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Independent System Operator

Energy Limited Resource (ELR) Modeling and Output Limitation Review – Special Case Resource (SCR) Modeling

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Background

- The 2021 ELR Modeling Whitepaper[1] noted that reevaluating the continued use of a single generation output limit for all ELRs would be necessary as the quantity of ELRs increases over time.
- Currently, the output limitations for all small EL3 and ES units (including SCRs) are lifted at hour beginning (HB) 14.
  - The Enhanced SCR Modeling technique implemented as part of the 2025-2026 IRM study increases the utilization of the ELR functionality and significance of the output window limitation for ELR units.
- Within the IRM model, all SCRs (~1,400 MW total) are available at the same time and their utilization in the model may be misaligned with actual operations.
- NYISO has conducted preliminary research into historical SCR activations and operational conditions to better inform SCR utilization for the purposes of the IRM model.

1. https://www.nysrc.org/wp-content/uploads/2023/03/ELR-Modeling-White-Paper-May-2021-FINAL.pdf

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Impacts on Hourly LOLE

- **The generation output limitation window for small ELRs, energy storage resources (ESRs), and SCRs is based on the hourly loss of load expectation (LOLE) from the previous year's IRM study.**
  - However, the adoption of the updated generation output limitation window will also influence when the majority (90%) of the risk occurs.
  - This creates a circular dependency, where the input (start time) is informed by an output (LOLE) that is itself impacted by that same input.
- **With a significantly larger number of SCRs being modeling, compared to small ELRs and ESRs, the current impact of updating the generation output limitation window will be largely driven by the activation of SCRs in the IRM model**
- **To avoid the circular dependency, start times for SCRs within the IRM model should be determined in a manner consistent with the expected times that SCRs are likely to be activated by NYISO operations**

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Historical SCR Events Since 2021 (Summer)

Date	Start Time (Hour Beginning)	Length of Call (Hours)	Load Zones	Day-Ahead Forecasted Peak Load Hour[2] (Hour Beginning)	Real-Time Actual Peak Hour[2] (Hour Beginning)	Number of hours called before forecasted peak	Event Type
June 25, 2025	14	7	A-K	17	18	3	Mandatory
June 24, 2025	14	7	A-K	18	18	4	Mandatory
June 23, 2025	14	7	A-K	17	18	3	Mandatory
August 1, 2024	15	5	A-K	17	17	2	Mandatory
July 16, 2024	15	5	A-K	17	17	2	Mandatory
July 15, 2024	15	5	A-K	17	17	2	Mandatory
June 20, 2024	*15*	*4*	*K*	*17*	*17*	*2*	*Voluntary*
July 20, 2022	15	7	F	18	18	3	Mandatory
July 19, 2022	16	6	F	18	18	2	Mandatory
August 27, 2021	13	7	K	16	16	3	Mandatory
August 26, 2021	13	7	K	17	16	4	Mandatory
August 25, 2021	13	7	K	17	17	4	Mandatory
August 13, 2021	13	7	K	16	17	3	Mandatory
August 12, 2021	13	7	K	17	17	4	Mandatory
August 11, 2021	13	6	K	17	17	4	Mandatory

2. https://www.nyiso.com/load-data

Determining When to Activate SCRs

- When SCR activations occur, NYISO operations typically seeks to center the event period around the expected net load peak hour (system peak demand after contributions from behind-the-meter (BTM) solar)
- The table below depicts an example of this practice based on a forecasted net load peak hour for HB18
  - A 5-hour event would typically start ~2 hours before the forecasted net load peak hour.
  - A 6-hour event would typically start 2 or 3 hours before the forecasted net load peak hour.
  - A 7-hour event would typically start ~3 hours before the forecast net load peak hour.
- With the "Enhanced SCR Modeling" approach, SCRs are assumed to be activated for 7 hours and derated for each of the hours according to their respective hourly response rates (see Appendix for details).
  - For the 2026-2027 IRM study preliminary base case (PBC), only Load Zones F and K have defined response rates covering a full 7-hour activation due to the historical SCR event information utilized.
  - Recent SCR events on June 23–25, 2025 were 7-hour calls for all Load Zones.
    - As a result, the 2027-2028 IRM study will have access to historical event information to develop 7-hour response rate data for all Load Zones.
- Based on historical operating practices and the duration of recent SCR events, the NYISO recommends that the IRM study model be updated to assume that SCRs would be activated 3 hours before the simulated net load peak hour as further described in following slides.

