 2 = 128.7 MW
- All four barges are needed to address 446 MW deficiency

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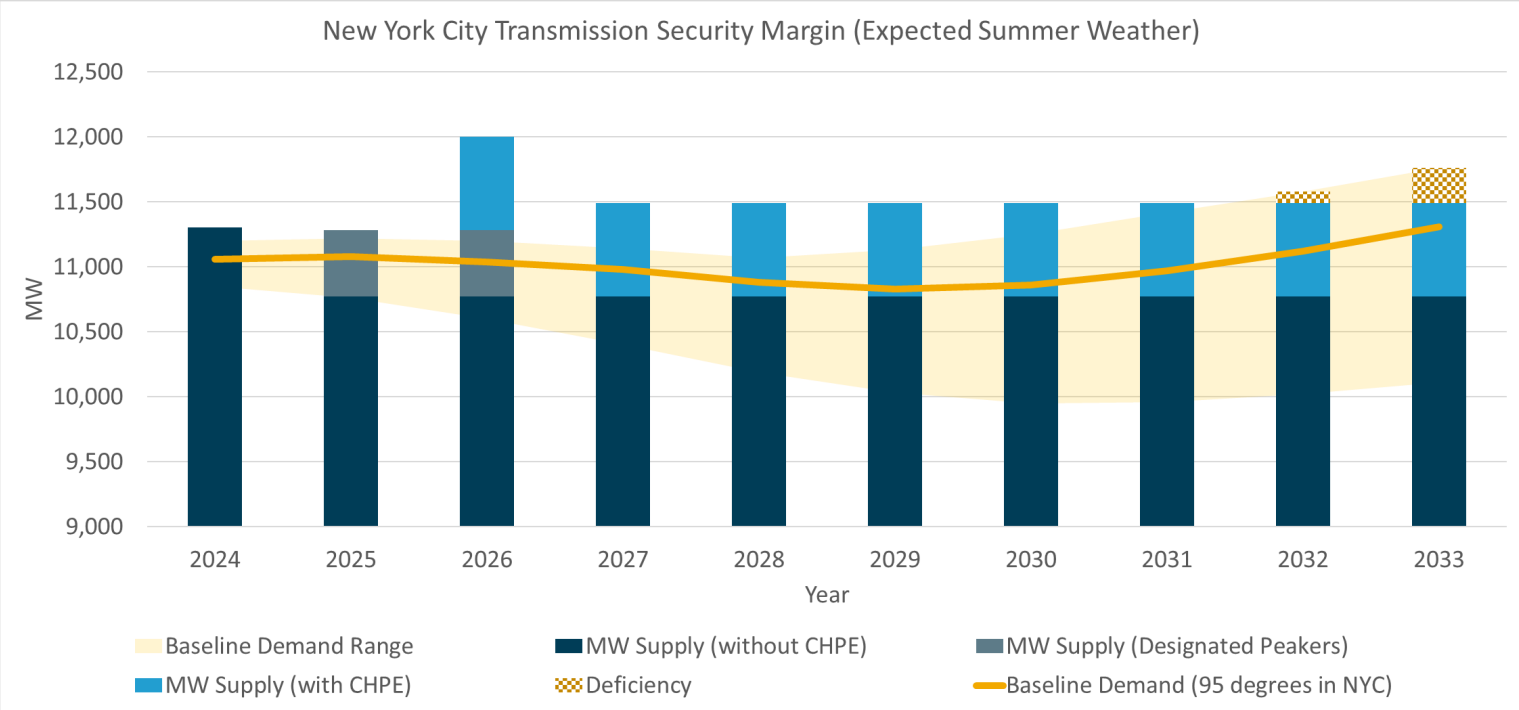
# New York City Margin with Designated Peakers

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# Peaker Designation

- To ensure the continued reliability of electric service in New York City, the NYISO is designating the generators on the Gowanus 2 & 3 and Narrows 1 & 2 barges to temporarily remain in operation after the DEC Peaker Rule compliance date until permanent solutions to the Need are in place, for an initial period of up to two years (May 1, 2027).
- There is a potential for an additional two-year extension (to May 1, 2029) if reliability needs still exist, as provided by the DEC Peaker Rule.
- Through the quarterly STAR studies, the NYISO will continuously evaluate the reliability of the system as changes occur and will carefully monitor the progress of the Champlain Hudson Power Express ("CHPE") project toward completion, currently scheduled to enter service in spring 2026.

