New York ISO
Independent System Operator

Tan45 Methodology Review: Thermal Shifting

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NYISO

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"Tan45 Methodology Review" 2024 Whitepaper Background

- The 2024 Whitepaper concluded that, when the underlying locational differences between upstate and downstate are significantly altered, the fundamental structure of the Tan45 methodology is challenged.
- The 2024 Whitepaper also identified a need to further assess the current process of capacity shifting and its impacts on outcomes for a changing grid, specifically:
  - Flattening of the Tan45 curves that may complicate the identification of a unique solution
  - Potential for achieving the "low point" of the Tan45 curves by removing capacities from other areas than historically utilized
- ICS recommended assessment of an alternative shifting methodology that varies thermal capacity as opposed to zonal average capacity
- The NYISO conducted analyses using the alternative thermal shifting methodology on the 2025-2026 installed reserve margin (IRM) Final Base Case (FBC) as well as the test case from the 2024 Whitepaper with 9,000 MW of offshore wind (OSW)

(Excerpt from 2024 Whitepaper)

1) The addition of significant offshore wind (OSW) resources in Load Zones J and K presents conditions under which the current Tan45 methodology may be unable to identify a unique Tan45 solution.
   - For a case involving the assumed ***addition of 9,000 MW of OSW resources the current Tan45 methodology was unable to establish an IRM.*** (emphasis added)
   - Cases involving the combination of the Champlain Hudson Power Express (CHPE) transmission project, which is currently expected in-service in 2026, and 3,000 MW or 6,000 MW of OSW lead to Tan45 "curves" demonstrate the ***potential for volatile results using the current Tan45 methodology.*** (emphasis added)
2) The removal of capacity from capacity-rich zones west of the Central-East Interface to identify the "low point" of the Tan45 curves, while maintaining Load Zones J and K "as found" as is done with the current Tan45 methodology, presents conditions in which the current Tan45 methodology is ***unable to properly identify the "lowest" IRM value.*** (emphasis added)
3) The addition of large quantities of renewable resources is expected to produce significantly higher IRM and locational capacity requirement (LCR) values than historically observed.

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Overview of Current Tan45 Shifting Methodology and the Alternative Thermal Shifting Methodology

- Currently, the Tan45 shifting methodology is based on the calculated Unforced Capacity (UCAP) in each zone
    - The "low-point" of the Tan45 curve is established by bringing the system to a 0.1 loss of load expectation (LOLE) criterion by removing capacity in Load Zones A-E based on the excess UCAP in each zone
    - Shifting ratio out of Load Zone J or Load Zone K in the solo shifting cases is based on (1 – zonal translation factor)
    - The zonal translation factor is the capacity-weighted equivalent forced outage rate on demand (EFORd) calculated based on all resources within a given zone, excluding Unforced Capacity Deliverability Rights, imports/exports, and Special Case Resources
- Based on the feedback from ICS, the NYISO assessed an alternative methodology for the shifting of capacity based on the zonal EFORd of thermal resources only
- The zonal EFORd values of thermal resources are generally lower than zonal translation factors accounting for all applicable resources within the upstate zones from which capacity is removed
    - Average thermal resource EFORd ~ 6%
    - Average zonal translation factor ~ 23%

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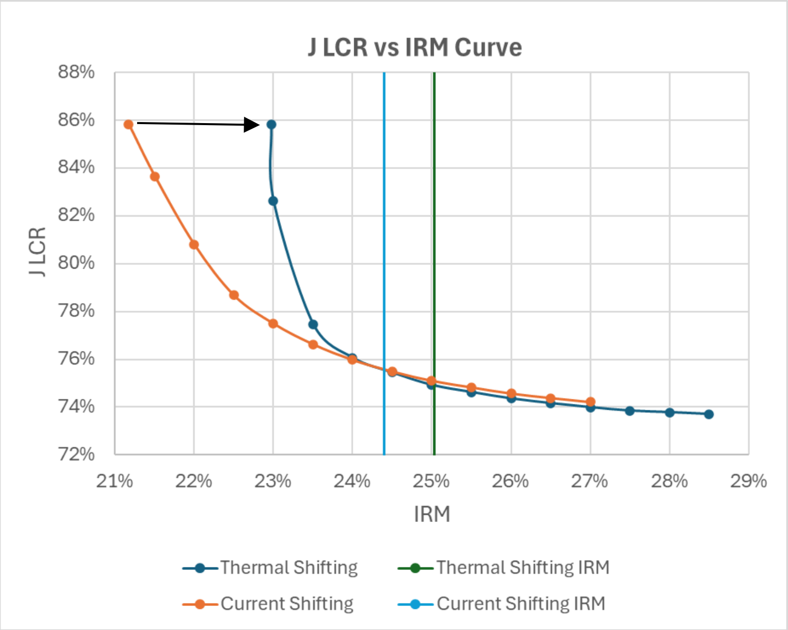
MW Shifted at the "Low Point"