Length of SCR Activation	HB15	HB16	HB17	HB18 (Forecasted Net Load Peak Hour)	HB19	HB20	HB21
5		x	x	x	x	x	
6	x	x	x	x	x	x	
7	x	x	x	x	x	x	x

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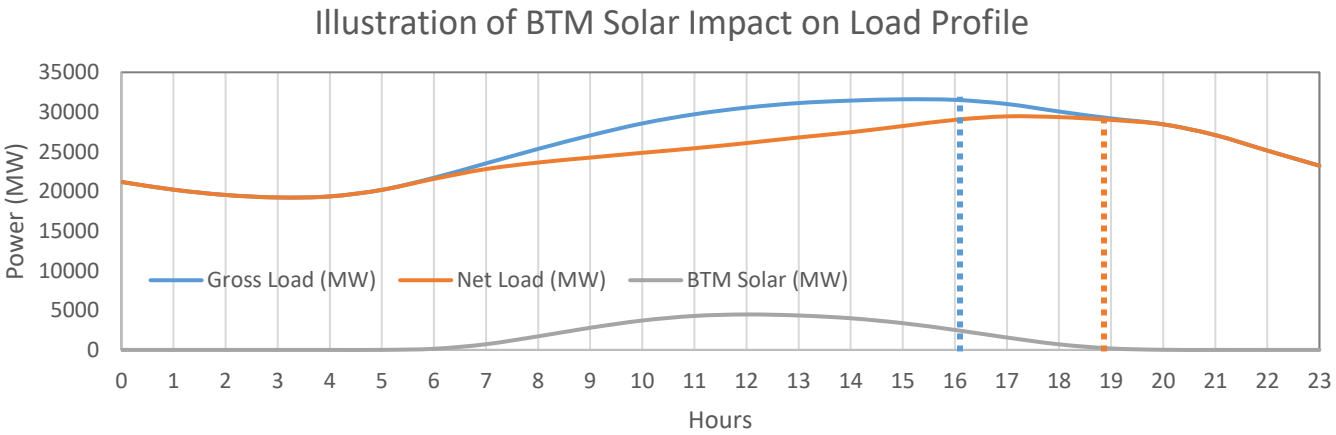
Relationship between BTM Solar and Net Load

- **With an increase of BTM solar capacity over time, the net load peak hour may vary and is expected to shift to later in the day.**
  - Therefore, it is expected that the net load peak hour in the IRM model may change over time with increased penetration of BTM solar
- **Each study year, the BTM solar adjusted net load[3] peak hour, should be reviewed to better align the SCR activation with expected operations.**
  - Since the current peak typically occurs during daylight hours in the summertime, an increase in BTM solar could impact when the net load peak hour occurs



3. BTM solar adjusted net load represents load from historical years (2013, 2017 & 2018), adjusted to reflect the impacts of the forecasted BTM solar capacity level and energy throughout the study year. The net load represents the gross load minus study year BTM solar

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Determination of the Net Load Peak Hour

- Currently, SCRs are called on average 5.6[4] times per year in the IRM model
- 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 model are consistent with the dates that the net load peak hours occur in the model (see Appendix for further details)
  - 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.

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

4. Analysis done on the latest case at the time of research (using updated 2026 solar adjusted load shapes)

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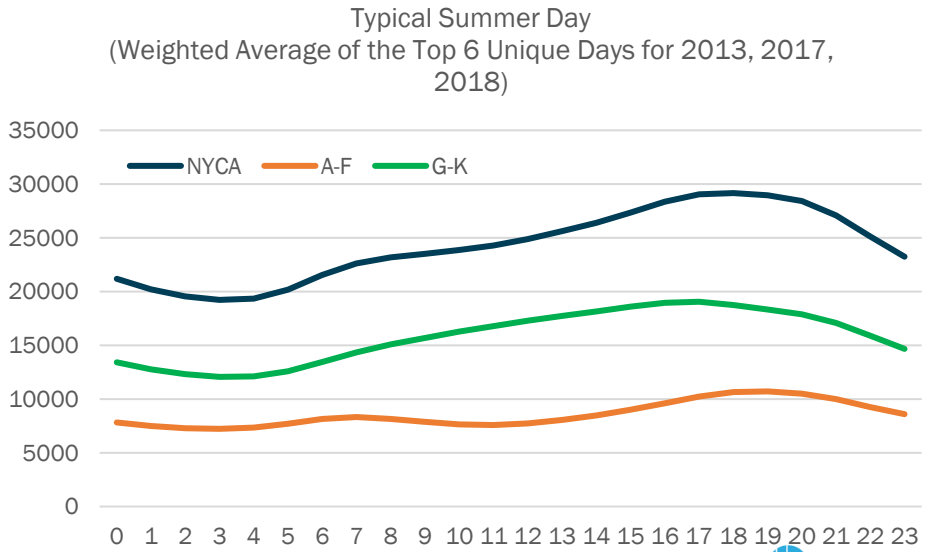
Summer Peak Hour of Top 6 Peak Days

- 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-K, 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

Year	NYCA Summer Day Peak Load Hour (Hour Beginning)	A-F Summer Day Peak Load Hour (Hour Beginning)	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**



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Winter Analysis

- The NYISO also assessed the net load peak hours in the winter season to determine whether significantly different hours are observed compared to the summer net load peak hours.
- The NYISO's assessment determined that winter peak hours are similar to the summer peak hours.
- Currently, the IRM model is generally driven by summer risks which is evidenced by SCR usage in the model.
  - The NYISO recommends focusing on the summer risk period for determining an appropriate start time for SCR events at this time.
- As winter reliability risks increase over time, it will be important to monitor the changes in the net load peak hours between the summer and winter seasons and update the modeled SCR start times accordingly.

