New York ISO
Independent System Operator

2024 NYSRC Long-Term Resource Adequacy Assessments

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Goal

- This presentation summarizes the 2024 NYSRC Long-Term Resource Adequacy Assessments (LTRAA) Report in support of the NYSRC certification
- The 2024 LTRAA report information is based on:
  - 2024 RNA Base Case and scenarios results
  - 2024 Q3 STAR results

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Outline

- NYISO's Reliability Planning Process
- LTRAA Background
- 2024 RNA Resource Adequacy Base Case Results
- 2024 RNA Resource Adequacy Scenarios Results
  - See 2024 RNA for additional details [Report] [Appendices]

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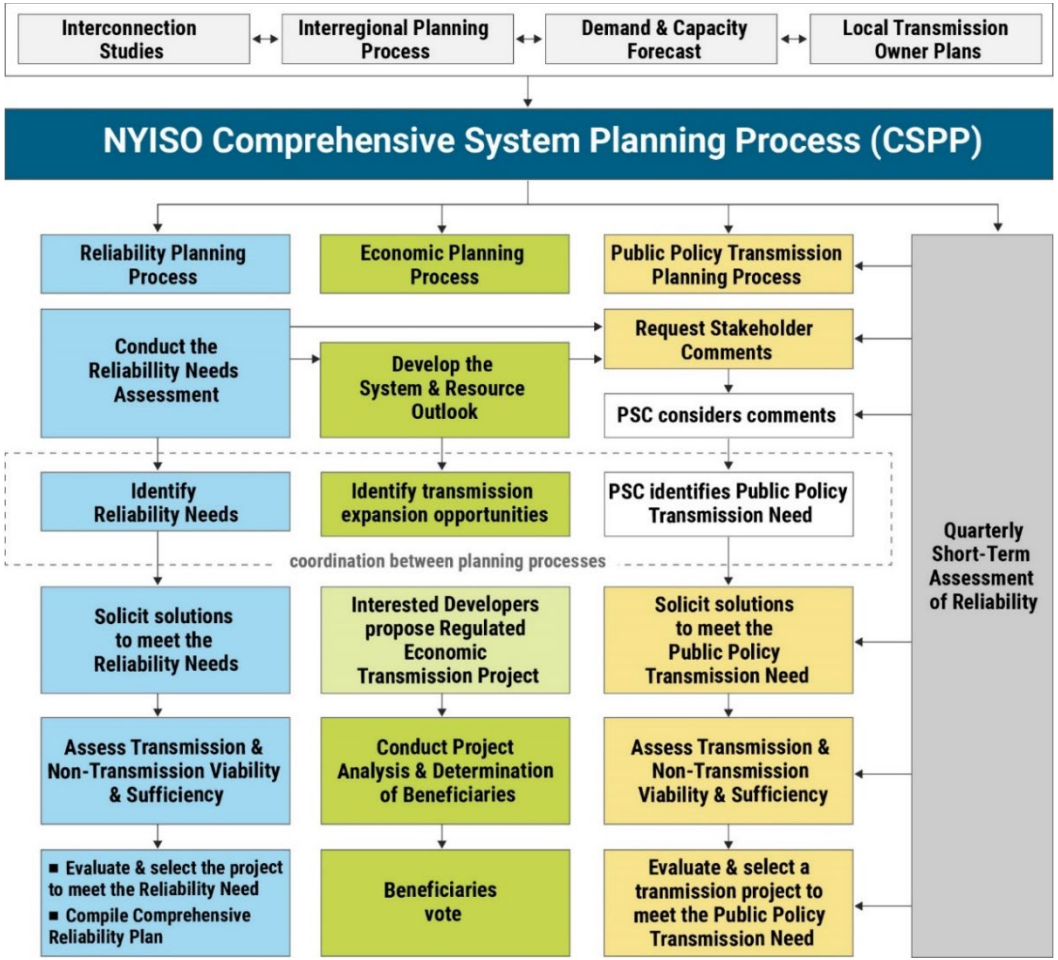
NYISO's Reliability Planning Process (RPP)



