2021-2030 Comprehensive Reliability Plan

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Management Committee

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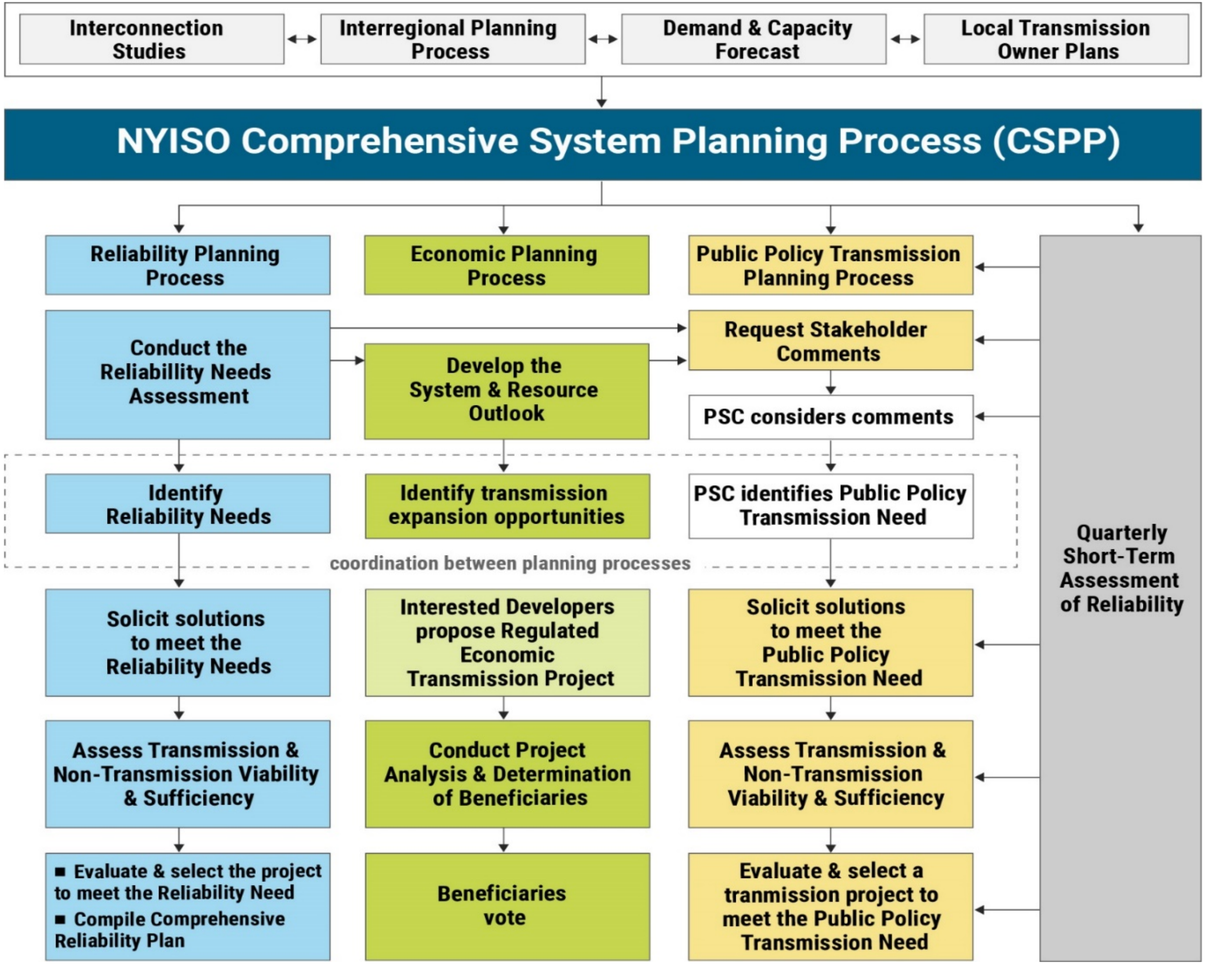
Agenda

