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Independent System Operator

2023-2032 Comprehensive Reliability Plan

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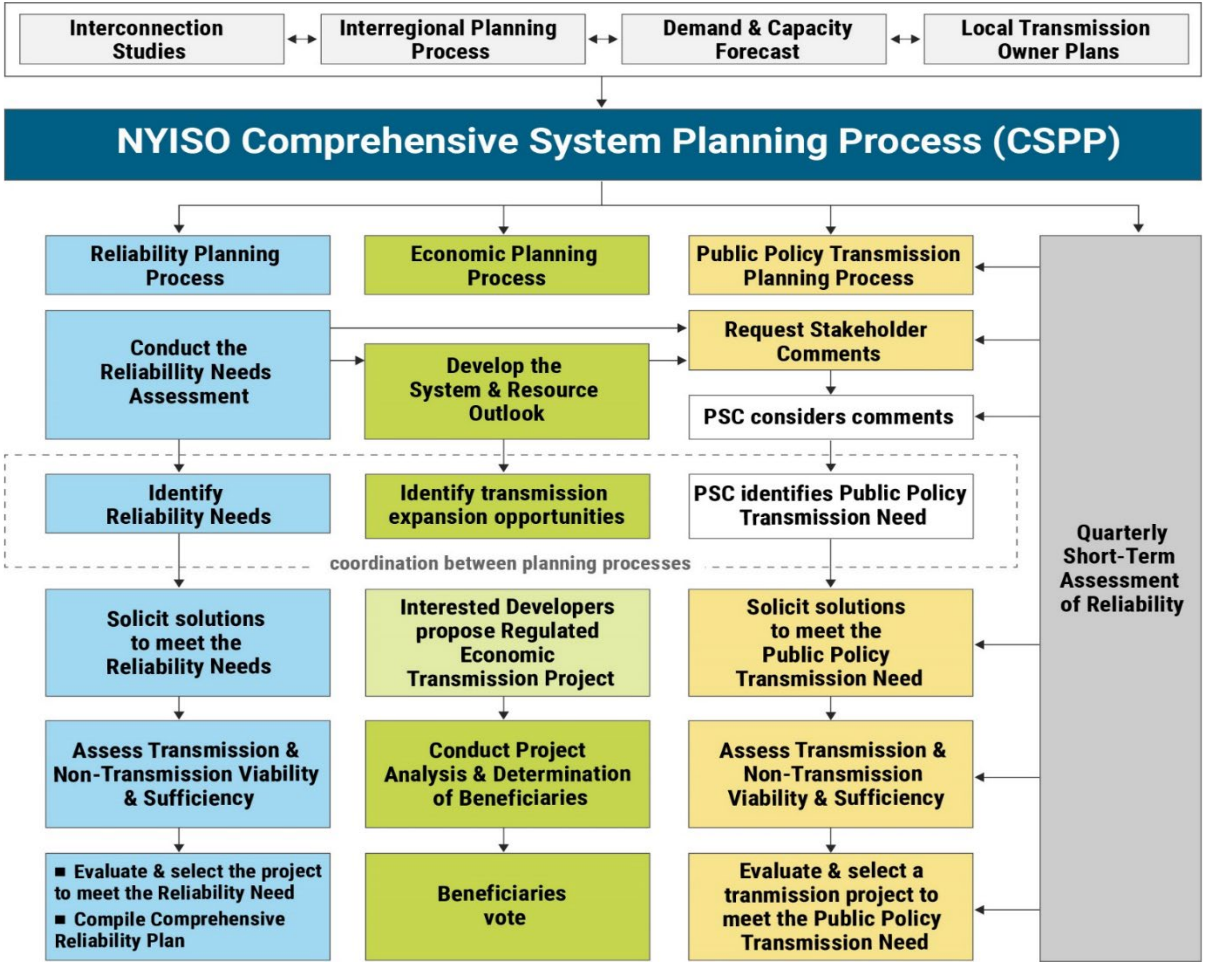
Management Committee

October 25, 2023

Agenda

- 2022-2023 Reliability Planning Process Findings
- Reliability Risks
- Road to 2040
- Next Steps