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# Statewide System Margin

# Objective

- Per NYSRC Rules, when the system enters an operating state other than the Normal State, the primary objective of the NYISO shall be to return the system to the Normal State as soon as possible.
- The Statewide System Margin measures the amount of generation and net imports available to supply firm load with the bulk power transmission system within applicable normal ratings and limits (i.e., Normal Transfer Criteria), while maintaining 10-minute operating reserves.

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# Statewide System Margin

- **Currently the Statewide System Margin represents Normal State for expected weather (50/50), securing for N-1-1**
  - Largest loss-of-source is the first contingency event, followed by system adjustments to restore 10-minute operating reserve within 30 minutes of the time that the contingency occurred.
  - Accounts for firm external area interchanges based upon ERAG MMWG interchange transaction schedules coordinated with neighboring systems, as represented in annual FERC 715 cases.
  - No SCRs, load curtailment, or other emergency operating procedures are accounted for.
- **NYISO also reports statewide margins for extreme weather (90/10, 99/1), which represents a Warning State utilizing Emergency Transfer Criteria**
  - Accounts for SCRs

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## Figure 24: Statewide System Margin (Summer Peak - Expected Weather, Normal Transfer Criteria)

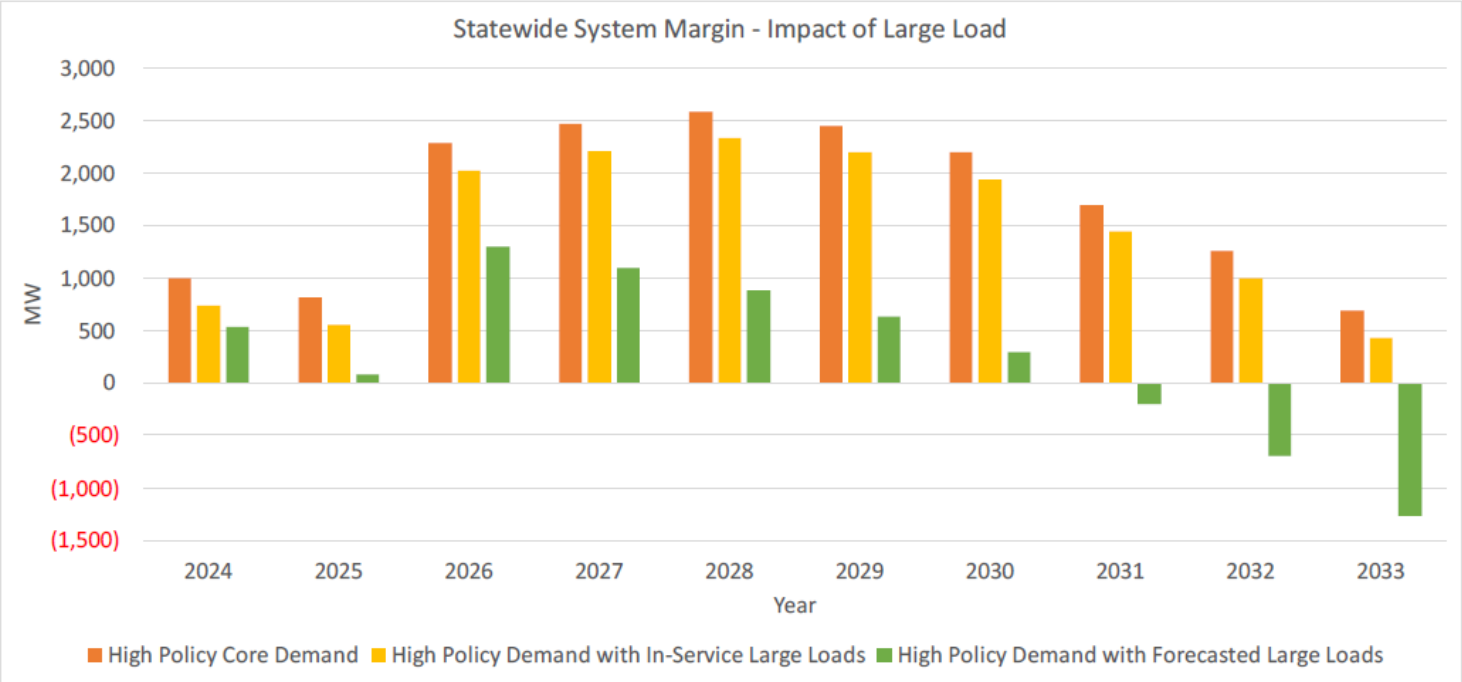
| Line | Item | Summer Peak - Baseline Expected Summer Weather, Normal Transfer Criteria (MW) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
| A | NYCA Generation (1) | 38,066 | 38,343 | 38,343 | 38,343 | 38,343 | 38,343 | 38,343 | 38,343 | 38,343 | 38,343 |
| B | NYCA Generation Derates (2) | (5,863) | (6,567) | (6,582) | (6,596) | (6,610) | (6,624) | (6,624) | (6,639) | (6,653) | (6,653) |
| C | Temperature Based Generation Derates | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D | External Area Interchanges (3) | 1,844 | 1,844 | 3,094 | 3,094 | 3,094 | 3,094 | 3,094 | 3,094 | 3,094 | 3,094 |