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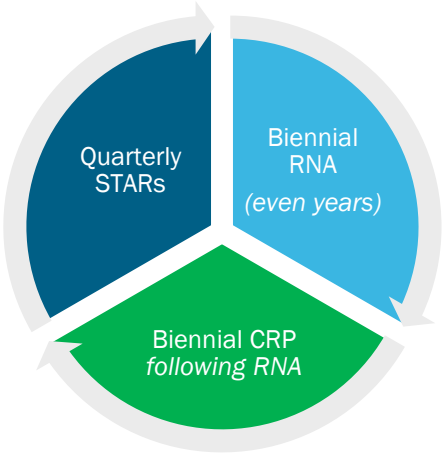
NYISO's Tariff Reliability Planning Studies

- **Short-Term Assessments of Reliability (STARs)**
  - Conducted quarterly in collaboration with Transmission Owners
  - Five-year study with a focus on addressing needs arising in the first three years
- **Reliability Needs Assessment (RNA)**
  - Conducted biennially to identify long-term reliability needs on the New York State Bulk Power Transmission Facilities (BPTF) occurring in years 4 through 10 in the Base Case
  - Considers "firm" projects from the Local Transmission Owner's Plans (LTPs), proposed generation and transmission that meets the NYISO's inclusion rules, demand forecasts, and other applicable system updates
- **Comprehensive Reliability Plan (CRP)**
  - If Reliability Needs are identified, the NYISO solicits market-based and regulated solutions, as well as identifying Responsible Transmission Owners to propose Regulated Backstop Solutions
  - Culminates in a biennial report that documents the plans for a reliable grid over the 10-year planning horizon



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2024 RNA: Base Case Development Background

- **Using the RNA Base Case, the NYISO assesses and identifies a Reliability Need(s) if there is a violation of the applicable Reliability Criteria (i.e., NERC, NPCC, and NYSRC) on of the Bulk Power Transmission Facilities (BPTF) for the study period**
- **2024 RNA and 2024 Q3 STAR Base Case:**
  - For the **transmission security** evaluations, the NYISO uses the 2024 FERC Form 715 filing and the information from the 2024 Gold Book as a starting point for developing the base case system models with the application of the inclusion rules
  - For the **resource adequacy** evaluations, the models are developed starting with prior resource adequacy models and are updated with information from the 2024 Gold Book and historical production data, with the application of the inclusion rules.
    - Information on modeling of neighboring systems is based on the input received from the NPCC CP-8 working group.
    - Power flow evaluations are based on the models described under the transmission security evaluations.

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NYSRC 2024 LTRAA Background

2024 LTRAA Background

- **The New York State Reliability Council's (NYSRC) Reliability Rule A.3:R2 requires the NYISO to prepare a biennial NYCA Long-Term Resource Adequacy Assessment (LTRAA) covering a ten-year look-ahead period**
  - New requirement in the NYSRC Reliability Rules, starting with the July 17, 2020, version #45: http://www.nysrc.org/NYSRCReliabilityRulesComplianceMonitoring.html
- **This assessment is designed to include the resource adequacy related findings from the latest NYISO RNA or other comparable NYISO resource adequacy reviews, such as its quarterly STAR.**
  - Note: for complete reliability criteria assessments, both the RNA and the STARs also include transmission security evaluations, which are beyond this review's requirements
- **The 2024 LTRAA review report uses the information from the 2024 RNA for Study Years 2028 through 2034 (year 4 through year 10) and from the 2024 Q3 STAR for Study Years 2025 through 2029 (with a focus on year 1 through year 3)**
  - The NYISO prepares the 2024 LTRAA report utilizing the resource adequacy assessments from the below two reports to fulfill the NYSRC RR A.3:R2 requirement:
    1. 2024 RNA November 19, 2024, final report [link] and appendices [link]
    2. 2024 Q3 STAR October 13, 2024, final report [link]

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Reliability Indices Reporting Requirement

- A.1:R2 requires the LTRAA to calculate and report LOLH and EUE metrics additional to the annual NYCA LOLE
- There is no criteria related with the two additional metrics at this time; reported only for information

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Resource Adequacy 2024 RNA Base Case Results

