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Independent System Operator

Fuel Availability Constraints Modeling Phase 2

NYISO

NYSRC Installed Capacity Subcommittee Meeting #302

April 2, 2025

Agenda

- Background
- Fuel Availability Assumptions Updates
- Modeling Adoption Recommendation
- Preliminary Impact Analysis
- Next Steps/Timeline

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Background

Background

- At the 3/5/2025 ICS meeting, the NYISO presented a recommendation for initial fuel availability constraint assumptions for the 2026-2027 installed reserve margin (IRM) study
- After ICS/EC feedback and discussion, the NYISO evaluated the fuel availability assumptions recommendation to further consider several factors including:
  - Potential production limitations (e.g., air permit limitations)
  - NYISO Operations experience
  - Alternative approaches to the historical gas production regression analysis
  - Methodology for establishing the gas availability assumption for higher load tiers where historical observations are not present
- After further consideration of these factors, the NYISO has updated the fuel availability assumptions recommendation for the 2026-2027 IRM study

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Updated Fuel Availability Assumptions

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“Available Oil” Assumption

- The NYISO recommends updating the “available oil” assumption for the 2026-2027 IRM study to **11,750 MW**
  - This update is to reflect the evaluation of potential production limitations in further assessing the 12,100 MW assumption presented at the 3/5/2025 ICS meeting
    - The 12,100 MW value was informed by reported available non-gas fuel storage (in MWh) from generator weekly fuel surveys and an energy duration production assumption of 56 hours
  - The updated recommendation considers potential limitations imposed by certain air permits, as well as historical operating experience under tight winter operating conditions

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“Available Gas” Assumption

- **The NYISO updated the 6-tiered “available gas” assumption recommendation for the 2026-2027 IRM study as shown in the table below**
  - There is a slight update for Tier 2-4 assumptions from the recommendations presented at the 3/5/2025 ICS meeting resulting from an update to the regression analysis to include certain data from 2024 that was inadvertently omitted
  - The updated regression analysis identified a reduction to the “available gas” assumption of 100 MW for each of Tier 2-4 compared to the recommendations presented at the 3/5/2025 ICS meeting
  - Tier 1 assumption was also updated to be calculated as 50% of the Tier 2 assumption. This change was suggested at the 3/5/2025 ICS meeting based on an observation that the Tier 1 assumption developed as part of the Phase 1 Whitepaper was equal to 50% of the Tier 2 value
- **It is not recommended to limit the dataset to historical winter peak load hours above 22,000 MW as this approach would drastically reduce the data used for the regression analysis**
  - A request was made at the 3/5/2025 ICS to consider an alternative regression using only observations of historical gas production during NYCA winter peak load hours greater than 22,000 MW
  - The results for such an alternative are provided for informational purposes in the Appendix
  - The alternative approach would reduce the available datapoints for the regression to 79. Such a limited set of data presents a potential for volatility in updating the assumptions for future studies
  - Comparatively, the analysis to inform the updated recommendations for the 2026-2027 IRM study includes 754 datapoints

Tier	NYCA Load Conditions (MW)	Available Gas (MW) – Updated Recommendation
1	>26,000	550
2	25,000 - 26,000	1,100
3	24,000 - 25,000	3,000
4	23,000 - 24,000	4,500
5	22,000 - 23,000	5,700
6	<22,000	No Constraint

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Updated Fuel Availability Assumptions

- The NYISO recommends use of the following updated 6-tiered fuel availability assumptions for the 2026-2027 IRM study

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	550	11,750	12,300	7,700
2	25,000 - 26,000	1,100		12,850	7,150
3*	24,000 - 25,000	3,000		14,750	5,250
4*	23,000 - 24,000	4,500		16,250	3,750
5	22,000 - 23,000	5,700		17,450	2,550
6	<22,000	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 2025-2026 IRM Final Base Case (ICAP: ~21,700 MW; UCAP: ~20,000 MW)

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Modeling Adoption Recommendation

