Attachment #4.1.1
Return to Agenda

New York ISO
Independent System Operator

2026-2027 Installed Reserve Margin (IRM) Preliminary Base Case (PBC)
- Tan45 Results

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Resource Adequacy

ICS Meeting #306

August 6, 2025

2026-2027 IRM: PBC Tan45 Results

Results	2025-2026 IRM FBC	2026-2027 IRM PBC	Delta
IRM	24.4	**27.3**	2.9%
Load Zone J	75.6	**80.6**	5.0%
Load Zone K	107.3	**106.9**	-0.4%
G-J Locality	86.9	**89.7**	2.8%
NYCA EOP (Days/Yr.)	7	**7.5**	0.5

Case	Loss of Load Expectation *(LOLE)*	Hourly Loss of Load Expectation *(LOLH)*	Normalized Loss of Energy Expectation or LOEE *(Expected Unserved Energy or EUE) "Simple Method" ppm*	Normalized LOEE *(EUE) "Bin Method" ppm*
2025-2026 IRM FBC	0.1	0.374	1.437	1.284
2026-2027 IRM PBC	0.1	0.354	1.112	1.007

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Observations

- The NYISO identified three modeling changes as the primary contributing factors to the increases to the IRM, as well as the Load Zone J and G-J Locality locational capacity requirements (LCR) relative to the 2025-2026 IRM Final Base Case (FBC).
  - Behind-the-meter (BTM) solar and enhanced load modeling (ELM) improvements,
  - Champlain Hudson Power Express (CHPE) modeling, and
  - Implementation of the winter fuel availability constraints model
- The incorporation of the BTM solar and enhanced load modeling improvements increased the IRM year-over-year due to increased variability of BTM solar generation shapes
  - Improvements to the load modeling were made to allow for winter peak loads to be more accurately reflected in the IRM study.
- The incorporation of CHPE into the model increases the Load Zone J and G-J Locality LCRs due to the increase in the modeled capacity in those regions and CHPE availability assumptions.
  - CHPE only provides reliability improvements during the summer period in the IRM model because the modeling construct used for the 2026-2027 IRM PBC assumes 0 MW of capacity provided from CHPE to Load Zone J during the Winter Capability Period.
- The incorporation of winter fuel availability constraints places upward pressure on the IRM.
  - The fuel availability constraints increase capacity requirements upstate, through an increase to the IRM, to allow for capacity to flow downstate to mitigate loss-of-load in the winter risk periods.
- The incorporation of fuel availability constraints also introduces winter LOLE in the IRM study
- The Tan45 solution for the 2026-2027 IRM PBC increases the upstate capacity requirement compared to the parametric study results

1. https://www.nysrc.org/wp-content/uploads/2025/07/CHPE-and-Fuel-Constraints.pdf

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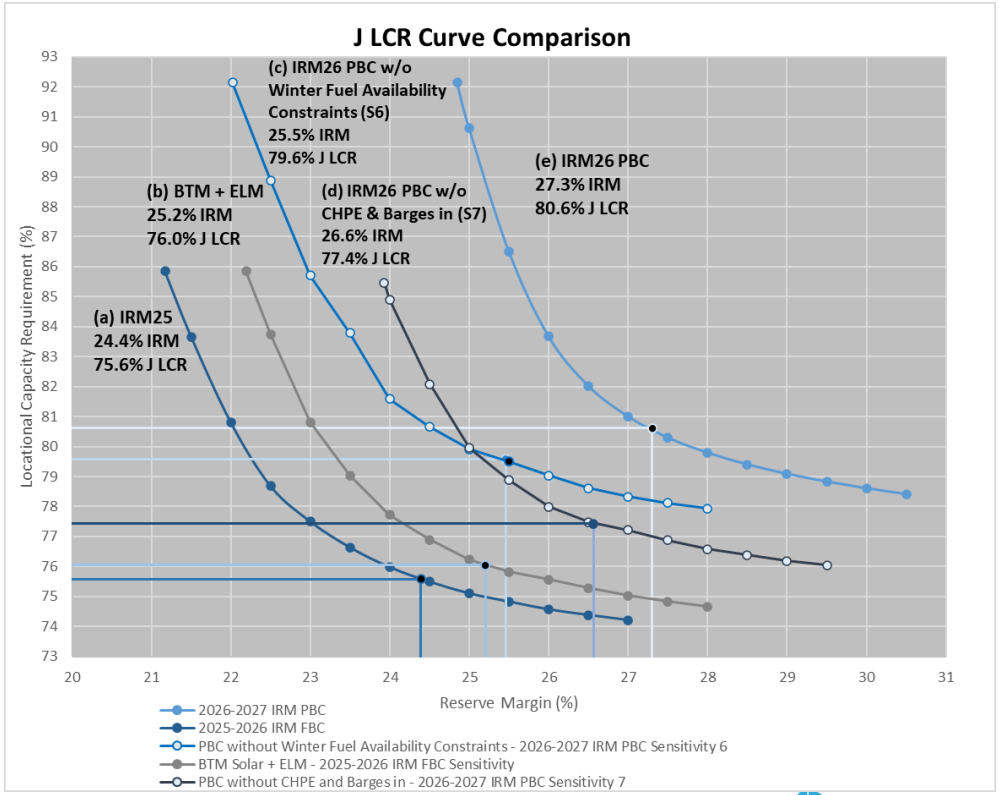
Review of Cases – Load Zone J Tan45 Curve