Reliability Planning Process Findings



Interconnection Studies
Interregional Planning Process
Demand & Capacity Forecast
Local Transmission Owner Plans
NYISO Comprehensive System Planning Process (CSPP)
Reliability Planning Process
Economic Planning Process
Public Policy Transmission Planning Process
Conduct the Reliabillity Needs Assessment
Develop the System & Resource Outlook
Request Stakeholder Comments
PSC considers comments
Identify Reliability Needs
Identify transmission expansion opportunities
PSC identifies Public Policy Transmission Need
coordination between planning processes
Quarterly Short-Term Assessment of Reliability
Solicit solutions to meet the Reliability Needs
Interested Developers propose Regulated Economic Transmission Project
Solicit solutions to meet the Public Policy Transmission Need
Assess Transmission & Non-Transmission Viability & Sufficiency
Conduct Project Analysis & Determination of Beneficiaries
Assess Transmission & Non-Transmission Viability & Sufficiency
Evaluate & select the project to meet the Reliability Need
Compile Comprehensive Reliability Plan
Beneficiaries vote
Evaluate & select a tranmission project to meet the Public Policy Transmission Need

2022-2023 Reliability Planning Process

- The 2022-2023 cycle of the Reliability Planning Process started in January 2022, with the 2022 Reliability Needs Assessment (2022 RNA)
- The 2022 RNA evaluated the reliability of the planned Bulk Power Transmission Facilities using transmission security and resource adequacy analysis
- The 2022 RNA did not identify any Reliability Needs; however, it noted the reliability margins are narrow
  - Final November 2022 RNA Report here: [link] [link]

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Reliability Metrics

- **Resource Adequacy**
  - The ability of the electric systems to supply the aggregate electrical demand and energy requirements of their customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements.
- **Transmission Security**
  - The ability of the electric system to withstand disturbances such as electric short circuits or unanticipated loss of system elements. The ability of the power system to withstand the loss of one or more elements without involuntarily disconnecting firm load.
  - Transmission security analysis includes transmission security margin calculations which are performed to using a deterministic approach through powerflow simulations combined with post-processing spreadsheet-based calculations. This assessment identifies plausible changes in conditions or assumptions that might adversely impact the reliability of the system.

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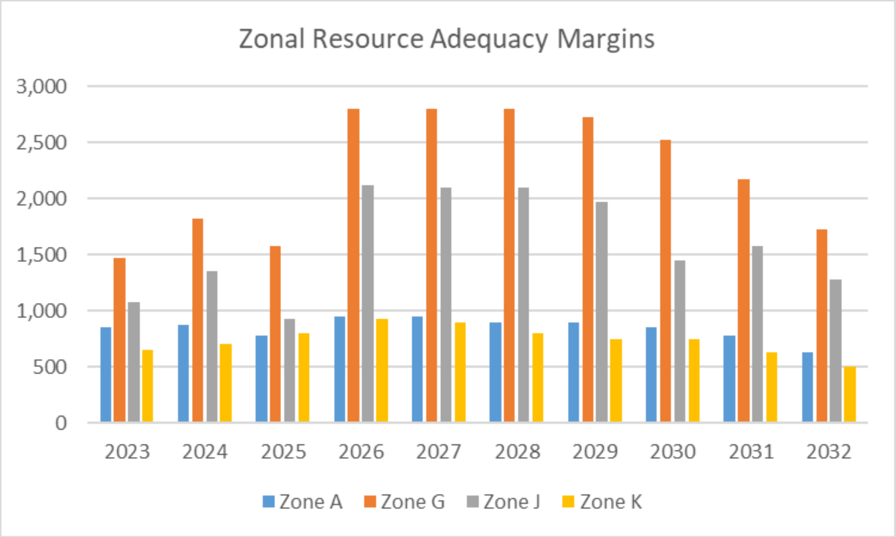
2023-2032 CRP

- **The Comprehensive Reliability Plan (CRP) found the following:**
  - There are no actionable, long-term Reliability Needs.
  - There is a Short-Term Reliability Process Need, which was identified in the 2023 Quarter 2 STAR. The need occurs in New York City in the summer of 2025 and is driven primarily by forecasted increases in peak demand and generation unavailability due to the Peaker Rule. Solutions are being determined through the Short-Term Reliability Process.
  - While no long-term Reliability Needs were identified in this CRP, the margin to maintain reliability over the next ten years will narrow or could be eliminated based upon a variety of potential changes in forecasted system conditions.
- **The CRP built on the results from the 2022 RNA to evaluate potential risks to reliability including:**
  - Generation availability, delays to transmission projects, demand uncertainties, proposed large loads, winter peak and gas shortage, emergency assistance from neighboring areas, and extreme weather.