- 2020-2021 Reliability Planning Process Conclusions
- Reliability Metrics
- Road to 2040
- Next Steps

Reliability Planning Process Conclusions



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DRAFT – FOR DISCUSSION PURPOSES ONLY

2020-2021 Reliability Planning Process

- The 2020-2021 Reliability Planning Process cycle started in January 2020, with its 2020 Reliability Needs Assessment (2020 RNA).
- The 2020 RNA identified both transmission security and resource adequacy Reliability Needs on the Bulk Power Transmission Facilities (BPTFs).
- The process allows for subsequent base case updates before soliciting for market-based and regulated solutions.
- With the updates described on the next slide, there are no remaining BPTF Reliability Needs; therefore, there is no solicitation for solutions necessary in this planning cycle.
- The 2021-2030 Comprehensive Reliability Plan (CRP) describes the findings and considers scenarios that could pose risks to reliability.

Post-RNA Key Updates

- **Load forecast update:**
  - Specifically, Zone J peak load forecast decreased as much as 392 MW by 2030
- **Con Edison local transmission plan updates:**
  - A new 345/138 kV PAR controlled 138 kV Rainey – Corona feeder
  - A new 345/138 kV PAR controlled 138 kV Gowanus – Greenwood feeder
  - A new 345/138 kV PAR controlled 138 kV Goethals – Fox Hills feeder
- **Short-Term Reliability Process solution for addressing a need arising in 2023:**
  - Series reactor status changes, starting summer 2023, through 2030

Reliability Metrics

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.

Resource Adequacy Metrics

- Loss of Load Expectation (LOLE in days/year) – the expected number of days in a given year when the hourly demand is projected to exceed the resources. Reliability criteria is to not exceed one day in 10 years, or LOLE < 0.1 days/year.
- Loss of load hours (LOLH in hours/year) – the expected number of hours in a given year when a system's hourly demand is projected to exceed the resources.
- Expected unserved energy (EUE in MWh/year) – the expected amount of energy (MWh) that will not be served in a given year.

2021-2030 CRP Base Case			
Study Year	LOLE (dy/yr)	LOLH (hr/yr)	EUE (MWh/yr)
2021	0.017	0.064	35.3
2022	0.017	0.055	26.6
2023	0.034	0.106	50.8
2024	0.024	0.083	47.2
2025	0.036	0.118	69.3
2026	0.038	0.131	83.7
2027	0.040	0.139	93.2
2028	0.047	0.146	83.4
2029	0.060	0.199	137.2
2030	0.064	0.212	156.2

