

# Balancing Intermittency

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# Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
09-18-2023	ICAPWG/MIWG	Analysis and proposal regarding uncertainty reserve requirement locational distribution: <a href="https://www.nyiso.com/documents/20142/40044890/3%20Balancing%20Intermittency_09182023_%20ICAPWG_MIWG.pdf/0d0e82b7-1d3a-7af0-fef7-237dbf5c1b77">https://www.nyiso.com/documents/20142/40044890/3%20Balancing%20Intermittency_09182023_%20ICAPWG_MIWG.pdf/0d0e82b7-1d3a-7af0-fef7-237dbf5c1b77</a>
09-05-2023	ICAPWG/MIWG	Analysis and proposal regarding uncertainty reserve requirement calculation methodology: <a href="https://www.nyiso.com/documents/20142/39768278/6%20Balancing%20Intermittency_ICAPWG_MIWG_090523.pdf/23391d26-0559-5757-1289-d043e833e16c">https://www.nyiso.com/documents/20142/39768278/6%20Balancing%20Intermittency_ICAPWG_MIWG_090523.pdf/23391d26-0559-5757-1289-d043e833e16c</a>
07-19-2023	ICAPWG/MIWG	Initial analysis regarding the need to address net load uncertainty: <a href="https://www.nyiso.com/documents/20142/38852999/Balancing%20Intermittency%20Initial%20Analyses_ICAPWG_MIWG_071923_Final.pdf/c4adb509-3c09-0361-7f52-b52cae880997">https://www.nyiso.com/documents/20142/38852999/Balancing%20Intermittency%20Initial%20Analyses_ICAPWG_MIWG_071923_Final.pdf/c4adb509-3c09-0361-7f52-b52cae880997</a>
04-17-2023	ICAPWG/MIWG	Kick-off for Regulation Requirements study (Stakeholder vote passed at May OC): <a href="https://www.nyiso.com/documents/20142/37014190/Proposed%20Regulation%20Requirements_20230406_SOAS_v1.pdf/a2d7d51a-5511-37c6-ad04-a177d69f5424">https://www.nyiso.com/documents/20142/37014190/Proposed%20Regulation%20Requirements_20230406_SOAS_v1.pdf/a2d7d51a-5511-37c6-ad04-a177d69f5424</a>
02-21-2023	ICAPWG/MIWG	Project Kickoff: <a href="https://www.nyiso.com/documents/20142/36339783/Balancing%20Intermittency_MIWG_022123_FINAL%20(002).pdf/5ff99fc1-1eb2-8bec-d385-b4983568802a">https://www.nyiso.com/documents/20142/36339783/Balancing%20Intermittency_MIWG_022123_FINAL%20(002).pdf/5ff99fc1-1eb2-8bec-d385-b4983568802a</a>

# Definitions

- **DAM : Day-Ahead Market**
- **DAM Net Load Forecast : Day-Ahead gross load forecast – Day-Ahead behind-the-meter (BTM) solar forecast**
- **Net Load Actual : Observed real-time actual load, which captures the effect of BTM Solar**
- **DAM Net Load Forecast Error : Net Load Actual– DAM Net Load Forecast**
- **Reserve Notification Time : The lead time that a reserve product is scheduled for (*i.e.*, 10-minute reserves, 30-minute reserves, etc.)**
- **Reserve Sustainability : The duration (number of hours) that reserve providers can sustain energy output upon conversion from reserves to energy. The current reserve sustainability requirement in the NYISO markets is 1 hour.**
- **MHFE : Multi-Hour Forecast Error**
- **Uncertainty Reserves: Reserves to address forecast error.**