| E | **Total Resources (A+B+C+D)** | 34,047 | 33,619 | 34,855 | 34,841 | 34,827 | 34,812 | 34,812 | 34,798 | 34,784 | 34,784 |
| | | | | | | | | | | | |
| F | Demand Forecast (5) | (31,763) | (31,626) | (31,436) | (31,292) | (31,164) | (31,126) | (31,266) | (31,526) | (31,886) | (32,296) |
| G | Large Load Forecast (6) | (517) | (764) | (1,004) | (1,118) | (1,146) | (1,174) | (1,224) | (1,224) | (1,224) | (1,224) |
| 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 (F+G+H)** | (33,590) | (33,700) | (33,750) | (33,720) | (33,620) | (33,610) | (33,800) | (34,060) | (34,420) | (34,830) |
| | | | | | | | | | | | |
| J | **Statewide System Margin (E+I)** | 457 | (81) | 1,105 | 1,121 | 1,207 | 1,202 | 1,012 | 738 | 364 | (46) |
| K | Higher Policy Demand Impact | 75 | 160 | 190 | (30) | (320) | (570) | (720) | (940) | (1,060) | (1,220) |
| L | **Higher Policy Statewide System Margin (J+K)** | 532 | 79 | 1,295 | 1,091 | 887 | 632 | 292 | (202) | (696) | (1,266) |
| M | SCRs (7), (8) | 897 | 897 | 897 | 897 | 897 | 897 | 897 | 897 | 897 | 897 |
| N | **Statewide System Margin with SCR (L+M)** | 1,429 | 976 | 2,192 | 1,987 | 1,783 | 1,529 | 1,189 | 695 | 200 | (370) |
| O | Operating Reserve | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) |
| P | **Statewide System Margin with Full Operating Reserve (N+O) (4)** | 119 | (334) | 882 | 677 | 473 | 219 | (121) | (615) | (1,110) | (1,680) |

Notes:

1. Reflects the 2023 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2023 Gold Book Table I-9a) and solar PV peak reductions (2023 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data published August 2022 (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx).
3. Interchanges are based on ERAG MMWG values.
4. For informational purposes.
5. Reflects the 2023 Gold Book Forecast without the impact of the large load queue projects included.
6. Forecast of large load queue projects included in this assessment (Q0580 – WNY STAMP, Q0776 – Greenidge, Q0849 – Somerset, Q0580 – Cayuga, Q0979 – North Country Data Center, Q1536 - White Pines Phase 1 (Micron), and Q1446 - Massena Green Hydrogen (Air Products and Chemicals)).
7. SCRs are not applied for transmission security analysis of normal operations, but are included for emergency operations.
8. Includes a derate of 384 MW for SCRs