Resource Adequacy Results

- The 2022 RNA and subsequent STARs found the NYCA LOLE is within 0.1 event-days/year criteria

Study Year	LOLE	LOLH	LOEE
	event-days/year	event-hours/year	MWh/year
2023	0.025	0.061	23.860
2024	0.018	0.035	11.538
2025	0.023	0.048	18.399
2026	0.004	0.008	1.734
2027	0.005	0.010	2.529
2028	0.004	0.008	1.626
2029	0.005	0.009	1.799
2030	0.006	0.013	3.051
2031	0.010	0.020	5.095
2032	0.022	0.045	11.382



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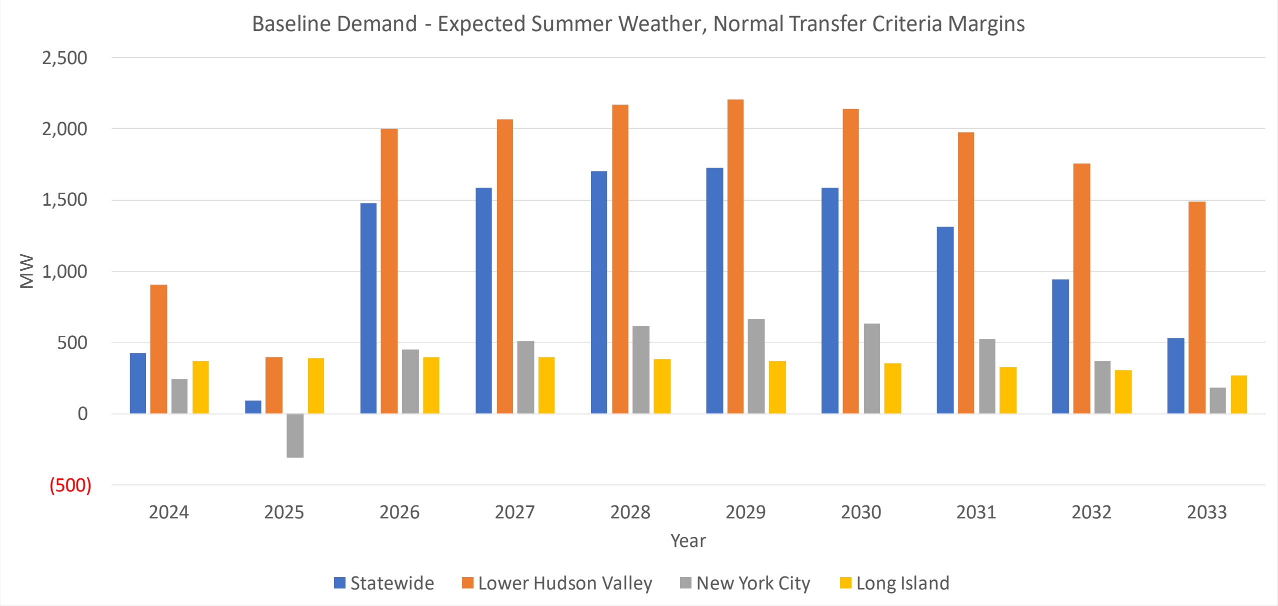
Transmission Security Results

- Statewide and local transmission security margins as assessed in the 2022 Reliability Needs Assessment (RNA) will meet all currently applicable reliability criteria from 2026 through 2032 for forecasted system demand in normal weather.



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Reliability Risks

Key Risk Factors to CRP

- The pace of generation retirements has exceeded the pace of resource additions to date. Should this trend continue, reliability needs will be identified both locationally and statewide.
- The reliability of the grid is heavily reliant on the timely completion of planned transmission projects, chiefly the CHPE project. Without the CHPE project in service or other offsetting changes or solutions, the reliability margins would be deficient for the ten-year planning horizon.
- There is a clear upward trend forecasted in peak demand over the next ten years, with significant uncertainty driven by electrification of heating and transportation coupled with the development of multiple high-electric demand facilities (e.g., microchip fabrication and data centers). As the demand on the grid grows at a rate greater than the build out of generation and transmission, deficiencies could arise within the ten-year planning horizon.