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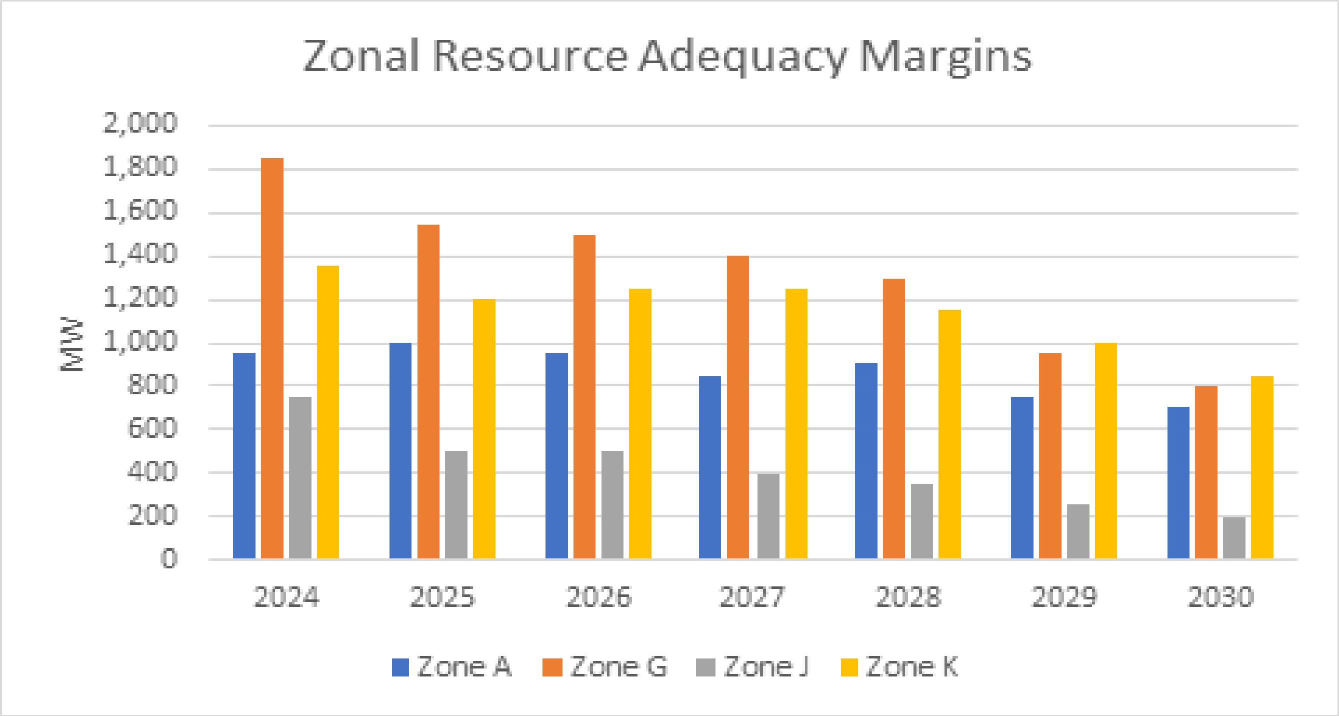
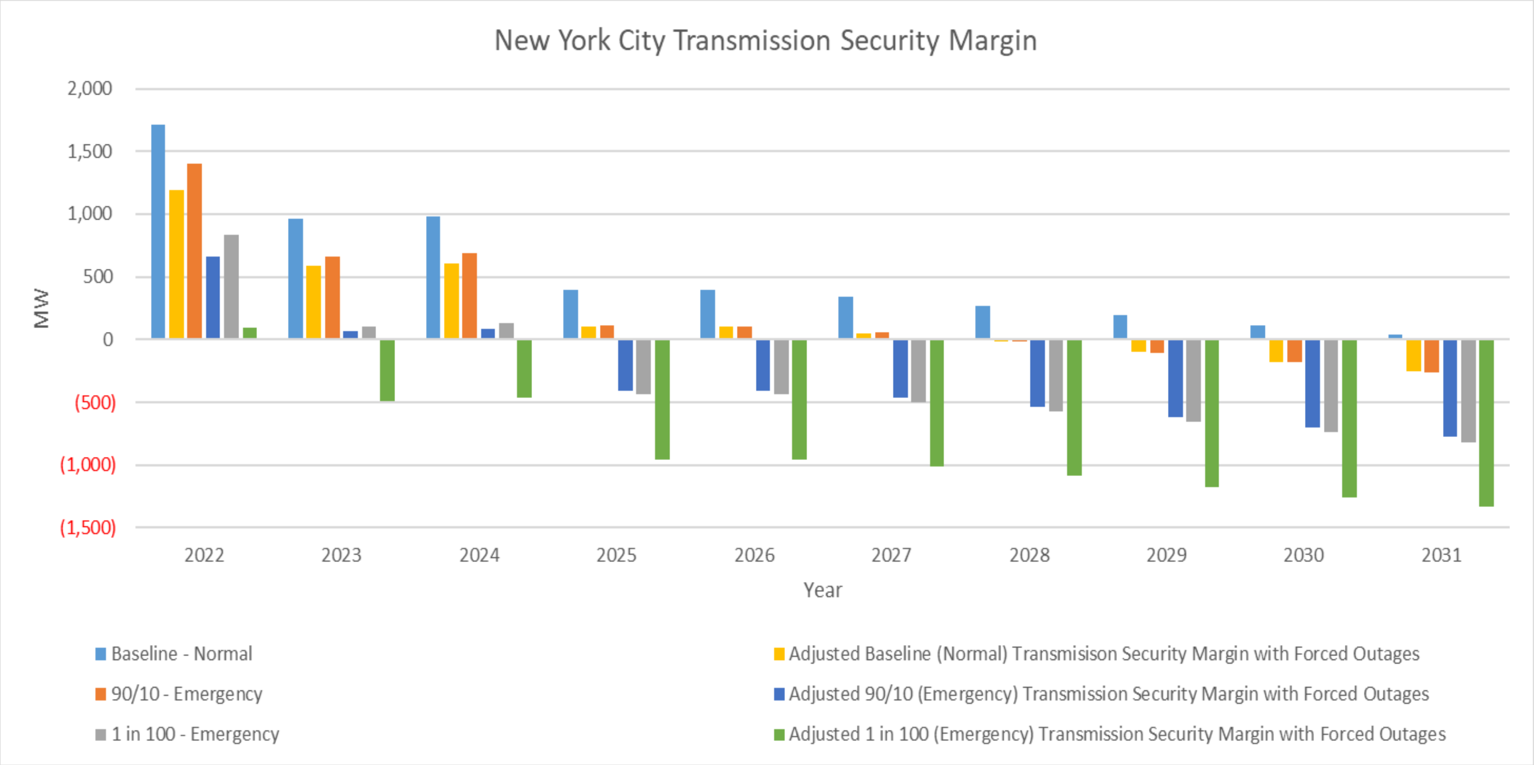
Zonal Resource Adequacy Margin (MW)