2024 RNA, Q3 STAR: Results

- Accounting for flexibility of certain large loads, NYCA LOLE is below 0.1 event-day/year criterion for each study year
- Winter events become more prominent during latter years
  - To account for winter uncertainties, several modeling changes were implemented:
    - Dynamic LFU: on the demand side, increasing winter peak load forecast uncertainty (starting year 2 throughout the study years) was modeled to account for the impacts of heating electrification, EV charging, and large loads.
    - Winter gas unavailability: on the resources side, risk of about 6300 MW of gas unavailability mainly related with NYCA gas-only plants was implemented.
- The findings are impacted by significant uncertainties associated with future demand growth and changing supply mix that will be continuously reviewed through the NYISO's quarterly short-term assessments and biennial long-term assessments.
- Although a NYCA LOLE violation is not identified, the loss of load expectation approaches the 0.1 event-days per year criterion in 2034, indicating that no surplus power would remain in ten years without further resource development.
- LOLH (event-hour/year) and LOEE (or EUE in MWh/year) are provided for information.
- Additional information and analysis:
  - 2024 RNA November 19, 2024, final report [link] and appendices [link]
  - 2024 Q3 STAR final report: [link]

Study Year	NYCA Annual LOLE (event-days/year)	
	Base Case with Large Loads Flexibility	Scenario without Large Loads Flexibility
2025	0.024	0.031
2026	0.006	0.010
2027	0.006	0.009
2028	0.005	0.007
2029	0.006	0.009
2030	0.001	0.004
2031	0.004	0.011
2032	0.010	0.030
2033	0.022	0.080
2034	0.094	0.289

Study Year	LOLE (event-days/year)	LOLH (event-hrs/year)	EUE (MWh/year)
2025	0.024	0.064	21.9
2026	0.006	0.017	3.5
2027	0.006	0.017	3.3
2028	0.005	0.012	1.7
2029	0.006	0.016	2.6
2030	0.001	0.002	0.5
2031	0.004	0.007	2.3
2032	0.010	0.025	9.4
2033	0.022	0.053	22.8
2034	0.094	0.251	148.1

Zonal Resource Adequacy Margin

- **ZRAM simulation gives a relative measure of how close the system is from not having adequate resources to reliably serve load**
  - Resource capacity is reduced one zone at a time to determine when violations occur. This is done in the same manner as the addition of compensatory "perfect" MW to mitigate resource adequacy violations but with the opposite impact
  - "Perfect capacity" is capacity that is not derated (*e.g.*, due to ambient temperature or unit unavailability), not subject to energy durations limitations (*i.e.*, available at maximum capacity every hour of the study year), and not tested for transmission security or interface impacts
- **ZRAM results show a very small margin, 50 MW, by 2034 that is not significantly affected by internal NYCA constraints**

Study Year	Base Case LOLE (event-days/year)	Zone A MW	Zone B MW	Zone C MW	Zone D MW	Zone E MW	Zone F MW	Zone G MW	Zone H MW	Zone I MW	Zone J MW	Zone K MW
2025	0.024	1500	1500	2200	1500	2200	2200	2200	1600	1600	1300	500
2026	0.006	1600	1600	3400	1600	3400	3400	3400	2700	2700	2200	700
2027	0.006	1700	1700	3600	1900	3600	3600	3600	2900	2900	2400	700
2028	0.005	1600	1700	3700	1900	3700	3700	3700	2900	2900	2500	700
2029	0.006	1700	1700	3200	2000	3200	3200	3200	2800	2800	2300	600
2030	0.001	1800	1800	3600	1900	3600	3600	3600	3100	3100	2900	1300
2031	0.004	1700	1700	2800	1900	2800	2800	2800	2500	2500	2400	1200
2032	0.010	1600	1600	2000	1700	2000	2000	2000	1800	1800	1800	1000
2033	0.022	1000	1000	1100	1000	1100	1100	1100	1000	1000	1100	800
2034	0.094	50	50	50	50	50	50	50	50	50	50	50

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LOLE Results After Each EOP

- **GE-MARS evaluates the need for using Emergency Operating Procedures (EOP) MW by calculating after each EOP step the expected number of days per year that the system is at a positive (surplus) and a negative (deficiency) MW margin. The MW available at each EOP step is used as needed and in sequential order.**
  - The LOLE results after each of the EOPs are below.