- With the alternative thermal shifting method, the left portion of the Tan45 curve shifts rightward, most prominently at the "low point"
- This is because with the same quantity of UCAP removed to bring the system to the 0.1 LOLE criterion, the thermal shifting method translates the UCAP to a lower ICAP amount, leading to higher ICAP retained in upstate and a higher IRM
  - For the 2025-2026 IRM FBC, approximately 2,345 MW of "perfect" capacity was removed to identify the "low point" with both shifting methods
  - The use of a 6.48% thermal resource EFORd instead of a 23.71% zonal translation factor based on all applicable resources results in a 570 MW difference in ICAP
  - The difference in the translation factors was primarily driven by the removal of the significant quantity of intermittent resources in Load Zones A-E from the thermal resource only value
- The IRM and Tan45-derived locational capacity requirements (LCRs), which are in ICAP terms, may differ significantly between the two shifting methodologies despite the same modeled UCAP MW the study
- For the 2025-2026 IRM FBC, use of the alternative thermal resource EFORd translation factor increased the IRM 1.8% at the "low point"



"Low Point"	Current Method	Thermal Method	Delta
UCAP Removed (MW)	2,345	2,343	-2
ICAP Removed (MW)	3,073	2,503	-570
Low Point IRM	21.17%	22.97%	+1.80%
Average Translation Factor	23.71%	6.48%	-17.23%

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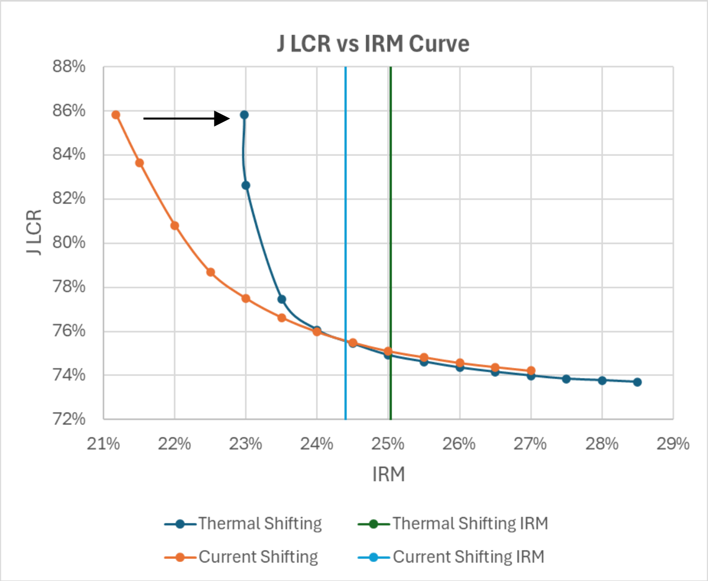
2025-2026 IRM FBC Impact

Reserve Margin	Current Method	Thermal Method	Delta
IRM	24.4%	25.0%	0.6%
Zone J LCR	75.6%	74.9%	-0.7%
Zone K LCR	107.3%	107.3%	0.0%



- While there is a more significant change to the "low point", the alternative thermal shifting methodology produced a moderate increase in the 2025-2026 IRM of 0.6%
- Use of the alternative thermal shifting methodology resulted in a decline to the Load Zone J LCR of 0.7%, and no change to Load Zone K LCR
  - The NYISO intends to further analyze the observed changes to the LCRs

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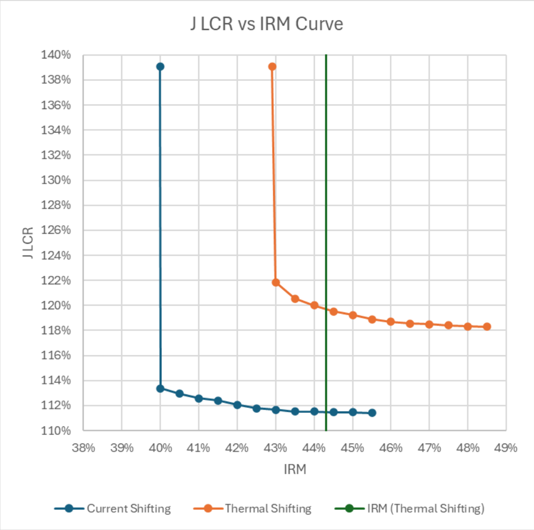
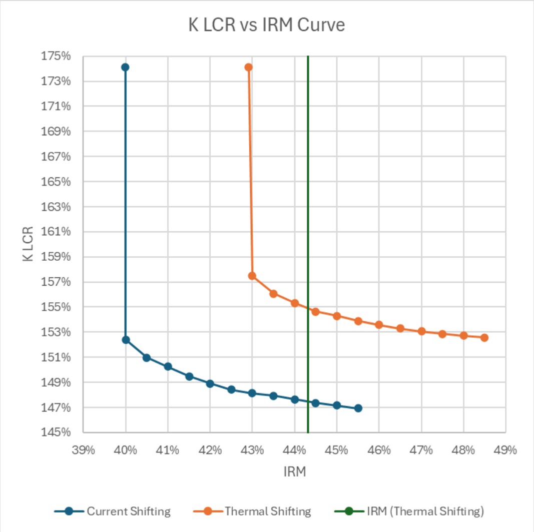
2024-2025 IRM FBC + 9,000 MW OSW Results

