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Attachments #4.1.3 and #4.1.4
Return to Agenda

Tan45 Thermal Shifting & Fuel Constraints Modeling Phase 2

Dylan Zhang

NYISO

NYSRC Executive Committee Meeting #310

February 15, 2025

Tan45 Methodology Review

Thermal Shifting

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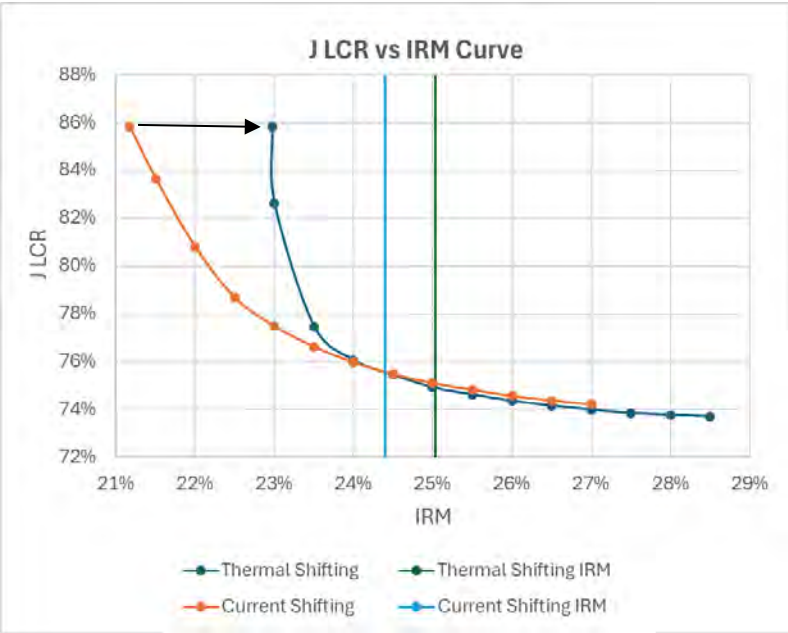
Thermal Shifting Method

- The ICS proposed testing of an alternative shifting method where MW are shifted based on zonal thermal capacity instead of the current zonal Unforced Capacity (UCAP) of all resources (see Appendix A for additional information)
- Based on an analysis using the 2025-2026 installed reserve margin (IRM) Final Base Case, the alternative thermal shifting method leads to the left portion of the Tan45 curves shifting rightward, most prominently at the "low point"
  - This result arises because removed UCAP is translated into a lower Installed Capacity (ICAP) amount leading to higher ICAP retained in upstate and a higher IRM low point
- The alternative thermal shifting method has a lesser impact on the right portion of the Tan45 curves, resulting in a moderate increase to the Tan45 IRM



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%

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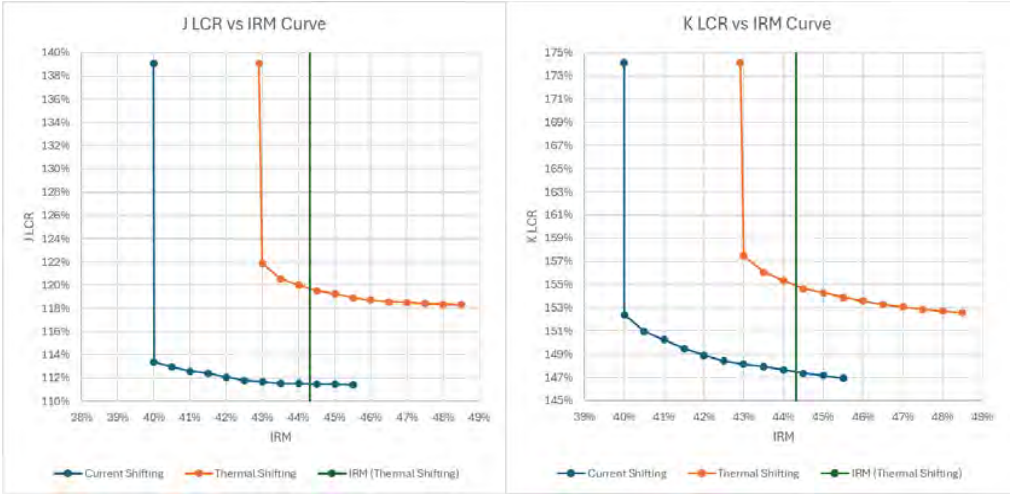
2024-2025 IRM FBC + 9,000 MW OSW Results