- The NYISO compiled several Tan45 cases to evaluate the impact on the 2026-2027 IRM PBC from the three key modeling updates
  - a) 2025-2026 IRM FBC
  - b) BTM Solar + ELM - 2025-2026 IRM FBC Sensitivity
  - c) PBC without Winter Fuel Availability Constraints - 2026-2027 IRM PBC Sensitivity Case 6 (S6)
  - d) PBC without CHPE and Gowanus/Narrows Barges – 2026-2027 IRM PBC Sensitivity Case 7 (S7)
  - e) 2026-2027 IRM PBC
- Compared to the 2025-2026 IRM FBC, the IRM/LCR curves are shifting outward because of increased reliability risk in the underlying IRM model.
- The movement of the curves is the result of annual updates such as generator EFORds, load forecast, and topology, along with modeling improvements such as BTM solar, winter fuel availability constraints, and new resource additions such as CHPE.
- The combination of CHPE/barges modeling assumptions together with winter fuel availability constraints are increasing the IRM/LCRs.



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Impact of Winter Fuel Availability Constraints

- Fuel availability constraints are applied to thermal resources in Load Zones F-K in the months of December – February.
- The fuel availability constraint model is critical to represent risks associated with non-firm fuel arrangements for thermal resources in Load Zones F-K.
- Increased capacity requirements are observed in NYCA and Load Zone J, while upstate capacity is preferred in the Tan45 solution.
  - The Tan45 solution procures relatively more capacity in upstate (Load Zones A-E) to meet shortage events in Load Zones F-K than procuring capacity in the regions where the constraints are applied (Load Zones F-K).
- Incorporating the winter fuel availability constraints introduces winter LOLE in the IRM model for 2026-2027.

Margin	2026-2027 IRM PBC (Tan45) (Sensitivity Case 6) *No Winter Fuel Availability Constraints*	2026-2027 IRM PBC (Tan45)	Delta *Impact of No Winter Fuel Availability constraints*
IRM	25.5	27.3	-1.8%
J LCR	79.6	80.6	-1.0%
K LCR	107.4	106.9	+0.5%
G-J LCR	89.0	89.7	-0.7%

Case	Summer LOLE	Winter LOLE
2026-2027 IRM PBC (Tan45) *No Winter Fuel Availability Constraints (Sensitivity Case 6)*	100%	0%
2026-2027 IRM PBC	86.16%	13.84%

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Impact of Alternative Assumptions for CHPE and the Gowanus and Narrows Barges

- The 2026-2027 IRM PBC assumes that CHPE is in-service and the Gowanus and Narrows barges are modeled out-of-service, a sensitivity was requested to exclude CHPE and model the barges as in-service (i.e., Sensitivity Case 7).
- The IRM decreases largely due to increased winter fuel availability and the Load Zone J LCR decreases largely due to reduced available capacity
- The incorporation of the Gowanus and Narrows barges reduces winter LOLE due to an increase in the assumed level of available oil under the fuel availability constraints modeling to account for historic fuel availability for such resources.
  - The winter LOLE is lower with the alternative assumptions, despite lower total capacity requirements.
- With the alternative resource inclusion assumptions, the IRM and Load Zone J LCR decrease, while the Load Zone K LCR increases.
  - Removal of CHPE from the modeled supply decreases the Load Zone J LCR.
- Without CHPE, winter LOLE risk is still present due to the modeling of the fuel availability constraints. The difference in the observed winter LOLE risk between the two cases suggests that the addition of resources supplying capacity only during summer can amplify the impacts of the fuel availability constraints.