# Background

- **Leveraging the findings in the 2022 Grid in Transition Study, the Balancing Intermittency effort is evaluating whether new market products are necessary to continue reliably maintaining system balance, given a future grid characterized by large quantities of intermittent renewable resources, ESR, and DER.**
  - Update regulation requirements [Completed]
  - Determine if there is a need for additional ancillary services to balance intermittency [Completed]
  - Determine the uncertainty reserve requirement calculation methodology [Completed]
  - Examine locational distribution and ORDCs for the uncertainty reserves [Completed]
  - New Uncertainty Reserve Product Evaluation [ Discussed in Today's Presentation]
  - Reserve Sustainability Evaluation [ Discussed in Today's Presentation]
- **The 2023 project deliverable is a Market Design Concept Proposed [Mid-Late Nov].**

# Objective of Today's Discussion

- Today's presentation will provide a recap of previous MIWG presentations, as well as discuss reserve sustainability and the potential characteristics of a new Operating Reserve product.

# Review of Previous ICAPWG/MIWG Discussions

# Prior ICAPWG/MIWG Discussion Summary

- **The NYISO has discussed with stakeholders its finding that there is a need for Operating Reserves to manage forecast error and balance DA to RT energy needs.**
  - The NYISO has proposed a requirement-setting methodology for procurement of these Operating Reserves.

# Review of Reserve Sustainability and Operating Reserve Product Characteristics

# Uncertainty Reserves in Other ISOs

- CAISO is implementing a 30-minute Imbalance Reserve product to address uncertainty between day-ahead forecasts and real-time needs.<sup>1</sup>
- SPP is implementing a 60-minute uncertainty product with a 1-hour sustainability requirement.<sup>2</sup>
  - The 60-minute notification time decision was driven by the response times of their resource mix, as well as observation of historical forecast error driving grid needs 60-minutes in advance.
- ERCOT has implemented two longer-term reserves products:<sup>3,4</sup>
  - A 4-hour sustainability product with 30-minute lead time ("non-spin").
  - A 2-hour sustainability product with 10-minute lead time ("ECRS").
- The NYISO views the other ISO/RTO products as seeking to manage forecast error, balance intermittency, and send appropriate market signals for the value of such balancing.
- The diversity of product design observed in other ISOs demonstrates the various potential ways to design a product with similar objectives.

1. [CAISO Imbalance Reserve Design](#) 2. [SPP Uncertainty Reserve Design](#) 3. [ERCOT Non Spin Product](#) 4. [ERCOT ECRS Product](#)

# Operating Reserve Notification Time Discussion

Notification Time (minutes)

Sustainability Requirement (hours)\*

	1	2	4	8
10	Dark Blue	Light Blue	Light Blue	Light Blue
30	Dark Blue	Light Blue	Light Blue	Light Blue
60	Light Blue	Light Blue	Light Blue	Light Blue
90	Light Blue	Light Blue	Light Blue	Light Blue
120	Light Blue	Light Blue	Light Blue	Light Blue

Key:

Current Reserve Products	Dark Blue
Potential New Reserve Products	Light Blue

Reserve Notification Time :  
The lead time that a reserve product is scheduled for (e.g., 10-minute reserves, 30-minute reserves, etc.)

\*Note this table is for illustration purposes and does not include all possible outcomes.

# Notification Time Discussion

- **Notification time can be conceptually linked to the need driving a reserve product.**
  - Instantaneous needs must be satisfied by resources that respond quickly (e.g., Regulation) while forecasted, or future, needs could potentially be procured via a longer notification time product.
    - Creating a new Operating Reserve product with a notification time that exceeds 30 minutes could enable NYISO to procure appropriate reserve needs through this product.
      - For example, a 60-minute notification time Operating Reserve product could satisfy Operating Reserve requirements that need to be resolved in greater than 30 minutes.
- **Notification time also influences the amount of reserve MW that a resource can be scheduled for.**
  - For example, a resource with a 2 MW/minute ramp rate can be scheduled for 20 MW of 10-minute spinning reserves or 60 MW of 30-minute spinning reserves.
  - Accordingly, a resource must be able to transition from the offline state to their Lower Operating Limit (LOL) within 10 minutes in order to be eligible to provide 10-minute non-spin reserves.

