New York ISO
Independent System Operator

2021 NYSRC Long-Term Resource Adequacy Assessment – Intervening Year Report

A Report by the
New York Independent System Operator

For the February 3, 2022 NYSRC RCMS

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Background

The New York State Reliability Council's (NYSRC) Reliability Rule A.3.B.R2[1] requires the NYISO to prepare a biennial NYCA Long-Term Resource Adequacy Assessment (LTRAA) covering a ten-year look-ahead period. The biennial LTRAA would include findings from the latest NYISO Reliability Needs Assessment (RNA) or other comparable NYISO-approved resource adequacy review.

Additionally, the A.3.B.R3 requires the NYISO to submit a report in the Intervening Year (LTRAA-I) between the biennial LTRAAs to inform the NYSRC of any significant updates to assumptions and, if available, findings from the latest final NYISO Comprehensive Reliability Plan (CRP) or other final NYISO reports which may include solutions to reliability needs identified in the Long-Term Resource Adequacy Assessment.

Summary of the Completed 2020 NYSRC LTRAA

The 2020 LTRAA was the first assessment developed under the new rule and it was presented at the February 2021 NYSRC Reliability Compliance Monitoring Subcommittee (RCMS). It included findings from the NYISO's 2020 Reliability Needs Assessment (RNA), and also from the 2020 Q3 Short-Term Assessment of Reliability (STAR). The 2020 LTRAA summarized the resource adequacy findings from the 2020 RNA[2] for 2024 through 2030 (year 4 through year 10), and from the 2020-Q3 STAR[3] for 2021 through 2023 (year 1 through year 3).

The summary of the NYISO's 2020 RNA and 2020-Q3 STAR resource adequacy findings were:

- The 2020-Q3 STAR identified that the planned system through 2025 is within the resource adequacy criterion of 0.1 days/year loss of load expectation (LOLE).
- The 2020 RNA identified resource adequacy LOLE violations starting 2027 and increasing through 2030.
- The issues identified were primarily driven by a combination of forecasted peak demand and the assumed unavailability of certain generation in New York City affected by the New York State Department of Environmental Conservation "Peaker Rule."[4]

[1] NYSRC Reliability Rules & Compliance Manual, Version #45, July 17, 2020: https://www.nysrc.org/PDF/Reliability%20Rules%20Manuals/RRC%20Manual%20V45%20Final.pdf

[2] 2020 RNA Report: https://www.nyiso.com/documents/20142/2248793/2020-RNAReport-Nov2020.pdf

[3] 2020-Q3 STAR Report: https://www.nyiso.com/documents/20142/16004172/2020-Q3-STAR-Report-vFinal.pdf

[4] The "Peaker Rule" is the commonly-used name for a New York State Department of Environmental Conservation (DEC) regulation that limits nitrogen oxides (NOx) emissions from simple-cycle combustion turbines, as discussed in greater detail within this report.

2021 LTRAA-I

2021-2030 CRP and 2021 Q3 STAR Base Case Findings

To address the Reliability Rule in A.3.B.R3, the NYISO submits this report in the Intervening Year between the biennial Long-Term Resource Adequacy Assessments to inform the NYSRC of any significant updates to assumptions and, if available, findings from the latest NYISO Comprehensive Reliability Plan (CRP) or other final NYISO reports which may include solutions to reliability needs identified in the Long-Term Resource Adequacy Assessment.

This 2021 LTRAA-I review report updates the 2020 LTRAA and uses the information from NYISO's 2021-2030 Comprehensive Reliability Plan (CRP[5]), and the 2021 Q3 STAR[6].

The RNA assesses an actionable Base Case set of assumptions, as well as various scenarios that are provided for information.

While the 2020 RNA concluded that there were Reliability Needs and LOLE violations starting in 2027 in the Base Case, the process allows for subsequent status and assumptions updates. These updates included a reduced demand forecast to account for economic and societal effects from the COVID-19 pandemic, and new local transmission plans and operating procedures by Con Edison for the New York City service territory. Specifically, the following updates were made post-RNA (and captured in the CRP):