- A sensitivity case with 9,000 MW of offshore wind (OSW) added to the 2024-2025 IRM Final Base Case was developed to further assess the alternative thermal shifting method.
- The alternative thermal shifting method shifted the Tan45 curves upwards and rightwards, with no impact on the steepness of the curves
- Although use of the alternative thermal shifting methodology was able to calculate an IRM, the concerns regarding the current Tan45 methodology identified in the 2024 Tan45 Methodology Review Whitepaper remain due to the fundamental shifts in the location of capacity supply



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Key Observations and 2/5/2025 ICS Discussions

- 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
- Based on the 2/5/2025 ICS discussion, the alternative thermal shifting methodology was not viewed as a viable long-term solution in isolation to address concerns identified by changing system dynamics
- ICS further stressed the importance of establishing core principles before further evaluating alternative shifting methodologies and recommended reviewing the original Tan45 principles as an initial next step

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Fuel Constraints Modeling

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Whitepaper Fuel Availability Assumption

- The 2024 Gas Constraint Modeling Whitepaper recommended a 6-tired initial fuel availability assumption, as follows:

Tier	NYCA Load Conditions (MW)	Available Gas (MW)	Available Oil (MW)	Total Available Fuel (MW) (Gas + Oil)**	Illustrative Modeled Derate (Rounded MW)***
1	>26,000	375	11,000	11,375	8,600
2	25,000 - 26,000	750		11,750	8,225
3*	24,000 - 25,000	2,750		13,750	6,225
4*	23,000 - 24,000	4,500		15,500	4,475
5	22,000 - 23,000	5,500		16,500	3,475
6	<22,000	No Constraint		No Constraint	0

- NYISO is working to update the recommended initial assumption values for "available oil" and "available gas" to reflect more recent information (see Appendix B for additional information)
  - In November 2024, the NYISO recommended revising the proposed requirements for "firm fuel" elections to reflect a duration requirement of 56 hours instead of the previously proposed 96-hour requirement
  - The "available oil" assumption will be updated to reflect the proposed change to the duration requirement, as well as more recent data
  - The "available gas" assumptions will be updated to incorporate more recent data
- The updated values will be to support development of a recommendation for adoption in the 2026-2027 IRM Preliminary Base Case

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Model Implementation Recommendation

- The NYISO recommended using the updated fuel availability assumptions for the 2026-2027 IRM study
  - Firm fuel elections from resources are not recommended for use at this time due to uncertainty as the market rules regarding “firm fuel” remain under development
  - The fuel availability assumptions represent reasonable estimates of fuel availability under various load levels based on historical information
- Beyond 2026-2027 IRM study, as more experience is gained with the fuel availability elections in the NYISO’s capacity market, the NYISO recommends further evaluation and discussion regarding how such elections can be incorporated into (or accounted for in) the fuel availability assumptions for the IRM study

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2/5/2025 ICS Discussion and Next Steps

- At its 2/5/2025 meeting, the ICS requested that the fuel availability constraints modeling considerations for 2026-2027 IRM study be discussed with the Executive Committee (EC) to solicit further input and guidance
- The ICS also requested further review of the methodology used to develop and update the "available oil" assumption
- NYISO currently intends to provide an overview of its updated fuel availability constraints modeling recommendations at the March 5, 2025 ICS meeting and the subsequent EC meeting

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Appendix A: ICS #300 Meeting Materials

Tan45 Methodology Review: Thermal Shifting

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Tan45 Methodology Review: Thermal Shifting