# Sustainability Requirement Discussion

- **Sustainability requirements can be conceptually linked to the need driving the requirement.**
  - Contingencies (or derates) that persist for multiple consecutive hours and forecast errors that persist for multiple consecutive hours require RT energy injections that exceed expected DA energy needs.
- **Today's 1-hour sustainability requirement is rooted in an NPCC regulation, which aims to ensure that resources are capable of sustaining output in the event of multiple consecutive contingency events.**
  - The current 1-hour sustainability requirement is secured in the optimization for ESRs (dividing the State of Charge by 1 hour).
- **Aligning the sustainability requirement and the conceptual need for sustainability could help facilitate reliability and send a market signal for needed Operating Reserve sustainability.**
  - NYISO's analysis indicates DAM Net Load Forecast Errors are correlated and thus tend to persist for multiple consecutive hours.

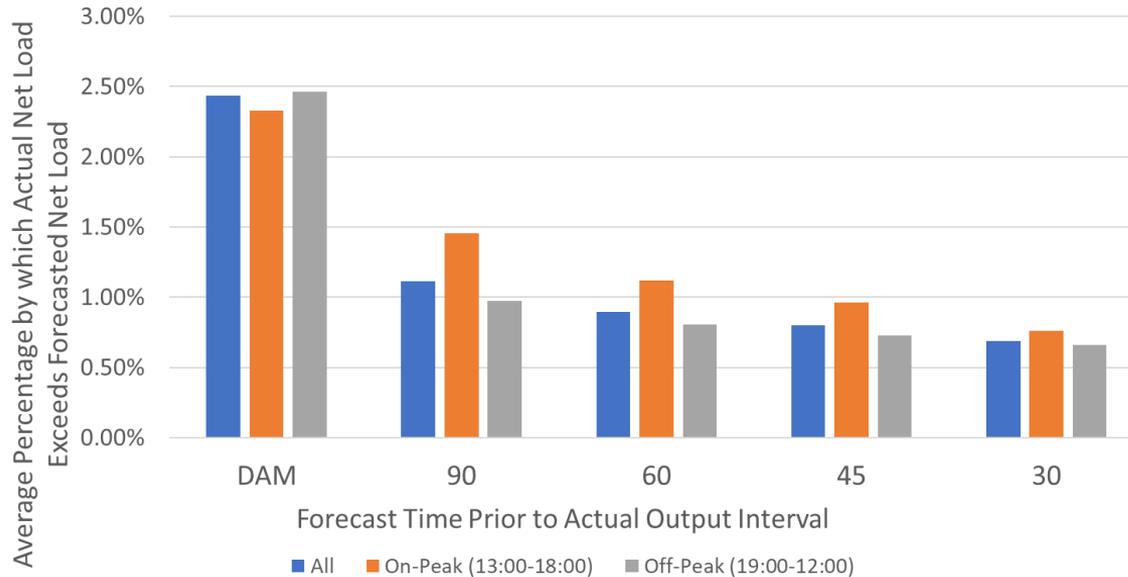
# Historic Observations Related to Operating Reserve Notification Time and Sustainability

# Reserve Notification Time

- **A longer notification time product (e.g., a 60-minute notification time product) could increase the pool of available reserves.**
  - This would include resources that have ramping capability between 30 and 60 minutes and resources that cannot startup within 30 minutes but can startup within 60 minutes.
  - The pool of such supply is expected to be modest under most operating conditions.