	NYCA LOLE (days/year) by EOP Step										
	Step	EOP	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	1	Removing Operating Reserve (1965 MW)	3.47	2.09	2.23	2.14	2.98	1.63	2.61	3.72	5.89	7.64
	2	Flexible Large Loads (407-976 MW)	2.95	1.53	1.46	1.45	2.22	0.82	1.53	2.37	4.02	5.45
	3	Require SCRs (Load and Generator)	2.16	1.10	1.08	1.09	1.71	0.46	0.92	1.58	2.87	4.18
	4	5% Manual Voltage Reduction	2.11	1.08	1.05	1.07	1.68	0.43	0.88	1.51	2.77	4.08
	5	655 MW 30-Minute Reserve to Zero	0.95	0.46	0.46	0.41	0.66	0.20	0.45	0.92	1.88	3.03
	6	Voluntary Load Curtailment	0.76	0.37	0.37	0.33	0.53	0.16	0.35	0.76	1.61	2.72
	7	Public Appeals	0.69	0.34	0.34	0.29	0.47	0.14	0.33	0.72	1.55	2.63
	8	5% Remote Controlled Voltage Reduction	0.51	0.25	0.25	0.21	0.37	0.09	0.22	0.53	1.22	2.19
	9	Emergency Assistance	0.09	0.03	0.02	0.02	0.02	0.01	0.03	0.06	0.11	0.30
NYCA LOLE	10	Part of 10-Minute Reserve (910 of 1310 MW) to Zero	0.02	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.02	0.09

Note: **The results at step 10** represent the NYCA LOLE, which is compared against the 0.1 days/year criterion.

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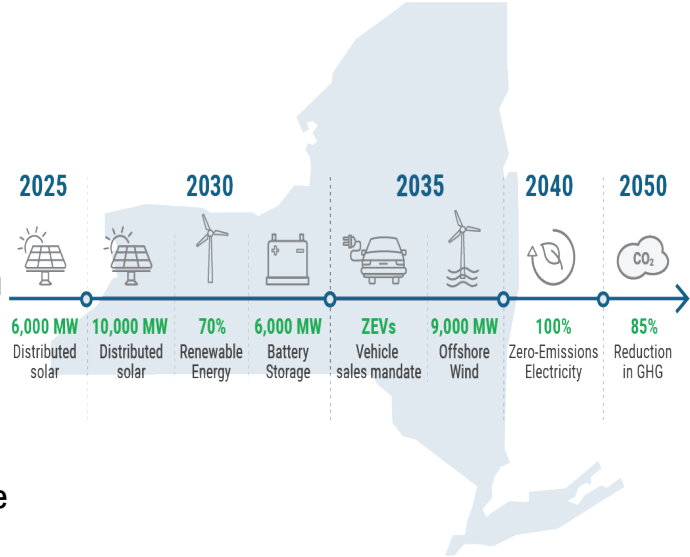
Exploring Uncertainty: Scenarios

Highlights

- Public policies, such as New York's CLCPA, as well as development of large industrial and data center loads, are driving rapid changes to the New York electric system and impacting how electricity is produced, transmitted, and consumed
- Recent assessments reveal that reliability margins are shrinking
  - Electrification programs are driving demand for electricity higher, and New York is projected to become winter peaking in the future
  - In response largely to public policies, fossil fuel generators are retiring at a faster pace than new renewable supply is entering service. The potential for delays in construction of new supply and transmission, higher than forecasted demand and extreme weather could threaten reliability and resilience to the grid
- To achieve the mandates of the CLCPA, new dispatchable emission-free resource (DEFR) supply with the necessary reliability services will be needed to replace the capabilities of today's generation
- 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 throughout the next ten years
- Significant load growth, especially in winter, is forecasted in the next ten years and beyond driven by large industrial loads and electrification of heating and transportation



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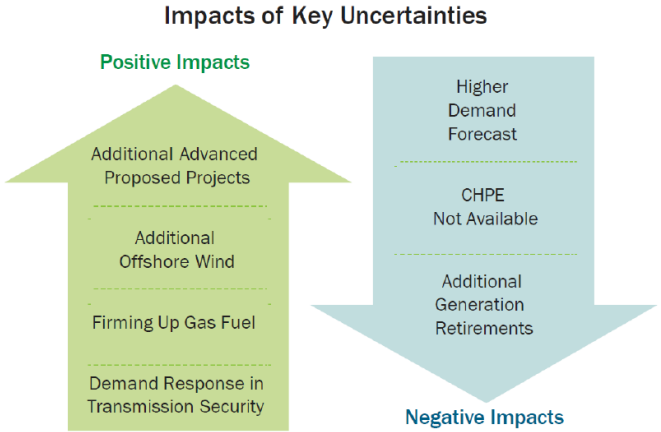
2024 RNA Resource Adequacy Scenarios