Tipping Points:
New York City Transmission Security Margin



Tipping Points

New York City Transmission Security Margin (Summer Baseline Peak Forecast – Normal)

Peak Load Forecast											
Line	**Item**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
A	**Zone J Load Forecast**	(11,116)	(11,075)	(11,052)	(11,029)	(11,031)	(11,082)	(11,151)	(11,232)	(11,308)	(11,381)
B	I+K to J (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)**	(8,203)	(8,162)	(8,139)	(8,116)	(8,118)	(8,169)	(8,238)	(8,319)	(8,395)	(8,468)
G	*Resources needed after N-1-1 (A+D)*	(7,223)	(7,182)	(7,159)	(7,136)	(7,138)	(7,189)	(7,258)	(7,339)	(7,415)	(7,488)
H	J Generation (1)	9,602	8,809	8,809	8,195	8,195	8,195	8,195	8,195	8,195	8,195
I	Temperature Based Generation Derates (2)	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	315	315	315	315	315	315	315	315	315	315
K	**Total Resources Available (H+I+J)**	9,917	9,124	9,124	8,510	8,510	8,510	8,510	8,510	8,510	8,510
L	*Resources available after N-1-1 (E+K)*	8,937	8,144	8,144	7,530	7,530	7,530	7,530	7,530	7,530	7,530
M	**Transmission Security Margin (F+K)**	1,714	962	985	394	392	341	272	191	115	42

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Summary of Reliability Metrics

- **Resource adequacy and transmission security is within criteria through the ten-year period.**
- **New York City margins are tight following Peaker Rule implementation**
  - Resource adequacy margin: 500 MW in 2025; 200 MW in 2030
  - Transmission security margin: 394 MW in 2025; 115 MW in 2030
- **Events beyond current transmission security design criteria would create tipping points, resulting in system deficiencies**
  - If additional forced generation outages occur consistent with historical forced outage rates, the transmission security margin is only 100 MW in 2025. The NYC zone would be deficient beginning in 2028.
  - If actual peak load reaches the 90th percentile forecast, the NYC zone would be deficient beginning in 2028.
  - If additional forced outages occur simultaneous with a 90th percentile peak load, or if a 1-in-100-year peak load occurred, the NYC zone would be deficient beginning in 2025.