# Net Load Forecast Evolution

Average Hourly Percentages by which Actual Net Loads Exceed Forecasted Net Loads (November 2022-April 2023)

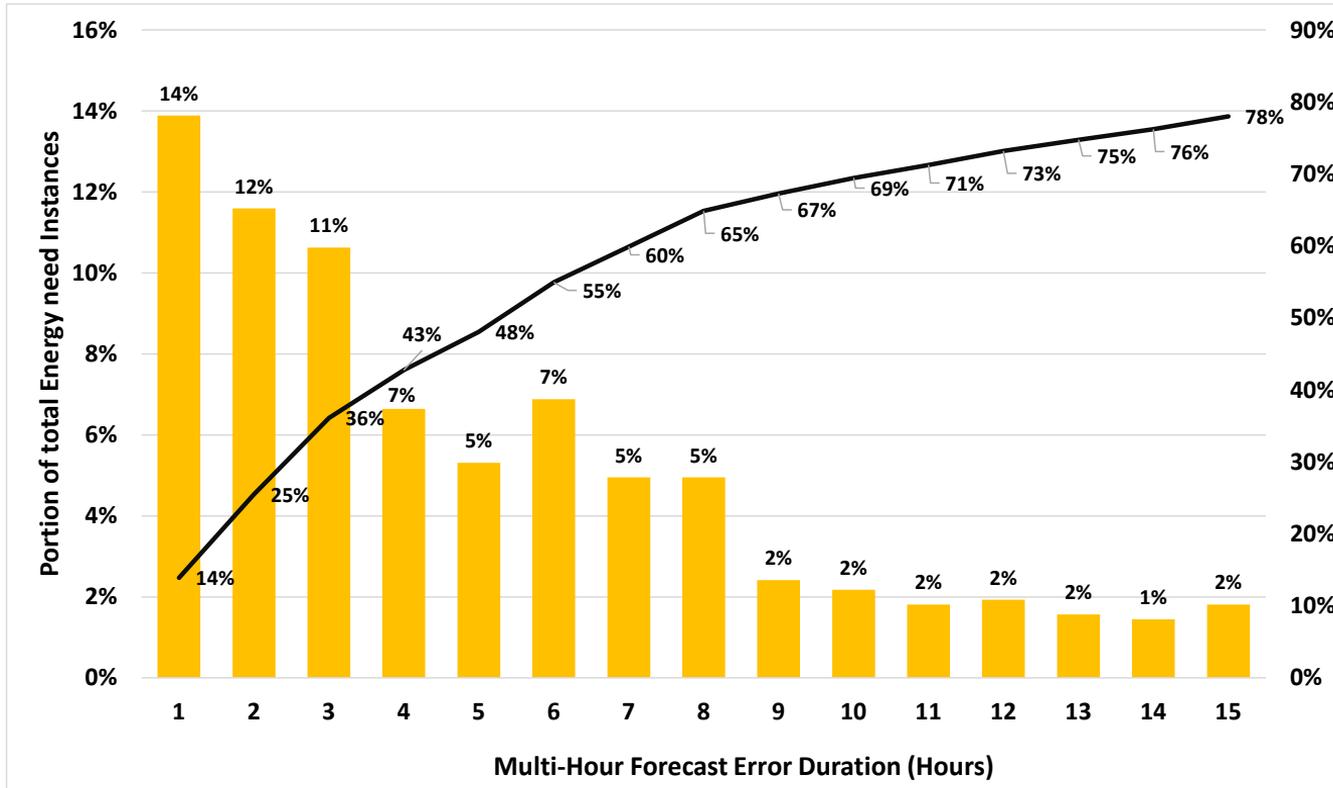


- **Creating a new notification time product would enable scheduling a portion of the uncertainty reserve requirement with a longer lead time.**
  - On average, roughly 36% of DAM Net Load Forecast Error is still present 60 minutes out from the actual output interval, and 30% is still present 30 minutes out.