- **Zonal Resource Adequacy Margins (ZRAM) Scenario**
  - Identification of the maximum level of zonal MW capacity that can be removed without either causing a NYCA LOLE violation or exceeding the zonal capacity (results in a slide above)
- **Free-Flow Scenario**
  - This analysis removes the limit on various transmission interfaces in resource adequacy models—either one at the time or in various combinations (*i.e.*, "free flow")
- **High Demand Forecast Scenario**
  - The 2024 Gold Book High Demand forecast was used for the resource adequacy analysis
- **CHPE Delayed Scenario**
  - Removal of the proposed 1,250 MW HVDC transmission line from Quebec to New York City
- **Additional Proposed Projects Scenarios.**
  - Two scenarios were performed, one at a time, on the RNA Base Case:
    - One scenario added approximately 5,000 MW of resource projects that are in an advanced stage of development but has not yet met the reliability planning inclusion rules to be included in the 2024 RNA Base Case. This amounted to approximately 2,500 MW solar, 1,500 MW land-based wind, and 1,000 MW battery storage
    - One scenario added approximately 7,000 of additional proposed offshore wind (5,000 MW in Zone J and 2,000 MW in Zone K) for a total of about 9,000 MW interconnected to the NYCA



Scenario Results

- The potential improvement or risks are shown below for the different resource adequacy, thermal overload, and NYC transmission security margin reliability metrics
- All scenarios are performed on the 2024 RNA Base Case, which accounts for ~1,200 MW of large load flexibility
- The NYCA LOLE results for study year 10 (2034) are detailed below

	Base Case		Solution Scenarios			Risk Scenarios	
2034 Reliability Metric (event-days/year)	w/o Large Load Flexibility	with Large Load Flexibility	Non-firm Gas *(700 MW)*	OSW *(additonal 7,000 MW)*	Additional Proposed Projects *(5,000 MW)*	High Demand	CPHE Delay
LOLE	0.289	0.094	0.049	0.031	0.030	2.744	0.119

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Conclusions

2024 LTRAA Conclusions

- **This 2024 LTRAA demonstrates that NYCA, as planned, will meet the NPCC resource adequacy criterion (*i.e.,* NYCA's loss of load expectation (LOLE) of disconnecting firm load due to resource deficiencies is, on average, no more than 0.1 days/year) throughout the ten-year study period of 2025 through 2034, with very low margins in the outer years**
  - While not a resource adequacy need and, therefore, beyond the NYRSC RR A.3:R2, two reliability needs have been identified in recent assessments:
    - a transmission security margin need was identified in the 2023 Q2 STAR that the NYISO has planned for until a permanent solution is available in 2026 (additional details on the 2024 Q2 STAR [link])
    - a transmission security margin violation was identified in the 2024 RNA starting 2033 in Zone J [link]
- **The 2024 LTRAA results are based on the NYISO's 2024 reliability planning models used for the NYISO's 2024 RNA and 2024 Q3 STAR**

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2024 LTRAA Conclusions, cont.

- **The reliability findings reflect the reliability base case assumptions, which are set in accordance with applicable reliability rules and procedures**
- **There are, however, numerous risk factors and uncertainties that could adversely affect the implementation of the plan and system reliability over the planning horizon**
  - These risk factors and uncertainties may arise for several reasons, including climate, economic, regulatory, and state and federal policy drivers
- **During 2023 and 2024, the NYSRC led discussions related with extreme weather and reliability rules and models impacts, including under the framework of the Extreme Weather Working Group.**
  - As result of these discussions, several transmission security proposed reliability rules were defined, and approved as new NYSRC reliability rules
  - Additionally, for the 2024 RNA resource adequacy assessments, gas availability is further derated during winter peak load conditions to further account for cold weather risks.
  - Additional work is in progress for the years to come

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Next Steps

Next Steps: 2025

- Preparation of 2025-2034 Comprehensive Reliability Plan (CRP)
- Preparation of Q1-Q4 STARs

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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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