New York State Reliability Council

Installed Capacity Subcommittee

Energy Limited Resources (ELR) Modeling Whitepaper – 2025 Phase (Phase 2)

Executive Summary

This whitepaper presents Phase 2 of the New York State Reliability Council's (NYSRC) ongoing efforts to refine the modeling of Energy Limited Resources (ELRs), with a particular focus on Special Case Resources (SCRs). Starting with the 2025-2026 installed reserve margin (IRM) study, SCRs are modeled using an ELR construct. As ELR capacity continues to grow across the New York Control Area (NYCA), it is important to ensure accurate and operationally aligned modeling within the IRM study framework. This paper outlines the background, methodology, impact analysis, and recommendations for updating SCR output limits in the IRM model to better reflect historical activation patterns and expected system risk profiles.

Introduction

The 2021 ELR Modeling Whitepaper[1] identified the need to revisit the use of a single generation output limit for all ES and small EL3 units. Historically, all ES and small EL3 units modeled using the GE Multi-Area Reliability Simulation software program (GE MARS) ELR functionality have their output limitations lifted at the same time based on the NYCA hourly LOLE profile.[2] For example, the output limitation for all ES and small EL3 units was lifted at hour beginning (HB) 14 for the 2025-2026 IRM study. However, this approach may not accurately reflect actual operational practices and may lead to suboptimal resource utilization in the simulation.

The Enhanced SCR Modeling[3] technique, adopted in the 2025–2026 IRM study, introduced hourly response rates and duration-limited modeling for SCRs, utilizing the existing GE MARS ELR functionality. Therefore, in the 2025-2026 IRM study, the SCRs were also modeled with the same output limitation as all other ES and small EL3 units. This improved modeling for SCRs increased the impact of resources being available at the same time and highlighted the need for differentiated output limitations across units using the ELR modeling. This Phase 2 whitepaper identifies that historical activation data and regional

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[1] 2021 ELR Modeling Whitepaper: https://www.nysrc.org/wp-content/uploads/2025/01/d6b73f97027bfa25602c1d091d316da2f493f7d0d76f00646a2644611eb.pdf
[2] 2023 ELR Output Limitation: https://www.nysrc.org/wp-content/uploads/2023/08/ELR_ICS_Presentation_Updated0801.pdf
[3] Enhanced SCR Modeling: https://www.nysrc.org/wp-content/uploads/2024/01/SCR-Modeling-ICS-01302024-Market-Sensitive27154.pdf

peak load profiles provide a better alternative basis for determining the appropriate output limit for SCRs in the IRM study.

Objectives

The primary objective of this whitepaper is to enhance the accuracy and operational alignment of SCR modeling within the IRM framework. Specifically, the goals are to:

- Review current GE MARS logic, existing software limitations, and recent software improvements.
- Better align SCR output limitations with historical operational practices and regional peak load profiles.

ELR Modeling in the 2025-2026 IRM Study

Since the initial adoption of the ELR functionality, in the 2024-2025 IRM study, a methodology was adopted to update the output limitation for all units modeled using the ELR functionality.[4] The current methodology establishes ELR output limitations based on the loss of load expectation (LOLE) distribution window from the NYISO's Locational Minimum Installed Capacity Requirement (LCR) study model for the prior year.

- ES and Small EL3: output limitations should be lifted at the beginning of the 90% of LOLE risk window.
  - The process aims to align ELR output in close proximity to the period with the highest risk.
- Large EL3: maintain the TC4C configuration (gradually starting between 7am and 11am)

These ELR modeling refinements highlight the importance of aligning resource availability with periods of highest system risk. As there are increased MW being modeled as ELRs and these MW are modeled to be available in the simulation based on LOLE risk windows, it becomes equally critical to revisit the operational assumptions for SCRs. The next section explores how SCR activation timing can be optimized to better reflect historical dispatch patterns and support system reliability.

SCR Activation

When SCR activations occur, the NYISO typically seeks to center the event period around the expected net load peak hour (i.e., system peak demand net of the forecasted contributions from behind-the-meter (BTM) solar). With the "Enhanced SCR Modeling"

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[4]2023 ELR Output Limitation: https://www.nysrc.org/wp-content/uploads/2023/08/ELR_ICS_Presentation_Updated0801.pdf

approach, SCRs are assumed to be activated for 7 hours using hourly response rates developed based on historical data. For the 2026-2027 IRM study, only Load Zones F and K have defined response rates covering a full 7-hour activation due to the historical SCR event information utilized.[5] SCR events on June 23–25, 2025 included 7-hour calls for all Load Zones. As a result, the 2027-2028 IRM study is expected to have access to historical event information to develop 7-hour response rate data for all Load Zones.