Key Observations:

1. Although use of the alternative thermal shifting methodology was able to calculate an IRM, the concerns regarding the current Tan45 methodology remain due to the fundamental shifts in the location of capacity supply
2. The steepness of the curve from the "low point" exists under both shifting methodologies
   - This is driven by changing system dynamics with surplus capacity existing in downstate zones
3. Use of the alternative thermal shifting methodology results in shifting the Tan45 upwards and rightwards





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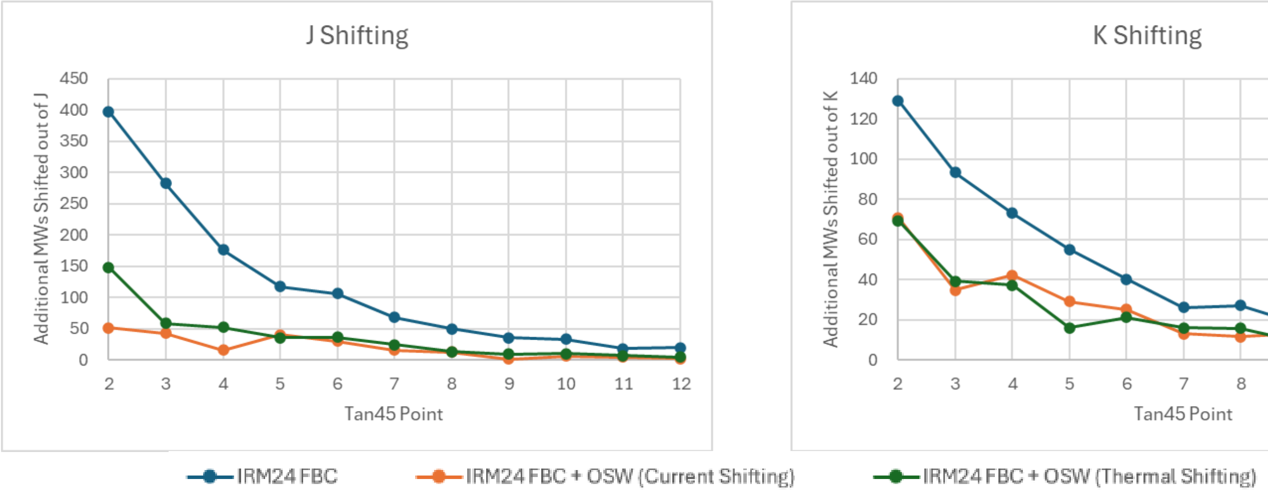
Load Zone J and Load Zone K - Shifting Comparison

- The following charts show the ICAP MW shifted out of Load Zones J or K along the Tan45 points as the IRM increases by 0.5% increments to maintain the same 0.1 LOLE criterion
- Compared to the 2024-2025 IRM FBC (using the current shifting method), both of the OSW test cases show a significant flattening of the Load Zone J and Load Zone K curves but did not demonstrate the "L" shape observed for the Tan45 curves
  - The flattening of the curves continues to indicate the potential for significant volatility to the IRM, as relatively small changes to the LCRs can lead to material increases to the IRM



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Alternative Thermal Shifting Methodology - Key Observations

- Core principles should be identified to guide the consideration of alternative shifting methodologies in the context of changing system dynamics
- The alternative thermal shifting methodology may provide for an alternative method to calculate an IRM under the current Tan45 construct in the near-term
  - However, fluctuations in the Load Zone J and Load Zone K "shift" curves remained present, suggesting the alternative thermal shifting methodology may not resolve the potential for future IRM volatility
- The alternative thermal shifting methodology may not be a viable long-term solution in isolation to address concerns identified by changing system dynamics
  - Further investigation is needed to understand the full scope of impacts associated with the alternative thermal shifting methodology and consistency of such alternative methodology with guiding principles for assessing alternatives and enhancements

Next Steps

Milestone	Anticipated Timeline
Present draft scope to the ICS for approval	January 8, 2025
Review alternative thermal shifting methodology test results	February 5, 2025
Identify and establish core principles for calculating the IRM	Q2 2025
Identify potential alternative shifting methodologies based on core principles	Q2 – Q3 2025
Identify potential test cases for testing alternative shifting methodologies Prepare and finalize interim progress report	Q3 - Q4 2025
Conduct testing of alternative shifting methodologies, enhancements, present results and insights	Q1 - Q2 2026
Finalize findings and formulate preliminary recommendations	Q3 2026
Prepare and finalize whitepaper report	Q4 2026

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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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