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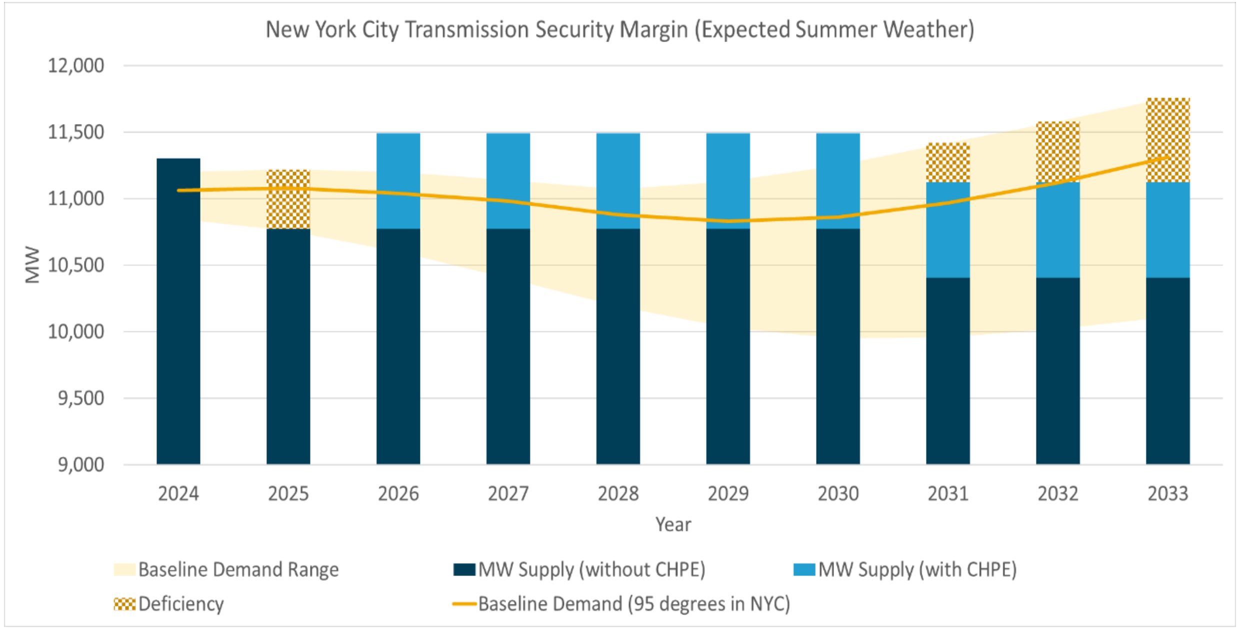
Key Risk Factors to CRP, cnt.

- 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.
- Extreme events, such as heatwaves or storms, pose a threat to grid reliability throughout the planning horizon and could result in deficiencies to serve demand statewide, especially in New York City. This outlook could improve as more resources and transmission are added to New York City.
- The New York statewide grid is projected to become a winter-peaking system in the mid-2030s, primarily driven by electrification of space heating and transportation. The New York statewide grid is reliable for normal weather in the winter for the next ten years, but deficiencies would arise as early as winter 2027-2028 for an extreme 1-in-100-year winter cold snap coupled with a shortage of gas fuel supply. This deficiency would grow to a 6,000 MW shortfall by winter 2032-2033.

Impact of NYPA Small Plant Phase-Out

- New York City will have a transmission security deficiency starting in 2031 should NYPA's small gas plants (517 MW) retire in December 2030 without replacement resources.
- The deficiency worsens to over 600 MW by 2033 when considering the higher range of the forecast, and would be far worse without the CHPE project in service.