- NYISO's load forecast update to account for the expected impact of COVID-19 and the associated economic and societal effects, as presented at the November 19, 2020 ESPWG/TPAS/LFTF meeting [link]
  - For example, the New York City peak load forecast decreased by 392 MW in 2030
- Local Transmission Owner Plans (LTPs) updates to address local reliability deficiencies as presented by Con Edison at the January 25, 2021, ESPWG/TPAS [link]:
  - A new 345/138 kV PAR controlled 138 kV Rainey – Corona feeder in 2023
  - A new 345/138 kV PAR controlled 138 kV Gowanus – Greenwood feeder in 2025
  - A new 345/138 kV PAR controlled 138 kV Goethals – Fox Hills feeder in 2025
- Short Term Reliability Process solution for addressing the 2023 Near-Term Reliability Need identified in the 2020 Quarter 3 STAR [link]. The solution changed the planned operating status of existing series reactors, starting summer 2023 through 2030:
  - In-service: series reactors on the following 345 kV cables: 71, 72, M51, M52

[5] 2020-2030 CRP Report: https://www.nyiso.com/documents/20142/2248481/2021-2030-Comprehensive-Reliability-Plan.pdf ; Appendices: https://www.nyiso.com/documents/20142/26735166/2021-2030-Comprehensive-Reliability-Plan-Appendices.pdf

[6] 2021 Q3 STAR Report: https://www.nyiso.com/documents/20142/16004172/2021-Q3-STAR-Report-vFinal2.pdf

- Bypass: series reactors on the following 345 kV cables[7]: 41, 42, Y49

- The transient voltage response issues were observed on Con Edison's non-BPTF system during 2025 through 2030, while the BPTF violations were observed starting in 2029. Con Edison will address the non-BPTF violations with a Corrective Action Plan as required by NERC Standard TPL-001-4. When the non-BPTF violations are addressed, the BPTF violations are no longer observed. [link]

With these updates, the CRP concluded that the New York State Bulk Power Transmission Facilities as planned will meet all currently applicable reliability design criteria from 2021 through 2030 for forecasted system demand in normal weather.

Additionally, the NYISO performs quarterly Short-Term Assessments of Reliability (STAR). Both the 2021 Q3 STAR[8] and the 2021 Q4 STAR[9] were based on the 2021 reliability planning databases and identified no Reliability Needs for the study period.

While the NYISO finds that there are no remaining long-term actionable reliability needs to be addressed in the 2020-2021 cycle of the Reliability Planning Process, the margin to maintain reliability over the next ten years will narrow or could be eliminated based upon changes in forecasted system conditions. Risk factors such as delayed implementation of projects in this plan, additional generator deactivations, unplanned outages, and extreme weather could potentially lead to deficiencies in reliable electric service in the coming years. New transmission projects, such as the recently approved[10] Champlain Hudson Power Express (CHPE) to deliver hydroelectric power between Quebec and New York City, could help mitigate these deficiencies if timely built and energized.

The 2021-2030 CRP was approved by the NYISO's Board of Directors on December 2, 2021.

[7] Additional LTPs were subsequently presented by the Transmission Owners, such as further changing the status of the series reactors on Con Edison's cables #41 and #42 from assumed bypassed in this CRP (starting 2023) to in-service, starting summer 2025 – details in the July 23, 2021 ESPWG Con Edison's presentation [link]. This change is reflected in the 2021 Q3 STAR [link].

[8] 2021 Q3 STAR Report, completed as of October 13, 2021: https://www.nyiso.com/documents/20142/16004172/2021-Q3-STAR-Report-vFinal2.pdf

[9] 2021 Q4 STAR Report, completed as of January 13, 2022: [link]

[10] On November 30, 2021, New York State Energy Research and Development Authority (NYSERDA) finalized contracts with Clean Path New York LLC for its Clean Path NY (CPNY) project and H.Q. Energy Services (U.S.) Inc. (HQUS) for its Champlain Hudson Power Express (CHPE) project to deliver clean, renewable solar, wind and hydroelectric power from upstate New York and Canada to New York City.

RNA and CRP Scenarios Background

In addition to the Base Case set of assumptions and findings, the RNA and the CRP provide an assessment of risks to the bulk electric grid under certain scenarios to inform stakeholders and policymakers of potential alternate outcomes. Scenarios are variations on key base case assumptions such as higher load forecast, capacity removal, or deviations from assumed system plans. If they occurred, the events analyzed in the scenarios could change the timing, location, or degree of reliability issues identified in the base case. The 2020 RNA scenarios included higher peak load than forecasted, additional generator retirements, and "status quo" in which major transmission and generation plans fail to come to fruition. Additionally, the CRP included, among others, wind lull scenarios performed for the resource adequacy assessment, and summarized below. Additional details on scope and assumptions are in Appendix E of the CRP [link]