Abdul Mohammed

NYISO

ICS Meeting #300

February 5, 2025

“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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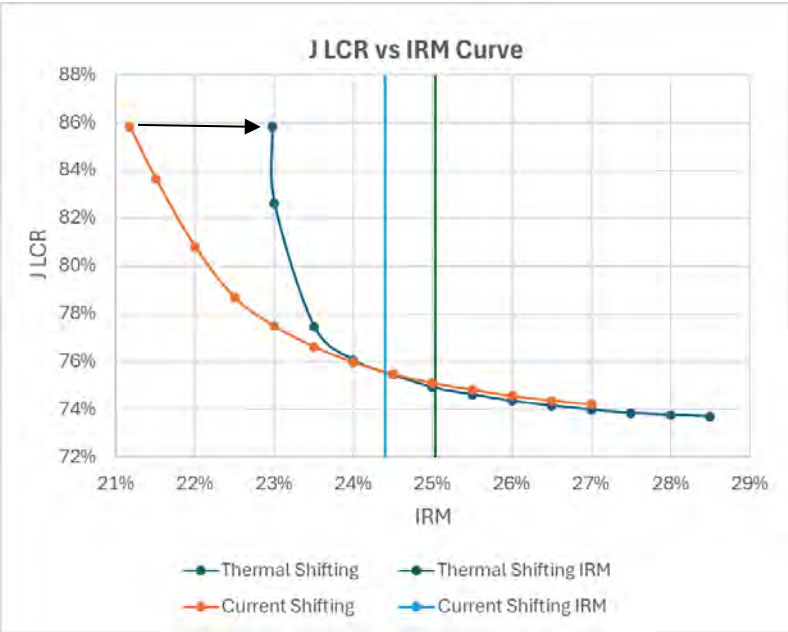
MW Shifted at the “Low Point”

- 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”



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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%
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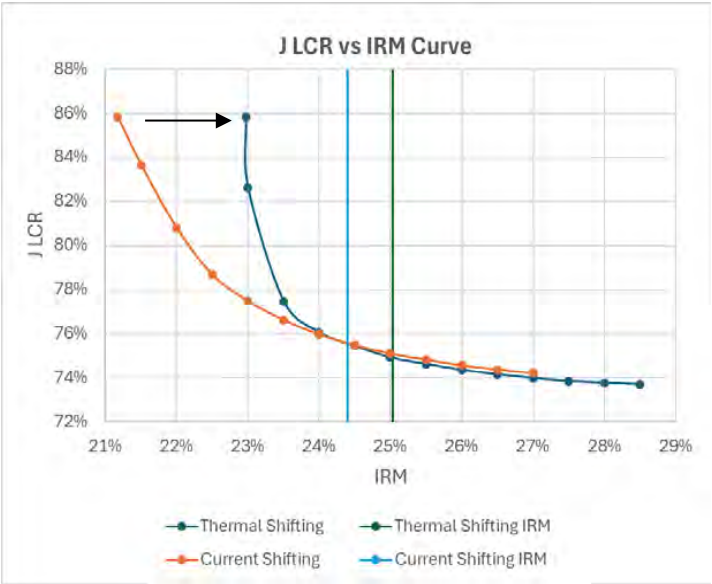

- While there is a more significant change to the “low point”, the alternative thermal shifting methodology produced a moderate increase in the 2025-2026 IRM of 0.6%
- Use of the alternative thermal shifting methodology resulted in a decline to the Load Zone J LCR of 0.7%, and no change to Load Zone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