Considering the timing of recent SCR events and historical dispatch practices, a 3-hour lead time before the simulated net load peak hour may be a reasonable modeling assumption for lifting the operating limit on SCRs in IRM studies. This revised methodology seeks to center SCR activations around the peak hour, reflecting the period of greatest system stress. This revised methodology is consistent with the NYISO's historical practice for assessing the appropriate start time of SCR events.

Determination of the Net Load Peak Hour

SCRs are called on average 5.64[6] times per year in the IRM model (see Table 1). The top 6 peak load hours, across unique days of the summer load shapes represented in the IRM model (i.e., 6 unique "peak load days") provides a reasonable timeframe to determine an appropriate start time for SCR events in the IRM model.

The dates that SCRs were called in the IRM model are consistent with the dates that the net load peak hours occur in the model. SCRs were rarely called outside of these high-demand windows. Of the top 6 peak load days for Bins 1-4, SCR activations occurred for all 6 days. Bin 5 had 4 out of the top 6 peak load days with SCR activations, and Bins 6 and 7 had no SCR activations for the top 6 peak load days (see Appendix A for more information).

The top 6 peak load days for each load shape year are used to create a typical day for various areas (i.e., Load Zones A-F, and G-K). The weighted average peak load hours in the table below are calculated by multiplying the typical day for given year by the bin probability (see Table 1 and Figure 1).

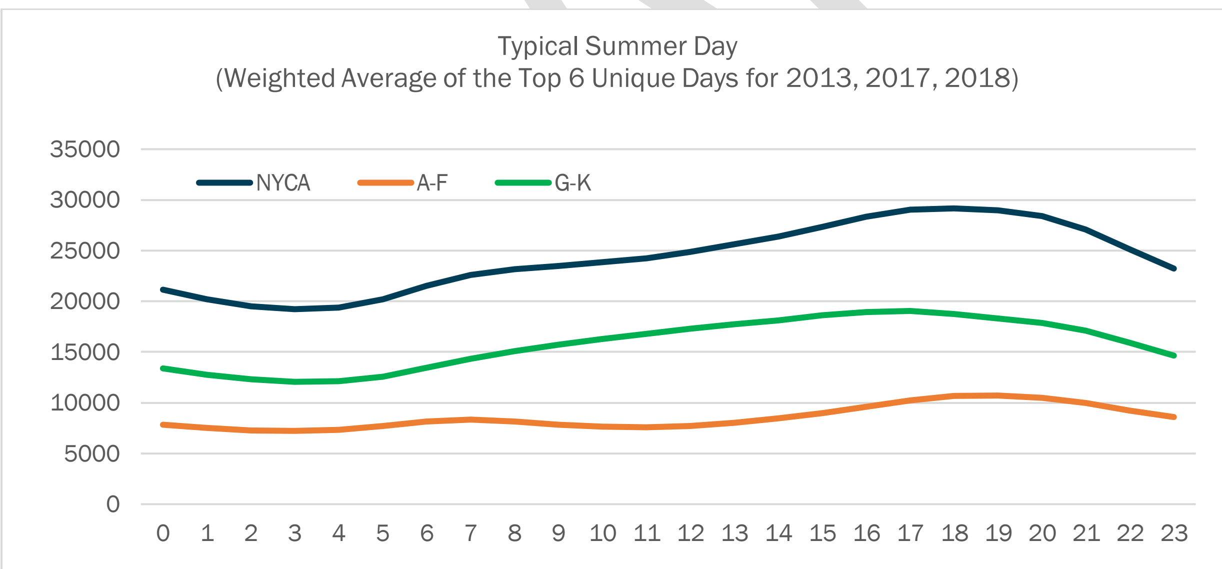
[5] Event List for 2026-2027 IRM SCR Response Rates: https://www.nysrc.org/wp-content/uploads/2025/09/Event-List-for-SCR-Response-Rates-2026-2027-IRM-Study.pdf

[6] Analysis done on the latest case at the time of research (using the updated 2026 solar adjusted load shapes)

Table 1: Summer Peak Hour of Top 6 Peak Days

Load Shape Year	NYCA Summer Day Peak Load Hour (Hour Beginning)	Load Zones A-F Summer Day Peak Load Hour (Hour Beginning)	Load Zones G-K Summer Day Peak Load Hour (Hour Beginning)
2013	19	19	17
2017	17	19	16
2018	18	19	17
Weighted Average	**18**	**19**	**17**

Figure 1: Typical Summer day in GE MARS Simulation



Winter Considerations

Assessment of winter net load peak hours shows that, at this time, they are generally consistent with those observed during the summer season (see Table 2). The IRM model currently reflects higher reliability risk in the summer season, as indicated by the timing and frequency of SCR usage. As a result, SCR event start times in the model are presently based on summer peak hour patterns. Ongoing monitoring of seasonal trends will be important as winter reliability risks evolve, and additional winter SCR events are recorded (see Table 3).