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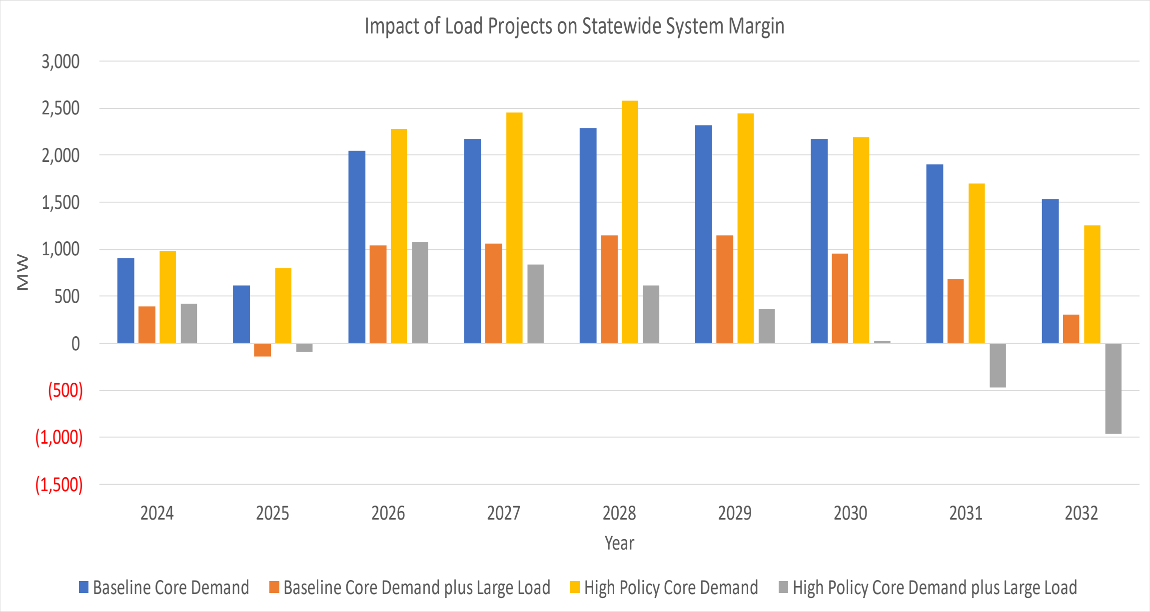
Impact of Large Loads



- **High forecast of core load for expected weather plus future large loads results in a statewide deficiency in 2031**