# Statewide Margin Projections

**Figure 10: Impact of Large Loads on Statewide System Margin**

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# Statewide 1-in-10 Margin

**Figure 28: Statewide System Margin (1-in-10-Year Heatwave, Emergency Transfer Criteria)**

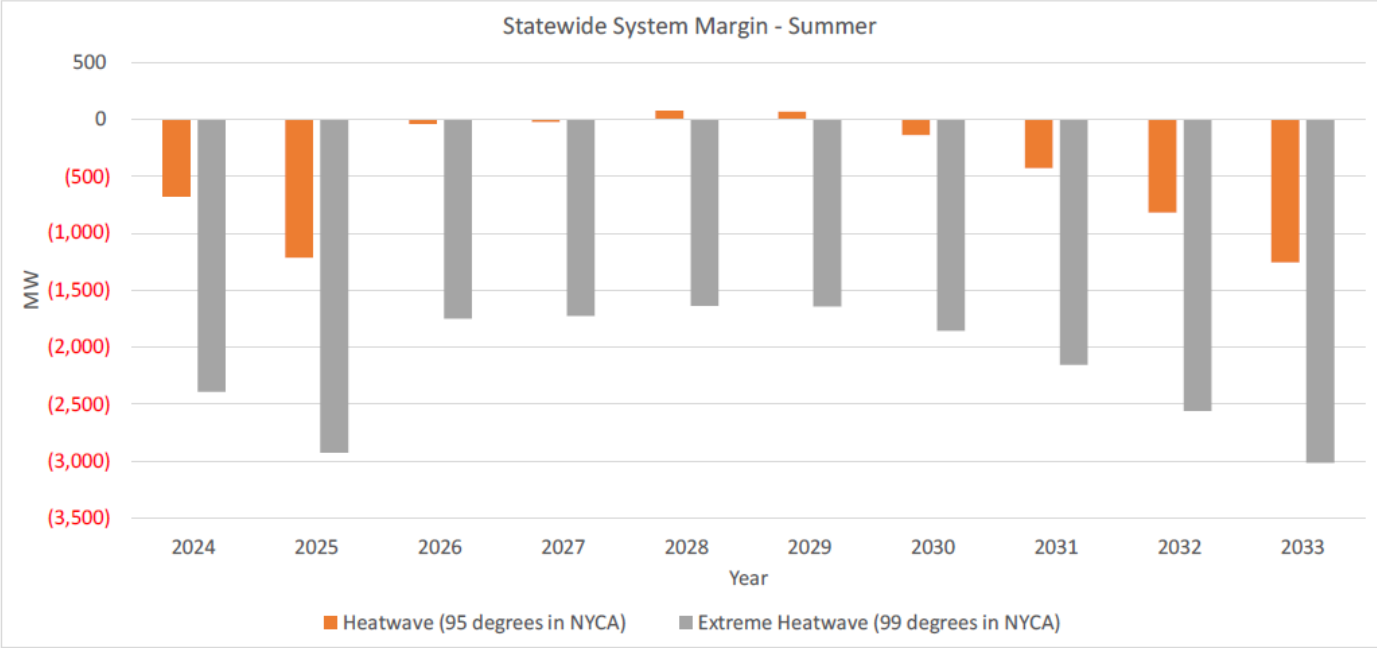
| Line | Item | Summer Peak - 1-in-10-Year Heatwave, Emergency Transfer Criteria (MW) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 |
| A | NYCA Generation (1) | 38,066 | 38,343 | 38,343 | 38,343 | 38,343 | 38,343 | 38,343 | 38,343 | 38,343 | 38,343 |
| B | NYCA Generation Derates (2) | (5,863) | (6,567) | (6,582) | (6,596) | (6,610) | (6,624) | (6,624) | (6,639) | (6,653) | (6,653) |
| C | Temperature Based Generation Derates | (185) | (176) | (176) | (176) | (176) | (176) | (176) | (176) | (176) | (176) |
| D | External Area Interchanges (3) | 1,844 | 1,844 | 3,094 | 3,094 | 3,094 | 3,094 | 3,094 | 3,094 | 3,094 | 3,094 |
| E | SCRs (4), (5) | 897 | 897 | 897 | 897 | 897 | 897 | 897 | 897 | 897 | 897 |
| F | **Total Resources (A+B+C+D+E)** | 34,759 | 34,340 | 35,576 | 35,562 | 35,547 | 35,533 | 35,533 | 35,519 | 35,504 | 35,504 |
| | | | | | | | | | | | |
| G | Demand Forecast (6) | (33,579) | (33,432) | (33,232) | (33,079) | (32,943) | (32,905) | (33,053) | (33,329) | (33,709) | (34,139) |
| H | Large Load Forecast (7) | (552) | (816) | (1,072) | (1,194) | (1,224) | (1,254) | (1,307) | (1,307) | (1,307) | (1,307) |
| I | 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) |
| J | **Total Capability Requirement (G+H+I)** | (35,441) | (35,558) | (35,614) | (35,583) | (35,477) | (35,469) | (35,670) | (35,946) | (36,326) | (36,756) |
| | | | | | | | | | | | |
| K | **Statewide System Margin (F+J)** | (682) | (1,218) | (38) | (21) | 70 | 64 | (137) | (427) | (822) | (1,252) |
| L | Operating Reserve | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) | (1,310) |
| M | **Statewide System Margin with Full Operating Reserve (K+L)** | (1,992) | (2,528) | (1,348) | (1,331) | (1,240) | (1,246) | (1,447) | (1,737) | (2,132) | (2,562) |