Margin	2026-2027 IRM PBC (Tan45) (Sensitivity Case 7) *CHPE + Barges Alternative Assumptions*	2026-2027 IRM PBC (Tan45)	Delta *Impact of CHPE out of service and Barges in*
IRM	26.6	27.3	-0.7%
J LCR	77.4	80.6	-3.2%
K LCR	108.9	106.9	+2.0%
G-J	87.4	89.7	-2.3%

Case	Summer LOLE	Winter LOLE
2026-2027 IRM PBC (Tan45) *CHPE + Barges Alternative Assumptions (Sensitivity Case 7)*	96.29%	3.71%
2026-2027 IRM PBC	86.16%	13.84%

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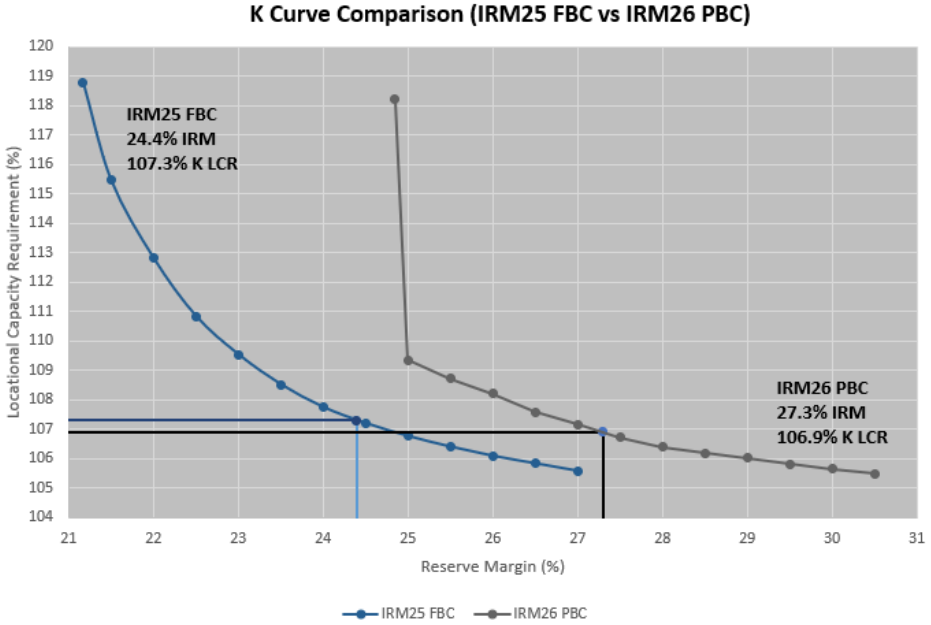
Load Zone K - Tan45 Curve

- The Load Zone K IRM/LCR curve exhibits a steep decline from the “point 0” to “point 1”
  - Information for Points 0 - 2 of the Tan45 solution are provided in the table below the figure.
- Starting from the as-found condition, a significant quantity of capacity from Load Zone K (~492 MW) needs to be removed and shifted upstate in order to meet the 0.1 event-days/year LOLE.
- NYISO is seeking feedback on next steps for research and analysis related to the changing shape of the Load Zone K IRM/LCR curve



Point	Margin	Total Removed MW	J shift MW	K shift MW	JK ratio MW	J ratio	K ratio	J LCR	K LCR
0	24.85	1,845.87						92.142	118.224
1	25	1,798.94	180.661	492.111	620.103	0.269	0.731	90.635	109.35
2	25.5	1,638.125	748.436	584.737	1,106.72	0.561	0.439	86.518	108.727

Summary

- Increases to the IRM as well as the Load Zone J and G-J Locality LCRs are observed due annual updates to the IRM study along with critical modeling improvements such as BTM solar, winter fuel availability constraints, along with the incorporation of CHPE into the IRM model.
- The underlying IRM model is representing greater risk across the NYCA system as observed by the outward shift of the IRM/LCR curves.
- Winter LOLE is observed for the first time in the IRM study at 13.84% due primarily to the incorporation of winter fuel availability constraints