Wind Lull Scenarios Summary

Solar and wind resources provide an emission-free source of electricity. As intermittent resources, solar and wind are not dispatchable (although they may be able to be dispatched down by curtailing their energy output) due to the variability of their "fuel" source. To maximize efficiencies, the location of these resources is dictated by where the wind is most constant or by where there is sufficient land for solar. This results in land-based wind locating in northern and western New York while solar resources are significantly located in these areas also. Offshore wind would connect primarily into New York City and Long Island. In 2020, the NYISO commissioned phase II of the Climate Change Study (Climate Change Impact and Resilience Study) that examined the resources needed to meet load in a 2040 scenario. This study looked at integrating large amounts of solar and wind resources into the model and concluded that the variability of meteorological conditions that govern the output from wind and solar resources presents a fundamental challenge to relying on those resources to meet electricity demand. Solar resources will have little to no output during the evening and nighttime hours and reduced output due to cloud cover, while wind resources can experience significant and sustained wind lulls.

To continue the study efforts on this subject, the NYISO conducted additional 'wind lull' scenarios for this CRP, using the 70 x 30 models developed during the 2020 RNA. Wind lull scenarios simulated a one-week loss of either offshore wind (approximately 6,000 MW nameplate total connected to New York City and Long Island) or land-based wind (located in Upstate New York) for various weeks. For the loss of all offshore wind, the NYISO also simulated the dynamic stability of the system immediately after the wind loss (details in the Appendix F of the CRP).

Loss of wind energy during an entire week impacts system reliability when the wind farms are interconnected to zones that usually drive the loss of load expectation events, such as New York City (Zone J) and Long Island (Zone K). The magnitude of the impact also depends on the amount of potential energy generated during the week of the wind lull, as well as the timing of generation during each day (*e.g.*, peak demand vs off-peak). Figure 1[11] provides the LOLE results for the most severe simulated offshore wind (OSW) lull weeks, showing that a one-week wind lull has the potential to significantly increase the probability of a loss of load event.

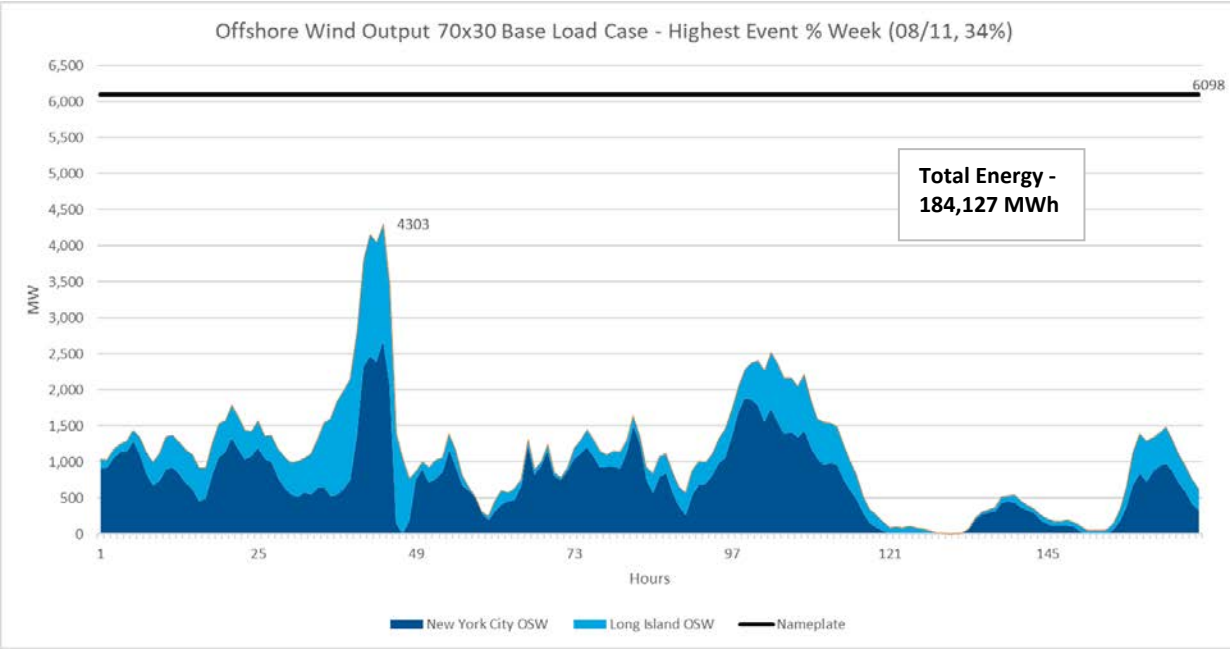
[11] Figure numbers correspond to the CRP Report numbering.