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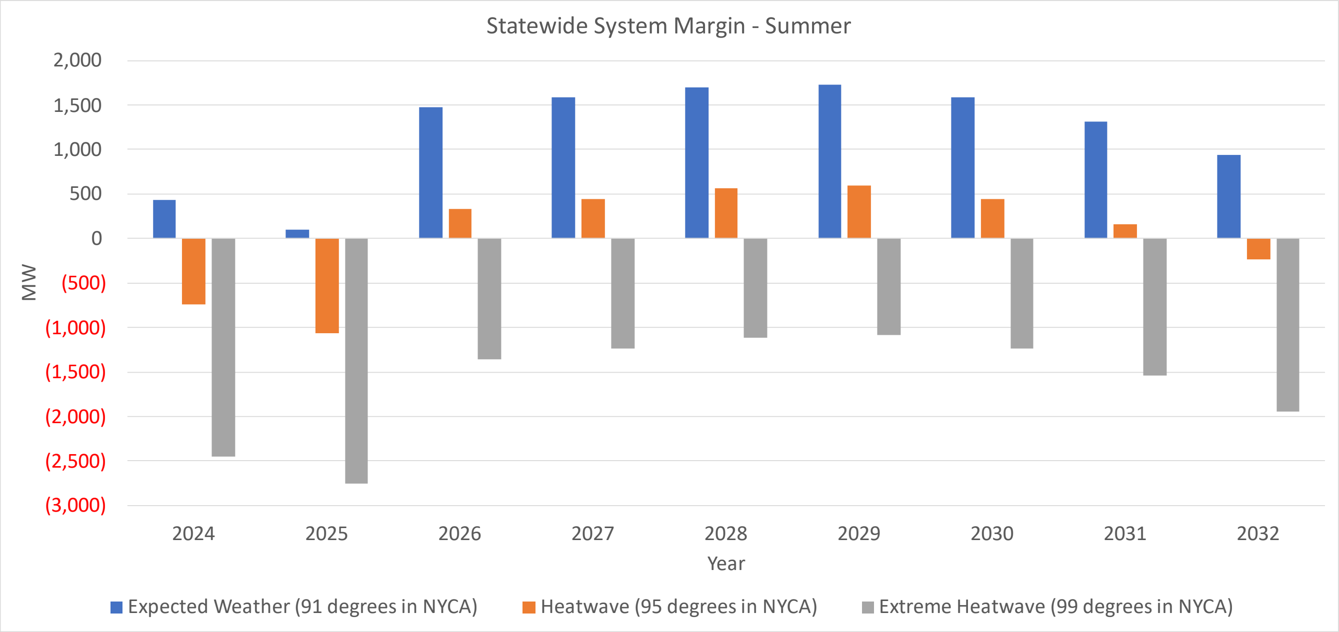
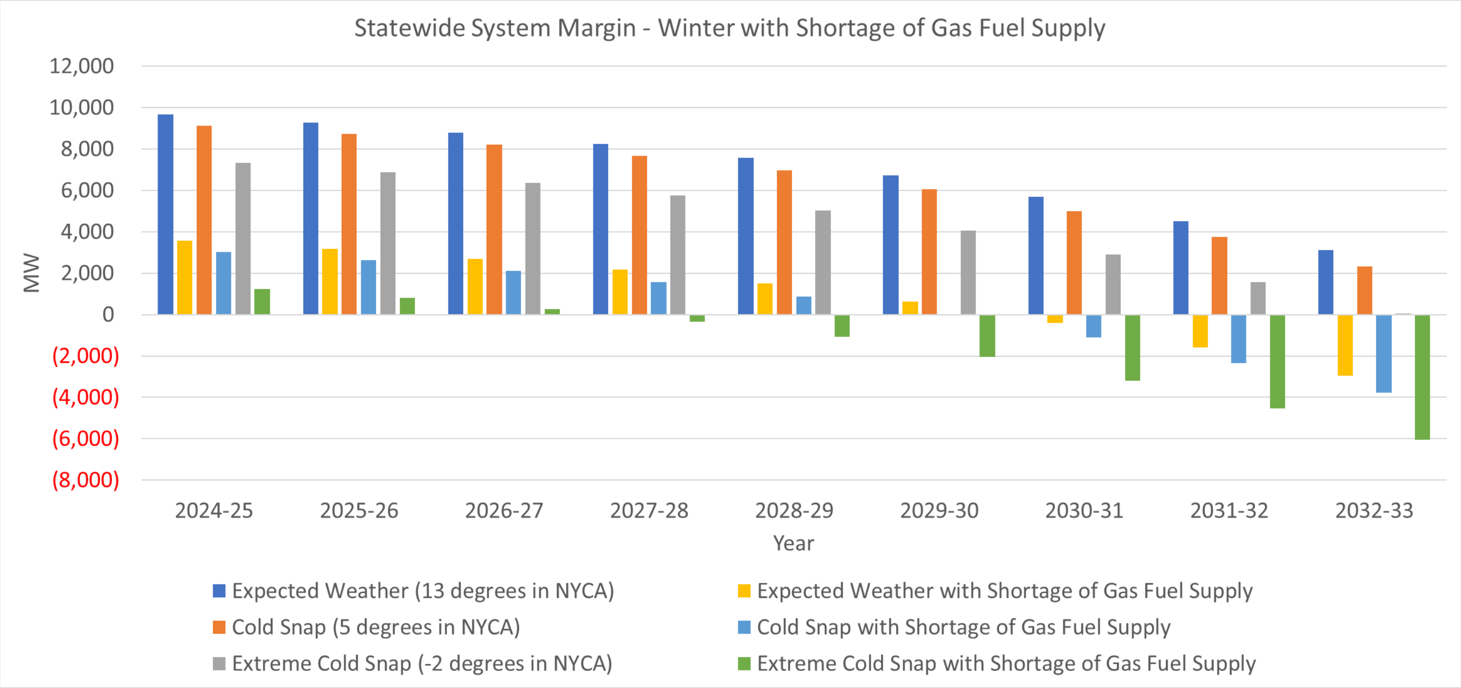
Impact of Extreme Weather