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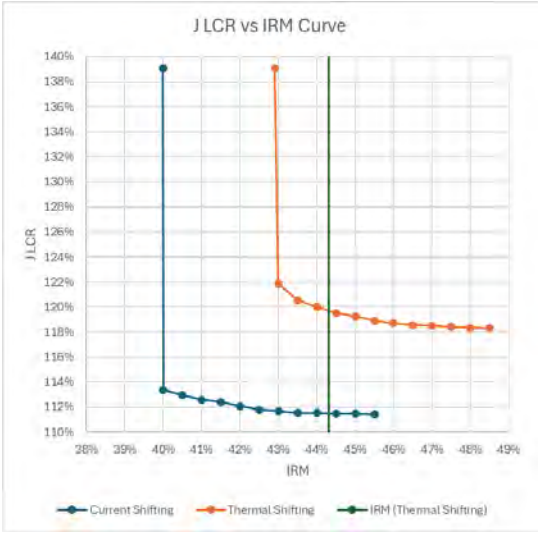
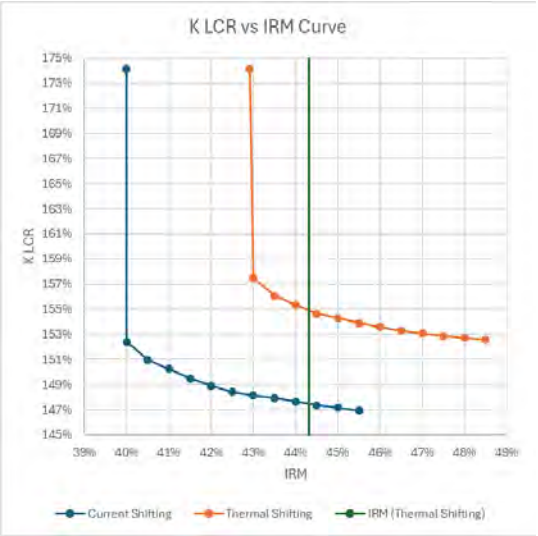
2024-2025 IRM FBC + 9,000 MW OSW Results

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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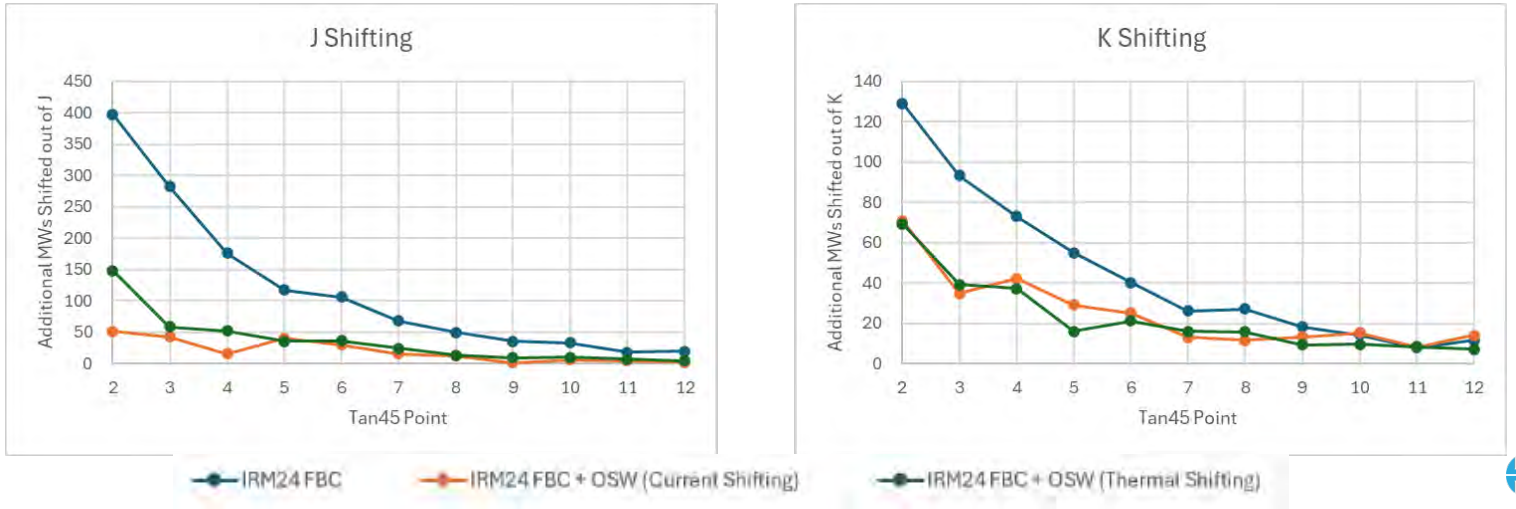
Load Zone J and Load Zone K - Shifting Comparison