Figure 2 shows the offshore wind energy production during the simulated week. Details of these scenarios are provided in Appendix E of the CRP.

Figure 1: Offshore Wind Lull for the Highest LOLE Week

Model	Event %	Initial LOLE	Wind Lull LOLE	Delta LOLE
70x30 'Base Load' at-criterion	34%	0.11	0.18	**0.07**
70x30 'Scenario Load' at-criterion	23%	0.11	0.22	**0.11**
70x30 'Scenario Load' at-low-LOLE	24%	0.03	0.06	**0.03**

Figure 2: Offshore Wind Output for the Highest LOLE Week



Additionally, a one-week outage of the largest generation source in New York City (*i.e.,* loss of Ravenswood 3 steam turbine generator) was simulated for the highest event week of the 70 x 30 "Base Load" condition. The results, shown in Figure 3, demonstrate that a one-week outage of approximately 6,100 MW of offshore wind (4,300 MW in New York City and 1,800 MW in Long Island) could have roughly the same impact to resource adequacy as the outage of a 1,000 MW conventional (*i.e.*, non-intermittent) generator.

Figure 3: Offshore Wind Lull Compared to Conventional Generator Outage

No Offshore Wind during the 1st Highest NYCA Event % Week (34%)					
Model	**Removal**	**Nameplate MW Removal**	**Initial LOLE**	**One-Week Outage LOLE**	**Delta LOLE**
70x30 'Base Load' at-criterion	Offshore Wind	6098 *(4320 MW in J and 1778 MW in K)*	0.106	0.179	0.072
	Ravenswood 3	1027		0.180	0.074

With high penetration of renewable intermittent resources, the system will need dispatchable, long-duration resources to balance intermittent supply with demand especially during extended periods where the intermittent resources are not available. These types of resources will need to be significant in capacity and have attributes such as the ability to come on-line quickly, stay on-line for as long as needed, maintain the system's balance and stability, and adapt to meet rapid, steep ramping needs.

2021 LTRAA-I Conclusion

Based on the 2021-2030 CRP and 2021 Q3 STAR, there are no Bulk Power Transmission Facilities (BPTF) Reliability Needs identified for the 2021-2030 study period. However, the system margin has been decreasing. Risk factors such as delayed implementation of projects in this plan, additional generator deactivations, unplanned outages, and extreme weather could potentially lead to deficiencies in reliable electric service in the coming years. New transmission projects, such as the recently approved[12] Champlain-Hudson Power Express to deliver hydroelectric power between Quebec and New York City, could help mitigate these deficiencies if timely built and energized. Additional details can be found in the two aforementioned study reports.

The NYISO continues to monitor the risks and will re-evaluate the system during the 2022-2023 Reliability Planning Process cycle, which starts with the 2022 RNA. The 2022 quarterly STARs will be performed in parallel, as well as other NYISO planning studies such as Economic Planning, Interconnection Studies, and Public Policy Transmission Planning. The Transmission Owners (TOs) will also continue to provide Local Transmission Owner Plans (LTPs) as input into the NYISO's planning processes.

The wholesale electricity markets administered by the NYISO are an important tool to mitigate these risks. These markets are designed, and continue to evolve and adapt, to send appropriate price signals for new market entry and retention of resources that assist in maintaining reliability. The potential risks and resource needs identified in the analyses may be resolved by new capacity resources coming into service, construction of additional transmission facilities, and/or increased energy efficiency, integration of distributed energy resources, and growth in demand response participation. The NYISO will continue to monitor these and other developments to determine whether changing system resources and conditions could impact the reliability of the New York bulk electric grid.

[12] On November 30, 2021, New York State Energy Research and Development Authority (NYSERDA) finalized contracts with Clean Path New York LLC for its Clean Path NY (CPNY) project and H.Q. Energy Services (U.S.) Inc. (HQUS) for its Champlain Hudson Power Express (CHPE) project to deliver clean, renewable solar, wind and hydroelectric power from upstate New York and Canada to New York City