Impact of Winter Cold Snaps and a Potential Gas Fuel Shortage



Reliance on Emergency Assistance

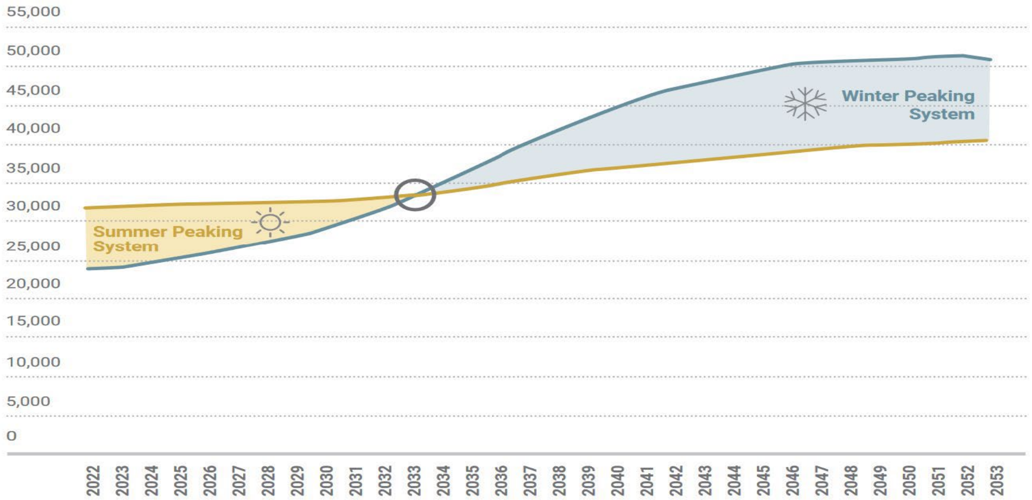
		NYCA LOLE (days/year) by Margin State									
Step	EOP	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
1	Removing Operating Reserve	6.32	4.37	4.99	1.91	2.98	2.32	2.89	2.94	5.02	6.74
2	Require SCRs (Load and Generator)	3.30	2.72	3.16	0.94	1.46	1.38	1.54	1.72	2.73	4.12
3	5% Manual Voltage Reduction	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.**

Road to 2040

Road to 2040: Demand



Key Takeaways

- Electrification of transportation and building heating and cooking will cause the NYCA to go from summer peaking to winter peaking in the mid-2030s
- The NYISO develops 90/10 and 99/1 forecasts and is engaged in several efforts at the state, regional, and national level to model and plan for extreme weather
- Potential load growth from low carbon fuel production (e.g., hydrogen production via electrolysis) could be significant and is captured in the high policy demand forecast

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Road to 2040: Generation

- **Key takeaways**
  - High penetration of inverter-based resources presents reliability risks due to weak-grid interconnection, common mode failures, and modeling accuracy.
  - NYCA will need significant amounts of dispatchable emission-free resources (DEFRs) that can run for multiple day periods.
  - DEFRs will be required to provide both energy and capacity over long durations, as well as the reliability attributes of retiring synchronous generation. The attributes do not need to be encapsulated in a singular technology, but in aggregate the system needs a sufficient collection of these services to be reliable.

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Attributes of Sample Generation Technologies (DEFR Options)

		2023 NYCA Summer Capacity (MW)	Energy Attributes						Other Reliability Attributes			
			Carbon Free*	Dependable Fuel Source	Energy Limited	Dispatchable	Quick start	Flexible	Multi start	Inertial Response	Dynamic Reactive control	High Short Circuit current
Sample Technology	Fossil	25,667	No	Yes*	No	Yes	Yes*	Yes	Yes	Yes	Yes	Yes
	Hydro	4,265	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Pumped Hydro	1,407	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Hydrogen Fuel Cell	0	Yes	Yes*	No	Yes	Yes	Yes	Yes	No	Yes	No
	Hydrogen Combustion	0	Yes	Yes*	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Nuclear	3,305	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes
	Modular Nuclear	0	Yes	Yes	No	No	No	Yes	No	Yes	Yes	Yes
	Battery	0	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No
	Solar	154	Yes	No	Yes	No*	Yes	Yes	Yes	No	Yes	No
	Wind	2,051	Yes	No	Yes	No*	Yes	Yes	Yes	No	Yes	No
	Demand Response*	1,234	Yes*	Yes	Yes	No	No	Yes	No	No	No	No
	Synchronous Condenser*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes

* See Figure 39 of the CRP Report for more detail.

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Road to 2040: Transmission

- **Key takeaways**
  - Transmission expansion is critical to facilitating efficient CLCPA energy target achievement. The current New York transmission system, at both local and bulk levels, is inadequate to achieve current policy objectives.
  - Major transmission development efforts are underway: NYC PPTN, three selected PPTN projects, Smart Path Connect, CHPE, Clean Path NY, and “Phase 2” local transmission projects.
  - Further transmission development will be necessary to address several renewable generation pockets across the state.

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CRP Report Next Steps

Stakeholder and Board Review

- **October:**
  - MMU presentation
  - Management Committee review and vote
- **November:**
  - Board of Directors action on final CRP report

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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Questions?