# Reserve Sustainability

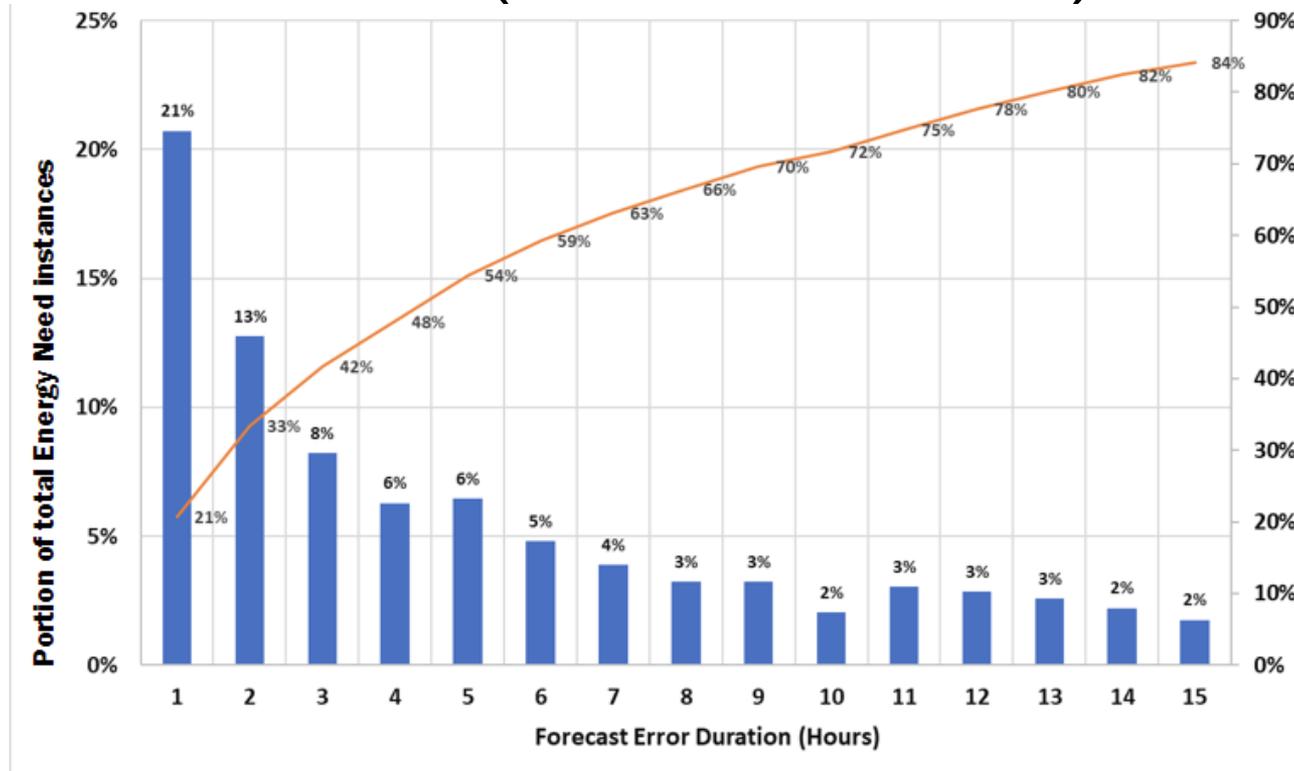
- **As illustrated in the subsequent slides and discussed in previous MIWG presentations, forecast errors often persist for multiple hours.**
  - The existing 1-hour reserve sustainability requirement increases the challenge of ensuring that adequate reserves are scheduled to address multi-hour energy needs that are not anticipated day-ahead.
- **A longer sustainability requirement would enable commitment of resources that can be available to provide energy during hours of extended need.**
  - We observe the need to address multi-hour forecast errors today, and these needs are expected to increase with higher levels of intermittent resources.