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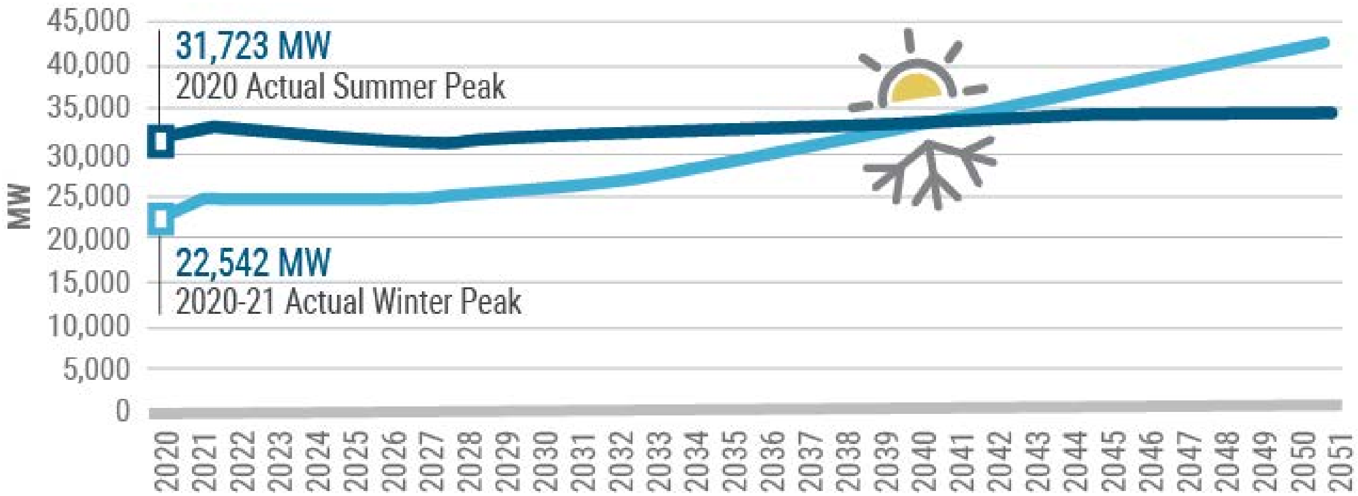
Road to 2040

Road to 2040: Load



- **Climate change and electrification will result in a significant increase in summer load**
- **CLCPA electrification will cause the NYCA to go from summer peaking to winter peaking**
- **The winter peak load under the CLCPA will be double compared to the reference case**

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Road to 2040: Generation

- **Key takeaways**
  - A system with significant amounts of intermittent resources will need significant amounts of dispatchable resources that can run for multiple day periods.
  - Due to the characteristics of sun and wind resources, there will be high ramping requirements needed from the dispatchable resources.
  - A “100 by 40” power system will require those dispatchable resources to be emissions-free
  - Dispatchable resources that are emissions-free, and on the scale needed, are not yet available or currently in the NYISO interconnection queue.

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Road to 2040: Transmission

- **Key takeaways**
  - More inter- and intra- zonal transmission capacity will be required to deliver a reliable system with a high level of renewables penetration.
  - Transmission additions would not reduce the amount of dispatchable resource capacity but would decrease the amount of energy needed from them.