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IRM Modeling Recommendation

- **The NYISO recommends adopting the fuel availability constraints model, with the updated fuel availability assumptions (see Slide 8), in the 2026–2027 IRM study as follows:**
  - For the Preliminary Base Case (PBC), the NYISO recommends that the fuel availability constraints model using the updated assumptions be adopted as a parametric step
  - After completion of the PBC and prior to the Final Base Case (FBC), the NYISO recommends conducting a Tan45 sensitivity analysis with the removal of the fuel constraint model to verify the modeling impact
  - For the FBC, the NYISO recommends maintaining the same fuel availability assumptions as the PBC unless changes to the modeled thermal generation fleet in Load Zone F-K occurs between the PBC and FBC. If changes to the modeled thermal generation fleet arise, the NYISO recommends the following:
    - **If a thermal unit in Load Zone F-K is removed from the model, the available fuel assumption associated with such unit should also be removed**
    - **Any available fuel assumption adjustments will be reviewed with the ICS as part of updating the generation inclusion/deactivation assumptions for the FBC**
    - **No updates to the methodology and underlying data for the fuel availability assumptions for the FBC**
- **The NYISO recommends continued collaboration with ICS to develop a process and methodology for determining updates to the fuel availability assumptions for the 2027–2028 IRM study. The NYISO recommends consideration of the following information expected to be available later in 2025 to help inform such ongoing discussions:**
  - Firm fuel elections for the 2026-2027 Capability Year and associated market rules
  - Outcomes from the NYISO's winter fuel constraint study
  - Additional datapoints from fuel surveys or production data
  - Other relevant information related fuel availability constraints in winter

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Rationale for the Modeling Recommendation

- **Reflecting reliability risk in the winter season has been identified as a key focus in the 5-year Resource Adequacy Modeling Improvement Strategic Plan.**
- **The 2026–2027 IRM will mark the first year of the study capturing fuel availability constraints to reflect winter reliability risk. Consideration for the first-year assumptions include:**
  - Basing the modeling assumptions on multi-year historical data provides transparency and stability in study assumptions
  - Transparency and stability of assumptions are critical to inform both market participant decisions and reliability impacts
    1. **NYSRC gains improved understanding of the expected reliability of the system**
    2. **Market participants gain insights that can help inform firm fuel election decision-making**
    3. **NYISO gains information for incorporation into the required studies to develop capacity market parameters**
  - Seeking to introduce significant changes to the firm fuel availability assumptions between the PBC and FBC (at least as it relates to the first year of incorporating the fuel availability constraints modeling in the IRM study), without known impacts, could produce unnecessary risk and volatility
- **Beyond the 2026-2027 IRM, other information can be considered for updating the fuel availability assumptions used in future studies, such as firm fuel elections**
  - Firm fuel elections will need to be further evaluated, as is discussed further in the following slide

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Firm Fuel Elections Considerations

1) **Firm fuel elections are, in part, based upon economic considerations that reflect risk/reward trade-offs of additional capacity market revenues against the cost of fuel arrangements and risk of potential penalties**
   - Resources elect a firm fuel designation in order to receive greater capacity market payments than the non-firm status, reflecting consideration of the revenue and performance differences.
2) **Firm fuel elections do not directly align with the proposed modeling construct, which represents expected fuel availability based on different load levels (as a proxy for varying winter system conditions)**
   - Firm fuel elections do not address different load level assumptions on fuel availability, nor which fuels may be utilized to satisfy the firm fuel requirements under varying system conditions
   - It is unclear how, or to what degree, to predict how resource performance will change from historical experiences
3) **Over time, information about firm fuel elections can be captured in historical data, and incorporated in the IRM model**
   - This historical data can capture generator elections, performance, and aggregate resource availability
   - Using rolling historical data for modeling assumptions can provide assumption stability and is consistent with current generation performance modeling in the IRM study

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Expected Timeline Relevant to Fuel Availability Constraints Modeling in the IRM Study