- 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

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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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Timeline – Fuel Constraints Whitepaper Phase 2

Milestone	Date
Update Fuel Availability Assumption Recommendations	Q1 2025
Conduct Test Cases and Present Findings to ICS	Q1 2025/Early Q2 2025
Finalize Assumptions and Modeling Recommendation for 2026-2027 IRM study	Q2 2025
Implement NYSRC Approved Recommendations for 2026-2027 IRM study	Following NYSRC Executive Committee Review (Target End of Q2 2025)

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Appendix B: ICS #300 Meeting Materials

Fuel Constraints Modeling Phase 2

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Fuel Availability Constraints Modeling Phase 2

Lucas Carr

NYISO

NYSRC Installed Capacity Subcommittee Meeting #300

February 5, 2025

Agenda

- Background
- Fuel Availability Assumptions
- Further Testing
- Timeline

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Background

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Background

- The NYISO and stakeholders are engaged in ongoing discussions regarding the market design for firm fuel election requirements and process as part of the Modeling Improvements for Capacity Accreditation project
- Fuel availability constraint modeling assumptions will need to be incorporated into the installed reserve margin (IRM) study to facilitate the determination of capacity accreditation factor (CAF) values for “firm” and “non-firm” resources/capacity
- The “Gas Constraints Modeling Whitepaper” addressing a fuel availability modeling construct for the IRM study was completed in June 2024
  - Gas Constraints Modeling Whitepaper: https://www.nysrc.org/wp-content/uploads/2024/06/Gas-Constraints-Modeling-Whitepaper-Final.pdf
- Sensitivity cases were conducted as part of the 2025-2026 IRM study to further assess the fuel availability constraint modeling construct described in the whitepaper
  - Fuel Availability Constraints Modeling: https://www.nysrc.org/wp-content/uploads/2024/09/Gas-Constraints-Sensitivity-Results-ICS-Updated-rev.pdf
- The whitepaper also outlined the need to further review/assess fuel availability constraint modeling assumptions to support the adoption of the modeling in the base case of the IRM study
  - Phase 2 of the fuel availability constraints modeling project will focus on both the near-term implementation and longer-term updating of the modeling/assumptions in the IRM study

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Fuel Availability Assumptions

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Whitepaper Fuel Availability Assumptions

- The whitepaper outlines the following 6-tiered fuel availability assumptions triggered by daily peak load level

Tier	NYCA Load Conditions (MW)	Available Gas (MW)	Available Oil (MW)	Total Available Fuel (MW) (Gas + Oil)**	Illustrative Modeled Derate (Rounded MW)***
1	>26,000	375	11,000	11,375	8,600
2	25,000 - 26,000	750		11,750	8,225
3*	24,000 - 25,000	2,750		13,750	6,225
4*	23,000 - 24,000	4,500		15,500	4,475
5	22,000 - 23,000	5,500		16,500	3,475
6	<22,000	No Constraint		No Constraint	0

* Tier 3 and 4 load levels comprise the actual peak loads observed in recent winter operating conditions. The illustrative MW derates are generally consistent with the typical reduction in generator capability experienced during such operating conditions.
**Includes gas-only and dual fuel units located in Load Zones F-K.
*** "Illustrative Modeled Derate" values are calculated using the gas-only and dual fuel fleet modeled in Load Zones F-K in the 2024-2025 IRM Final Base Case (ICAP: ~21,770 MW; UCAP: ~19,975 MW)