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Case	Loss of Load Expectation *(LOLE)*	Hourly Loss of Load Expectation *(LOLH)*	Normalized Loss of Energy Expectation or LOEE *(Expected Unserved Energy or EUE) "Simple Method" ppm*	Normalized LOEE *(EUE) "Bin Method" ppm*	Summer LOLE	Winter LOLE
2025-2026 IRM FBC	0.1	0.374	1.437	1.284	100%	0%
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Standard Error Analysis

- **Under the Policy 5, Section 3.8, the standard error of the IRM study should be less than 0.025 of the mean LOLE.**
  - "The ICS has determined that the desired standard error value for the mean Loss of Load Expectation (LOLE) at the 95% confidence level shall be less than or equal to 0.025 at the final iteration at three critical points; a) the beginning of the IRM Study; b) at the conclusion of the Preliminary Base Case prior to Tan 45 process; and c) at the conclusion of the Final Base Case prior to the Tan 45 process. "
- **At 1,865 replications, the standard error at the conclusion of the Preliminary Base Case prior to the Tan 45 process is 0.025**
  - Prior to the Tan45 for the 2026-2027 IRM PBC, the number of replications used was 2,000. This will be reassessed prior to the 2026-2027 IRM FBC Tan45.

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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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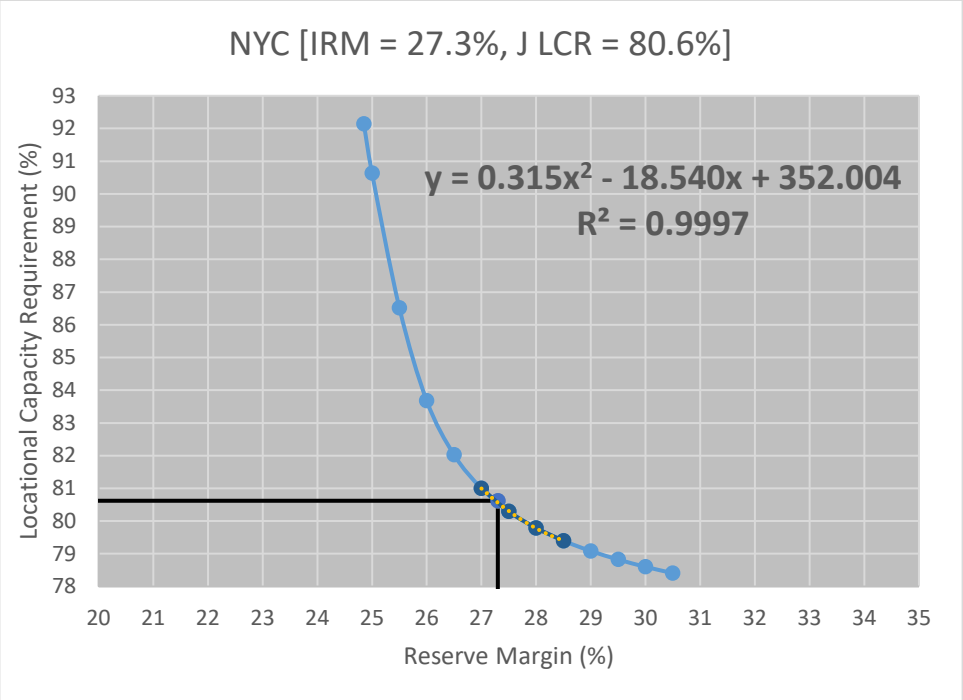
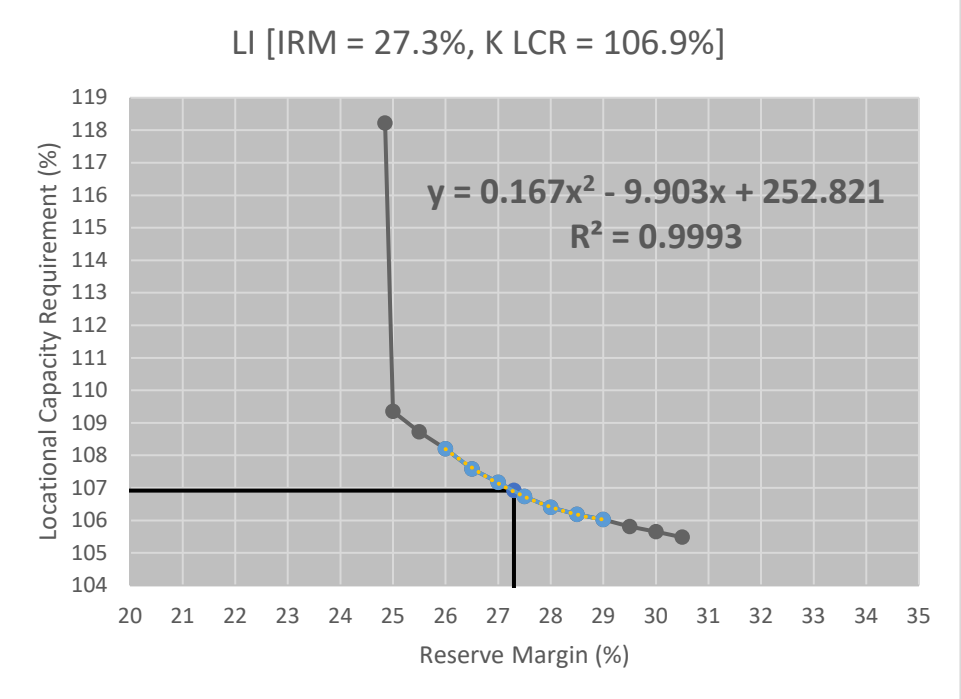
For review and approval at the 08/15/2025 NYSRC EC Meeting