Table 2: Summer and Winter Weighted Average Peak Load Hour

Weighted Average Peak Load Hour (Hour Beginning)			
Year	NYCA	Load Zones A-F	Load Zones G-K
Summer	18	19	17
Winter	17	17	17

Table 3: Historical Winter SCR Events Since 2014

Historical Winter SCR Events Since 2014						
Date	Start Time (Hour Beginning)	Length of Call	Load Zones	Day-Ahead Forecasted Peak Load Hour[2] (Hour Beginning)	Real-Time Actual Peak Load Hour[2] (Hour Beginning)	Number of hours called before forecasted peak
January 22, 2025	16	6	A-K	18	18	2
January 21, 2025	16	6	A-K	18	17	2
January 7, 2014	16	6	A-K	18	18	2

BTM Solar Considerations

Currently, the net load peak typically occurs during daylight hours in the summer season. As BTM solar capacity continues to increase over time, this peak is expected to shift later in the day. This shift may influence the timing of the net load peak hour represented in the IRM model. To maintain alignment with expected system operations, the BTM solar-adjusted net load peak hour should be reviewed annually.

Modeling Methodologies

Within the 2025-2026 IRM model, SCRs are not permitted to be utilized prior to HB14. This modeling can result in inefficient utilization of SCRs and potential misalignment with historical activation of SCR events. Two potential methodologies have been identified for determining an appropriate start time for SCRs in the IRM model:

Method 1: NYCA weighted average net load peak hour for all SCRs; for the 2026-2027 IRM study, all SCRs starting HB15 (i.e., 3 hours before the weighted average NYCA summer net load peak hour).

Method 2: Weighted average net load peak hour for grouped regions with SCRs grouped by Upstate (Load Zones A-F) and Downstate (Load Zones G-K); for the 2026-2027 IRM study, all SCRs in Load Zones A-F starting at HB16 (i.e., 3 hours before the weighted average summer net load peak hour for Load Zones A-F) and all SCRs in Load Zones G-K starting at HB14 (i.e., 3 hours before the weighted average summer net load peak hour for Load Zones G-K).

Impact Analysis

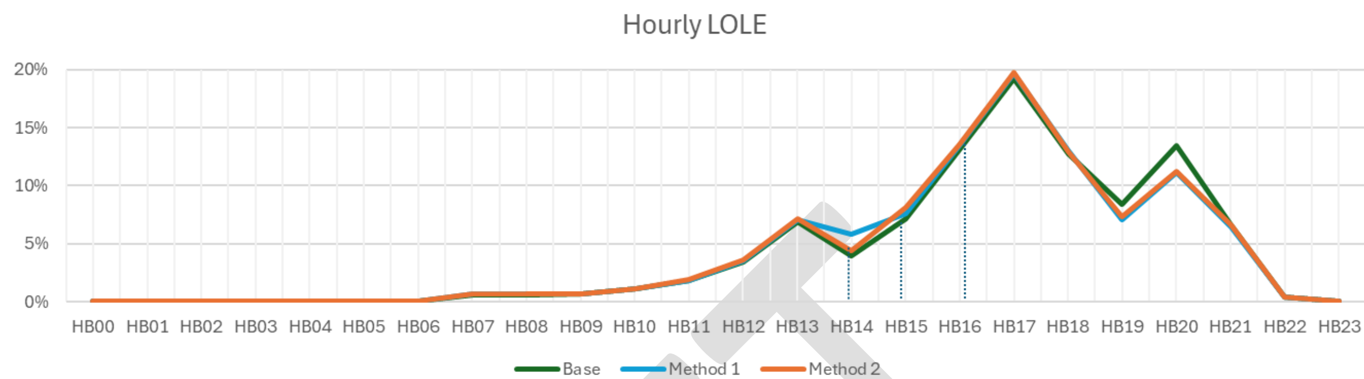
This impact analysis evaluates the potential effect of different methods of setting the SCR start time on the IRM (Table 4). The base case, which uses a parametric approach for the 2026–2027 IRM study presented at the September 3, 2025 Installed Capacity Subcommittee (ICS) meeting, assumes a start time of HB14 for all SCRs (i.e., consistent with all ES and small EL3 units) and yields an IRM of 25.78%. Method 1 adjusts the SCR start time to HB15 for all SCRs, resulting in a slightly lower IRM of 25.66%, a decrease of 0.12 percentage points from the base case. Method 2 applies differentiated SCR start times for grouped regions of SCRs —HB16 for SCRs in Load Zones A-F and HB14 for SCRs in Load Zones G-K—leading to an IRM of 25.62%, a reduction of 0.16 percentage points from the base case.