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“Available Oil” Assumptions

- The initial assumption of 11,000 MW of “available oil” was developed, in part, based on an expected firm fuel duration requirement of 96 hours of on-site fuel availability during December – February as part of the NYISO’s Modeling Improvements for Capacity Accreditation project
- In November 2024, the NYISO recommended revising the duration requirement to 56 hours. As a result, the prior 11,000 MW assumption should be updated to reflect this proposed change
  - Modeling Improvements for Capacity Accreditation: Firm Fuel: https://www.nyiso.com/documents/20142/48151567/MICA%2011_21%20ICAPWG_v6.pdf
- NYISO is developing an updated recommendation for “available oil” assumptions incorporating this change, as well as data from more recent weekly fuel surveys
  - Currently anticipate reviewing updated information at the March 5, 2025 ICS meeting

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“Available Gas” Assumptions

- The initial 6-tiered “available gas” assumptions were developed based on production data from dual fuel and gas-only resources in Load Zones F-K during recent winters
- The NYISO is working to update these values to incorporate more recent data
  - Currently anticipate reviewing updated data at the March 5, 2025 ICS meeting
- The NYISO is also seeking to complete a winter fuel constraint study in Q3 2025
  - One objective of the study is to quantify the amount of natural gas available to New York generators during various winter conditions
  - Information from the study may also help inform initial assumptions for the fuel availability constraints modeling construct

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Annual Firm Fuel Elections

- Modeling the firm fuel elections by resources is not recommended for the 2026-2027 IRM study
  - The market rules remain under development within the NYISO stakeholder process
  - Elections would be received no later than August 1, 2025, and there is uncertainty regarding the elections that may materialize under initial implementation of the market rules
- The proposed fuel availability constraint modeling assumptions for the IRM study are intended to represent reasonable assumptions of fuel availability under various load levels for the initial year of implementation
- The proposed assumptions regarding “available gas” do not equate to the quantity of fuel available on a firm or non-firm basis
  - The initial proposed assumptions are based on observed historical production under various load levels
- Transparency regarding the potential IRM impacts and CAF values are beneficial to inform market participant decision making and future planning studies
- NYISO currently intends to provide an overview of its updated fuel availability constraints modeling recommendations at the March 5, 2025 ICS meeting

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Implementation for the 2026-2027 IRM Study

- As described in the prior slides, the NYISO is developing updated recommendations for assumptions regarding “available gas” and “available oil” for use in the 2026-2027 IRM study
- The NYISO currently intends to review updated assumption recommendations at the March 5, 2025 ICS meeting
- Final recommendations for the 2026-2027 IRM study adoption/assumptions will be developed based upon discussions at upcoming ICS meetings
    - Currently targeting to finalize recommendations for the 2026-2027 IRM study in Q2 2025

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Implementation for Future IRM Study Years

- As more experience with the fuel availability elections in the NYISO's capacity market is gained over the coming years, the NYISO will further evaluate and discuss with ICS how such elections can be incorporated into (or accounted for in) the fuel availability assumptions for the IRM study
- The NYISO recommends that the assumptions regarding "available gas" and "available oil" be reviewed/refined annually

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Further Testing

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Further Fuel Availability Constraints Testing

- **The following fuel availability constraints testing is recommended for completion over the coming months:**
  - Test updated fuel availability assumption recommendations using the 2025-2026 IRM final base case (FBC)
  - Test updated fuel availability assumption recommendations in combination with the recommended enhancements resulting from the ongoing alternative load shape adjustment method and behind-the-meter solar modeling projects using the 2025-2026 IRM FBC
    - Enhancements to load modeling seek to better align the annual energy forecast and seasonal peak load values, which could impact the triggering conditions of the fuel availability constraints modeling construct

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Timeline

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Timeline

Milestone	Date
Update Fuel Availability Assumption Recommendations	Q1 2025
Conduct Test Cases and Present Findings to ICS	Q1 2025/Early Q2 2025
Finalize Assumptions and Modeling Recommendation for 2026-2027 IRM study	Q2 2025
Implement NYSRC Approved Recommendations for 2026-2027 IRM study	Following NYSRC Executive Committee Review (Target End of Q2 2025)

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