Weighted Average Peak Load Hour (Hour Beginning)

Year	NYCA	A-F	G-K
Summer	18	19	17
Winter	17	17	17

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

2. https://www.nyiso.com/load-data

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SCR Start Time in the IRM Model

- **Within the current IRM model, output limitations for SCRs are currently removed at HB14.**
  - 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 during peak load periods.
- **The NYISO recommends consideration of the two potential methodologies for determining an appropriate start time for SCRs in the IRM model:**
  - Method 1: NYCA peak load hour
    - All SCRs starting HB15 (i.e., 3 hours before the weighted average NYCA summer peak load hour)
  - Method 2: Grouped by Upstate (A-F) and Downstate (G-K)
    - All SCRs in Load Zones A-F starting at HB16 (i.e., 3 hours before the weighted average summer peak load hour for Load Zones A-F)
    - All SCRs in Load Zones G-K starting at HB14 (i.e., 3 hours before the weighted average summer peak load hour for Load Zones G-K)

Method	Zone	Peak Load Hour	Start Time (Peak Load Hour – 3hrs)
Method 1	NYCA	18	15
Method 2	A-F	19	16
	G-K	17	14

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Next Steps

- Continue discussions at the 8/6/2025 ICS meeting
- Present analysis of different SCR start time configurations
- Finalize SCR start time modeling recommendation for the 2026-2027 IRM study Final Base Case
- Prepare ELR Whitepaper with research findings and recommendations
- Continue to work with GE Vernova to explore potential GE Multi-Area Reliability Simulation software program (MARS) improvements to the ELR functionality for potential implementation in future study years.

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ELR Modeling and Output Limitation: Proposed Timeline

Milestone	Anticipated Timeline
Present draft scope to the ICS for approval	January 8, 2025
Review current GE MARS logic, existing software limitations, and recent software improvements	April 2, 2025
Review the utilization of ELRs within the IRM model and LOLE relationship	July 10, 2025
Discuss historical availability and operations of energy limited resources, optimal scheduling, and potential improvements to the modeling	July 10, 2025
Recommend near-term modeling improvements	Q3 2025
Prepare whitepaper report on near-term improvements (Phase 1)	Q4 2025
Test alternative ELR scheduling strategies and continue to Phase 2	2025/2026

Questions?

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Our Mission and 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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Appendix

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SCR Response Rates for 2026-2027 IRM PBC

SCR Performance for 2026-2027 IRM Study									
Super Zones	SCR Enrollments (MW) (Preliminary – To be updated for FBC)	Response Rate (%) by Hour of SCR Activation							Superzonal ACL to CBL Translation Factor (%)
		Event Hour 1	Event Hour 2	Event Hour 3	Event Hour 4	Event Hour 5	Event Hour 6	Event Hour 7	
A - E	783.4	82.33%	85.85%	85.54%	79.20%	75.61%	-	-	91.85%
F	103.5	72.95%	79.54%	82.43%	83.29%	83.40%	70.40%	66.99%	89.18%
G - I	90.6	61.08%	69.85%	72.12%	73.52%	74.47%	71.50%	-	83.46%
J	478.7	57.53%	62.61%	66.97%	70.70%	72.29%	66.09%	-	72.92%
K	30.6	51.20%	57.99%	63.12%	65.49%	64.82%	63.35%	52.63%	75.13%
All Zones	1,486.7	66.77%	72.08%	74.61%	74.35%	73.83%	66.38%	58.14%	

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Top 6 Net Load Days (NYCA – 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

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

*SCR activation is determined by averaging the SCR event data across 99 replications for each zone and then summing the zonal values to assess whether an SCR event occurred at the NYCA-wide level

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Top 6 Net Load Days (NYCA – 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

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

*SCR activation is determined by averaging the SCR event data across 99 replications for each zone and then summing the zonal values to assess whether an SCR event occurred at the NYCA-wide level

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Top 6 Net Load Days (NYCA – 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

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

*SCR activation is determined by averaging the SCR event data across 99 replications for each zone and then summing the zonal values to assess whether an SCR event occurred at the NYCA-wide level

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