IRM 2026-2027 Preliminary Base Case Tan45





Step	EOP	Expected Implementation (Days/Year)
1	Require SCRs (Load and Generator)	7.5
2	5% manual voltage reduction	6.3
3	30-minutes reserve to zero	6.1
4	Voluntary load curtailment	4.4
5	Public appeals	4.2
6	5% remote controlled voltage reduction	4.1
7	Emergency purchases	3.4
8	10-minutes reserve to 400 MW	0.2
9	Customer disconnections	0.1

Note: The expected implementation days per year reported in each Emergency Operating Procedure (EOP) step are the expected number of days that MARS calls for that EOP step. If an EOP step has a limitation on the number of days that it can provide relief, such as the 3 calls per year for Voluntary Curtailment and Public Appeals, it will provide no load relief after the 3rd call. Special Case Resources (SCRs) are modeled utilizing a duration limitation with hourly response rates and a 1 call per day limitation.

SCR Calls Per Month	
Month	Days/Month
JAN	1.7
FEB	0.1
MAR	0.0
APR	0.0
MAY	0.0
JUN	0.1
JUL	2.2
AUG	1.9
SEP	0.9
OCT	0.0
NOV	0.0
DEC	0.5

For information at the 08/15/2025 NYSRC EC Meeting

2026 - 2027 IRM PBC Tan45				
Summary Results				
	IRM	J LCR	K LCR	G-J
IRM Tan45	27.3	80.6	106.9	89.7

J /K Individual Tan45 Regression Outcome				
J - Tan45	27.849	79.921		
K - Tan45	26.667		107.450	

J / K Regression Formula				
	ax^2	bx	c	LCR
J LCR	0.315	-18.540	352.004	**80.564**
K LCR	0.167	-9.903	252.821	**106.884**

Sections on J and K Curves for the final Tan45 Results			
J Curve Section		K Curve Section	
First Point	Last Point	First Point	Last Point
27.00	**28.50**	**26.00**	**29.00**

Low point and the 12 points on the Tan45 Curve

IRM	J_LCR	K_LCR
24.85	92.14	118.22
25.00	90.64	109.35
25.50	86.52	108.73
26.00	83.68	108.21
26.50	82.02	107.58
27.00	81.00	107.17
27.50	80.29	106.73
28.00	79.79	106.40
28.50	79.40	106.18
29.00	79.09	106.02
29.50	78.83	105.81
30.00	78.60	105.65
30.50	78.41	105.48

IRM Results Comparison					
Case	IRM (%)	LOLH (hours/yr)	EUE (MWhr/yr)	Normalized EUE (Simple Method)	Normalized EUE (Bin Method)
2025-2026 IRM Final Base Case	24.4	0.374	216.980	1.437	1.284
2026-2027 IRM Preliminary Base Case	27.3	0.354	172.836	1.112	1.007

Note: The hourly loss of load expectation (LOLH) and expected unserved energy (EUE) metrics reported here for information purposes only were requested by the NYS Reliability Council. The data used to calculate the LOLH and EUE were obtained from the GE MARS output.[1]

1. https://www.nysrc.org/wp-content/uploads/2023/04/NormalizedEUECalculationMethods-v1forMarch30RCMS.pdf