- **2026-2027 IRM Study:**
  - April 2025:
    - Expect NYSRC decision on incorporating the Fuel Availability Constraints Modeling in the 2026-2027 IRM study [EC 4/11]
    - Present capacity accreditation modeling assumptions and, pending NYSRC decision, overview of the fuel availability constraints modeling for the 2026-2027 IRM study [ICAPWG 4/24]
  - May 2025: Present informational firm/non-firm Capacity Accreditation Factors [ICAPWG]
  - July 2025: Finalize PBC Assumptions Matrix reflecting fuel availability constraint modeling decision/assumptions [ICS/EC]
  - August 2025: Completion of PBC Tan45 and finalize list of sensitivity cases [ICS/EC]
  - September 2025: Completion of sensitivity cases and review updated study assumptions for FBC [ICS/EC]
  - October 2025: Finalize FBC Assumptions Matrix reflecting updated study assumptions [ICS/EC]
  - November and December 2025: Finalize FBC Tan45 and approval of 2026-2027 IRM [ICS/EC]

- **Other relevant efforts in 2025:**
  - Completion of the Fuel Availability Constraints Modeling (Phase 2) whitepaper report: Q3–Q4
  - Develop and recommend process and methodology for fuel availability assumption updates: remaining of 2025 with expected completion by Q1 2026

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Preliminary Impact Analysis

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Preliminary Impact Analysis

Case	IRM	J LCR	K LCR	G-J LCR	LOLE (Event-Days/Yr)	Summer LOLE (Event-Days/Yr)	Winter LOLE (Event-Days/Yr)	EOP Calls
IRM25-26 FBC + BTM Solar + ELM	25.20%	76.04%	108.77%	87.25%	0.100	0.1000	0.0000	5.79
IRM25-26 FBC + BTM Solar + ELM + Fuel Avail. Constraints	**25.56%**	**76.23%**	**108.66%**	**87.38%**	**0.100**	**0.0984**	**0.0015**	**6.21**
Delta	+0.36%	+0.19%	-0.11%	+0.13%	-	-0.0016	+0.0015	+0.42

- A Tan45 test case was performed adding the fuel availability constraints modeling construct (with the updated fuel availability assumptions) to a case consisting of the 2025-2026 IRM FBC plus the proposed behind-the-meter (BTM) solar and enhanced load modeling (ELM) improvements
- The impact analysis showed a net ~0.4% increase to IRM and lesser impacts to the locational capacity requirements (LCRs) from the implementation of fuel availability constraints modeling
- With the addition of the fuel availability constraints modeling, the NYISO observed the presence of winter loss of load expectation (LOLE) risk in the IRM model. But the overall LOLE is still largely driven by summer risk for the 2025-2026 IRM FBC

LFU Bin	Summer LOLE (Event-Days/Yr)	Winter LOLE (Event-Days/Yr)	Total LOLE (Event-Days/Yr)
1	0.0263	0.0014	0.0278
2	0.0556	-	0.0556
3	0.0137	-	0.0137
4	0.0023	-	0.0023
5	0.0003	-	0.0003
6	0.0000	-	0.0000
7	0.0000	-	0.0000
Total	0.0984	0.0014	0.0998

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Preliminary Impact Analysis (cont.)

- The relatively small shift towards winter LOLE risk from the incorporation of the fuel availability constraints modeling was examined to further explain the results
- After further review, the relatively small shift towards winter LOLE risk seems to be due to the use of emergency operating procedure (EOP) steps with annual limits being utilized more in the winter in the simulation period and, as a result, being unavailable for some of the summer events
  - The observed increase to the IRM is the combined result of an increase in winter LOLE driven by introduction of the fuel availability constraints modeling and a small increase in summer LOLE due to limitations on EOP availability
- The Tan45 case incorporating the fuel availability constraints modeling did meet the standard error criteria at 4,250 replications
  - The standard error for this case actually decreased from the 2025-2026 IRM FBC and would have met the standard error criteria at approximately 2,500 replications