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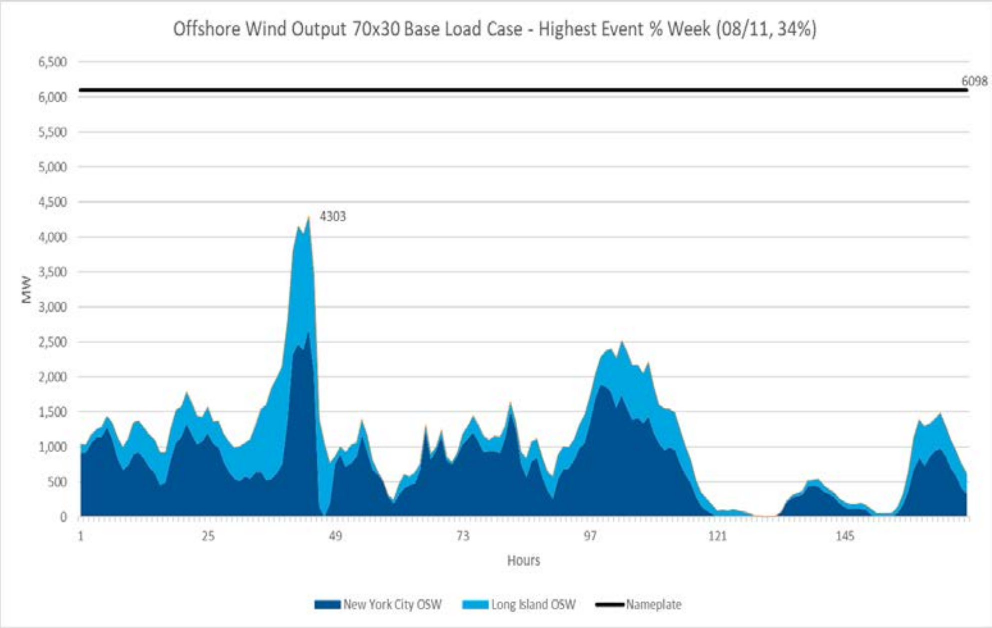
70x30 Analysis: Offshore Wind Lull

- Outage of all offshore wind generation has a substantial impact on loss of load events. This is largely due to the co-location of offshore wind together with the majority of the resource deficiencies in New York City and Long Island.
- A one-week outage of 6,100 MW of offshore wind could have roughly the same impact to resource adequacy as the outage of a 1,000 MW conventional generator.



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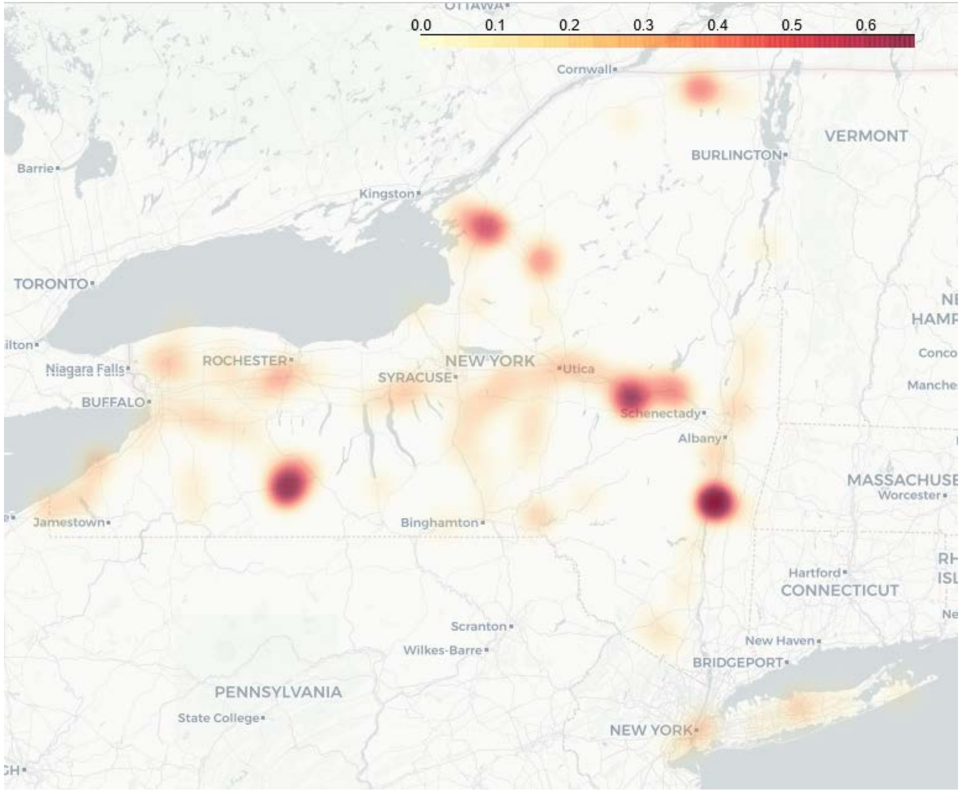
70x30 Analysis: Short-Circuit Ratio