# DAM Net Load Multi-Hour Forecast Error Duration Histogram with Cumulative % (Jan '21 – Dec '22)\*

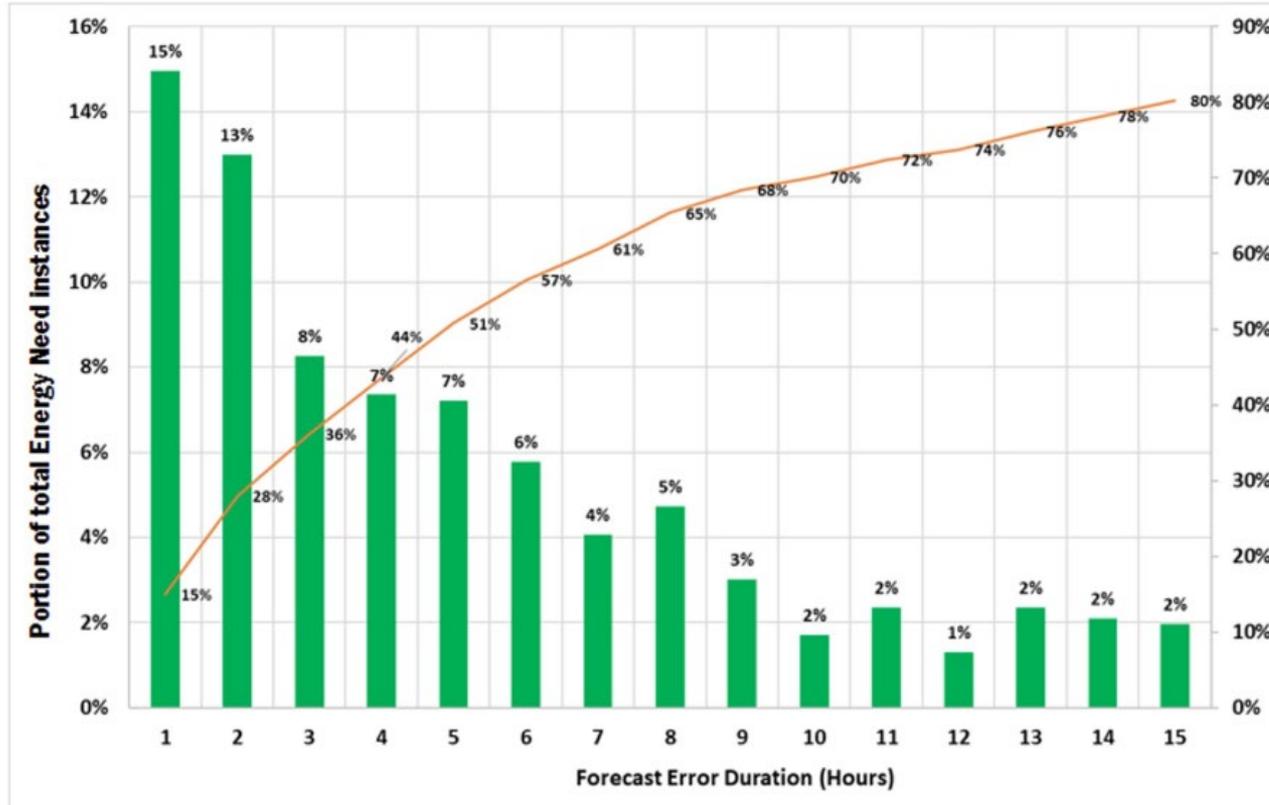


\*Net Load Errors in this chart include Load and BTM Solar.

# DAM NYCA Wind Multi-Hour Forecast Error Duration with Cumulative % (Jan '21 – Dec '22)



# DAM Net Load Multi-Hour Forecast Error Duration Histogram with Cumulative % (Jan '21 – Dec '22)\*



\*Net Load Errors in this chart include Load, BTM Solar, and Wind.

# Summary and Next Steps

# Next Steps

## ■ October 2023

- Return to ICAPWG/MIWG to continue discussions on Operating Reserve product notification time and sustainability requirements.

## ■ 2023 Project Milestone: Q4 Market Design Concept Proposed

# Balancing Intermittency Timeline

## ■ Short-term (2025 target implementation)

- Implement Uncertainty Reserve Requirements as incremental requirements on the 10-minute and 30-minute Reserve Notification Time products.
  - This enhancement will address the near-term needs to address uncertainty that we are observing today.

## ■ Medium-term (2026 target implementation)

- Implement any new reserve product and/or sustainability requirement, if such enhancements are proposed.

# 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