Table 4: Impact Analysis

Method	Zone	SCR Start Time	IRM (Parametric Results)	Delta (Test Case – Base)
BASE: (Parametric)* ***2026-2027 IRM Final Base Case presented at 9/3/2025 ICS meeting without the inclusion of updates for Voluntary Curtailments and Public Appeals**	**NYCA**	14	25.78	-
Method 1	**NYCA**	15	25.66	(0.12)
Method 2	**A-F**	16	25.62	(0.16)
	G-K	14		

The Hourly LOLE analysis (see Figure 2) indicates that for both Method 1 (all SCRs in NYCA at HB15) and Method 2 (SCRs in Load Zones A-F at HB16, and SCRs in Load Zones G-K at HB14), because small ELRs and ESR are permitted to generate beginning at HB14 a valley in the LOLE risk occurs at HB14. For Method 1, the LOLE risk for HB14 is higher due to SCRs not being permitted to start until HB15. For Method 2, SCRs in Load Zones G-K are permitted to start at HB14, reducing the risk for HB14 resulting in a similar hourly LOLE profile to the base case. For Method 2, SCRs in Load Zones A-F are permitted to start at HB16. However, the SCRs in Load Zones A-F have a similar response rate for Event Hour 1 and Event Hour 3 and therefore, a similar amount of SCRs are available for HB16 in both the base case and the Method 2 test case.

Figure 2: Hourly LOLE



Recommendation and Conclusion

For the 2026-2027 IRM Final Base Case (FBC), the NYISO recommends updating the SCR start times for Load Zones A-F to HB16 and HB14 for Load Zones G-K to better align with historical activations and separate upstate and downstate net load peak/risk profiles.

The modeling improvements outlined in this whitepaper represent a significant step forward in aligning SCR activation assumptions with observed operational practices and regional risk profiles. By differentiating start times for upstate and downstate zones and incorporating historical SCR event data, the IRM model can more accurately reflect system behavior during peak risk periods. These enhancements were approved by the ICS on September 3, 2025, and have been incorporated in the 2026–2027 IRM FBC.

Beyond the 2026–2027 IRM study, continued refinement of ELR modeling will be essential to ensure alignment with evolving system conditions and operational practices. As winter reliability risks grow, solar penetration increases, and load shapes shift seasonally and regionally, future IRM cycles will benefit from ongoing evaluation of ELR activation timing and methodology. Reviewing net load peak hours each study year will be important to ensure that ELR activation remains appropriately timed and reflective of changing system dynamics.

Appendix A:

Table A-1: SCR Calls by Bin

Bin	1	2	3	4	5	6	7
# SCR Calls	14.7	9.2	12.4	4.7	0.8	0.1	0.0

Table A-2: Top 6 NYCA Net Load Days Bin 1&2 (2013)

Date	NYCA Peak Net Load Hour (HB)	SCR Activated in Bin 1	SCR Activated in Bin 2
7/18/2013	17	Yes	Yes
7/19/2013	17	Yes	Yes
7/17/2013	19	Yes	Yes
7/15/2013	19	Yes	Yes
7/16/2013	19	Yes	Yes
8/21/2013	19	Yes	Yes

Table A-3: Top 6 NYCA Net Load Days Bin 3&4 (2018)

Date	NYCA Peak Net Load Hour (HB)	SCR Activated in Bin 3	SCR Activated in Bin 4
8/29/2018	17	Yes	Yes
8/28/2018	18	Yes	Yes
9/5/2018	18	Yes	Yes
8/6/2018	18	Yes	Yes
9/4/2018	18	Yes	Yes
7/2/2018	18	Yes	Yes

Table A-4: Top 6 NYCA Net Load Days Bin 5, 6 & 7 (2017)

Date	NYCA Peak Net Load Hour (HB)	SCR Activated in Bin 5	SCR Activated in Bin 6	SCR Activated in Bin 7
7/19/2017	19	Yes	No	No
8/22/2017	16	No	No	No
6/13/2017	17	Yes	No	No
7/20/2017	18	Yes	No	No
7/21/2017	17	Yes	No	No
6/12/2017	19	No	No	No