The figure shown here highlights the buses with low short circuit ratio (i.e., weak system strength) where intensity is inversely proportional to the short-circuit ratio. Short-circuit ratio is defined as the ratio of short-circuit apparent power from a 3-phase fault to the power rating of the resource.

Inverter-based resources connected to a “weak” portion of the grid may be subject to instability, adverse control interactions, and other issues.



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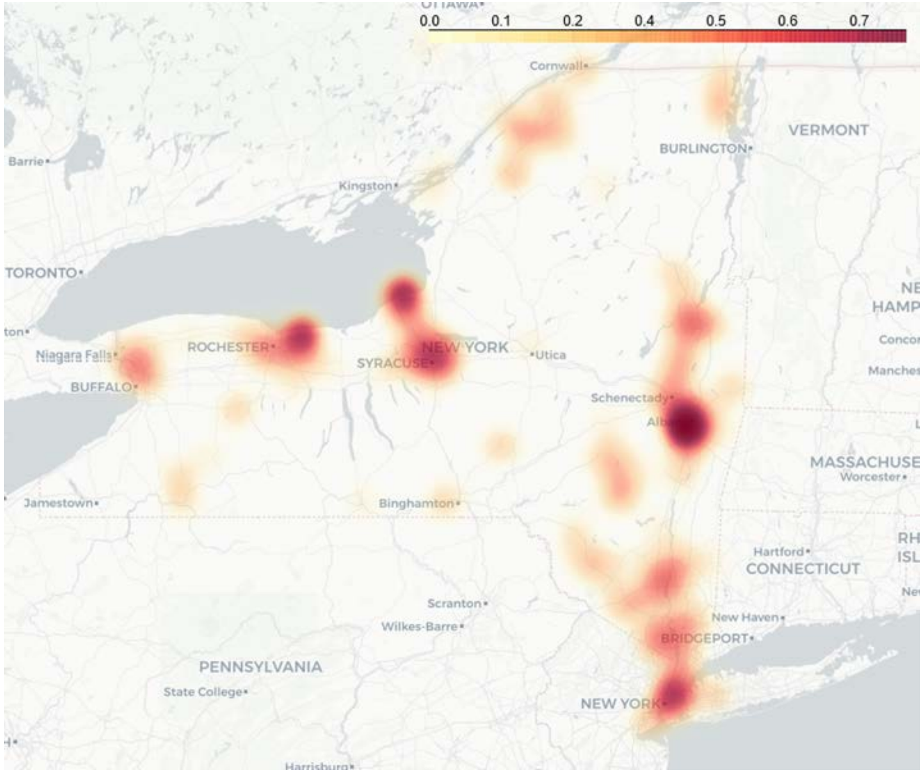
70x30 Analysis: Voltage Flicker

Another measure of system strength is light flicker caused by the connection of large reactive devices. Some Transmission Owners have flicker (or Delta-V) criteria.

The figure shown here highlights the buses more susceptible to voltage flicker. In the plot scale, a 0 represents no change in per-unit voltage and a 1 represents a 0.03 per-unit voltage decline.



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CRP Report Next Steps

Stakeholder and Board Review

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

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Questions?