Notes:

1. Reflects the 2023 Gold Book existing summer capacity plus projected additions and deactivations.
2. Reflects the derates for generating resources. For this evaluation land-based wind generation is assumed to have a capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2023 Gold Book Table I-9a) and solar PV peak reductions (2023 Gold Book Table I-9c). Derates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service. Includes derates for thermal resources based on NERC five-year class average EFORd data published August 2022 (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 derate of 384 MW for SCRs.
6. Reflects the 2023 Gold Book Forecast without the impact of the large load queue projects included.
7. Forecast of large load queue projects included in this assessment (Q0580 – WNY STAMP, Q0776 – Greenidge, Q0849 – Somerset, Q0580 – Cayuga, Q0979 – North Country Data Center, Q1536 - White Pines Phase 1 (Micron), and Q1446 - Massena Green Hydrogen (Air Products and Chemicals)).

# Statewide Margin for Heatwaves

**Figure 14: Statewide System Margin for Heatwaves and Extreme Heatwaves**

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# Reliance on Emergency Assistance

| | | NYCA LOLE (days/year) by Margin State | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Step** | **EOP** | **2023** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** |
| 1 | Removing Operating Reserve | 6.32 | 4.37 | 4.99 | 1.91 | 2.98 | 2.32 | 2.89 | 2.94 | 5.02 | 6.74 |
| 2 | Require SCRs (Load and Generator) | 3.30 | 2.72 | 3.16 | 0.94 | 1.46 | 1.38 | 1.54 | 1.72 | 2.73 | 4.12 |
| 3 | 5% Manual Voltage Reduction | 3.12 | 2.59 | 3.01 | 0.88 | 1.34 | 1.32 | 1.47 | 1.64 | 2.60 | 3.94 |
| 4 | 30-Minute Reserve (*i.e.*, 655 MW) to Zero | 2.01 | 1.42 | 1.89 | 0.41 | 0.79 | 0.55 | 0.65 | 0.76 | 1.20 | 2.05 |
| 5 | 5% Remote Controlled Voltage Reduction | 1.36 | 1.00 | 1.32 | 0.27 | 0.52 | 0.37 | 0.44 | 0.51 | 0.81 | 1.47 |
| 6 | Voluntary Load Curtailment | 1.18 | 0.84 | 1.11 | 0.23 | 0.47 | 0.30 | 0.37 | 0.42 | 0.69 | 1.32 |
| 7 | Public Appeals | 1.13 | 0.78 | 1.06 | 0.21 | 0.44 | 0.27 | 0.33 | 0.38 | 0.63 | 1.23 |
| 8 | Emergency Assistance | 0.11 | 0.10 | 0.11 | 0.05 | 0.05 | 0.04 | 0.04 | 0.05 | 0.07 | 0.09 |
| 9 | Part of 10-Minute Reserve (*i.e.* , 960 of 1310 MW) to Zero | **0.02** | **0.02** | **0.02** | **0.00** | **0.00** | **0.00** | **0.00** | **0.01** | **0.01** | **0.02** |

Note:
• The results in bold font (Step 9) represent the NYCA LOLE that is compared against the 0.1 event-days/year criterion.

- **New York's current reliance on neighboring systems is expected to continue through the next ten years. Without emergency assistance from neighboring regions, New York would not have adequate resources to serve forecasted demand.**

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# Questions?

# 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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