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Timeline

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Timeline

Milestone	Date
Update Fuel Availability Assumption Recommendations for the 2026-2027 IRM Study	Q1 2025
Conduct Test Cases on Updated Assumptions and Present Findings to ICS	Q1 2025/Early Q2 2025
Finalize Fuel Availability Assumptions and Modeling Recommendation for the 2026-2027 IRM Study	Q2 2025
Implement NYSRC Approved Recommendations as part of the 2026-2027 IRM PBC	Following NYSRC EC Review (Target April 2025)
Finalize 2026-2027 IRM PBC Fuel Availability Constraints Modeling Assumptions Reflecting NYSRC Modeling Decision	July 2025
Finalize 2026-2027 IRM FBC Fuel Availability Constraints Modeling Assumptions Reflecting NYSRC Modeling Decision	October 2025
Complete Fuel Availability Constraints Modeling (Phase 2) Whitepaper	Q3/Q4 2025
Develop and Recommend Process and Methodology for Fuel Availability Assumptions Updates for Future Study Years	Remainder of 2025 (Completion by Q1 2026)

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Appendix

- Alternative gas production regression

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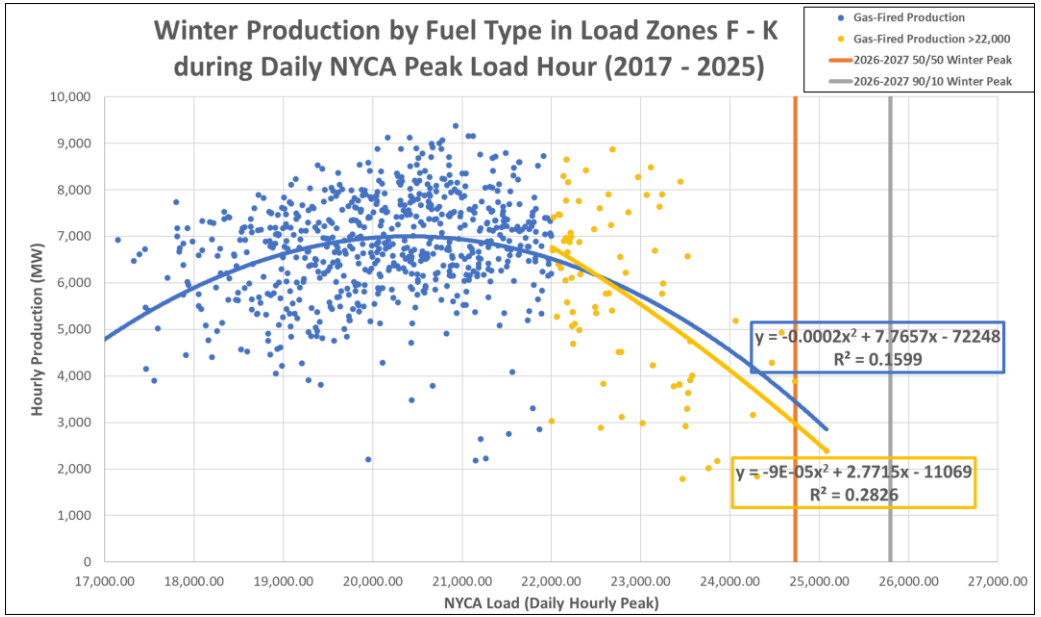
“Available Gas” Regression @ >22,000 MW

- The chart to the right compares the trendlines created by the full dataset (blue) vs the dataset limited to points above 22,000 MW (orange)
- There are only 79 datapoints above 22,000 MW compared to 754 datapoints for the full dataset
- The updated regression looking at only datapoints above 22,000 MW would produce the following “available gas” assumptions:

Tier	NYCA Load Conditions (MW)	Available Gas (MW) – >22,000 MW Peak Load
1	>26,000	275
2	25,000 - 26,000	550
3	24,000 - 25,000	2,550
4	23,000 - 24,000	4,225
5	22,000 - 23,000	5,625
6	<22,000	No Constraint



Note: the orange datapoints are also be included in the blue dataset

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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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