New York ISO
Independent System Operator

Balancing Intermittency: 1h Notification w/ 4h Duration Operating Reserves Product

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Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
10-03-2023	ICAPWG/MIWG	Introductory Analysis regarding uncertainty reserve product : https://www.nyiso.com/documents/20142/40342797/Balancing%20Intermittency_100323%20ICAPWG_MIWG_final.pdf/71269f5b-1e84-4bda-3219-b36a71a9be24
09-18-2023	ICAPWG/MIWG	Analysis and proposal regarding uncertainty reserve requirement locational distribution: https://www.nyiso.com/documents/20142/40044890/3%20Balancing%20Intermittency_09182023%20ICAPWG_MIWG.pdf/0d0e82b7-1d3a-7af0-fef7-237dbf5c1b77
09-05-2023	ICAPWG/MIWG	Analysis and proposal regarding uncertainty reserve requirement calculation methodology: https://www.nyiso.com/documents/20142/39768278/6%20Balancing%20Intermittency_ICAPWG_MIWG_090523.pdf/23391d26-0559-5757-1289-d043e833e16c
07-19-2023	ICAPWG/MIWG	Initial analysis regarding the need to address net load uncertainty: https://www.nyiso.com/documents/20142/38852999/Balancing%20Intermittency%20Initial%20Analyses_ICAPWG_MIWG_071923_Final.pdf/c4adb509-3c09-0361-7f52-b52cae880997
04-17-2023	ICAPWG/MIWG	Kick-off for Regulation Requirements study (Stakeholder vote passed at May OC): https://www.nyiso.com/documents/20142/37014190/Proposed%20Regulation%20Requirements_20230406_SOAS_v1.pdf/a2d7d51a-5511-37c6-ad04-a177d69f5424
02-21-2023	ICAPWG/MIWG	Project Kickoff: https://www.nyiso.com/documents/20142/36339783/Balancing%20Intermittency_MIWG_022123_FINAL%20(002).pdf/5ff99fc1-1eb2-8bec-d385-b4983568802a

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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. The reserve sustainability requirement is a qualification requirement.
- MHFE : Multi-Hour Forecast Error
- Uncertainty Reserves: Reserves to address forecast error.

*Based on recent stakeholder feedback, we are looking for other terms to replace the term "sustainability". Suggestions are welcome.

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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 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].**

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Objective of Today's Discussion

- Today's presentation will outline NYISO's concept proposal for a new Operating Reserve product with a longer sustainability requirement.
- Discuss a potential timeline for implementing the proposed new product.

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Review of Previous ICAPWG/MIWG Discussion

Recap of 10/03/23 ICAPWG/MIWG

- A longer notification time product could increase the pool of available reserves and enable procurement to address needs that arise more than 30 minutes in advance.
- 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 greater penetration of intermittent resources.

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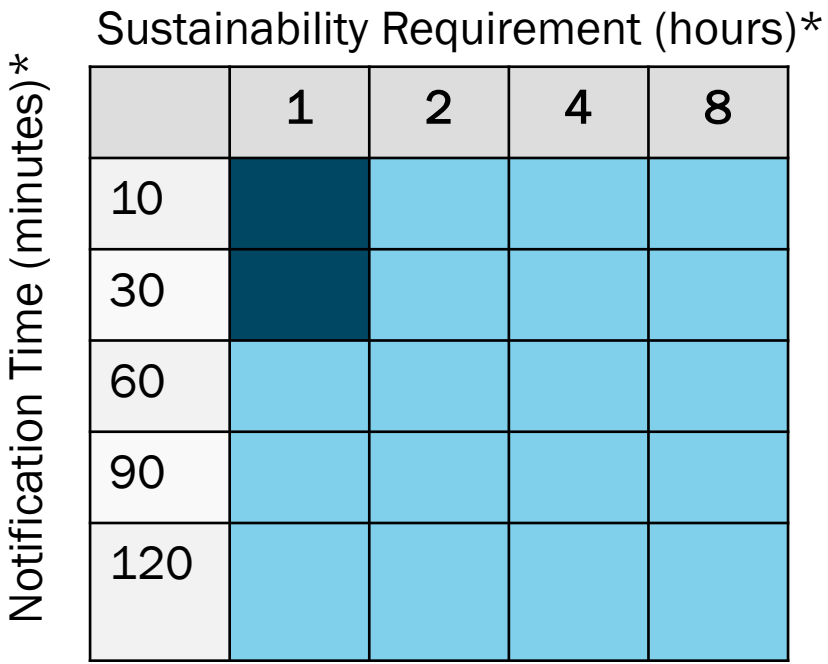
Operating Reserve Characteristics



Key:	
Current Reserve Products	
Potential New Reserve Products	

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.

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Proposed Reserve Product Characteristics

Proposed Reserve Product Context

- **As detailed in the coming slides, the proposed new reserve product is targeted to facilitate a robust market-based solution for addressing forecast uncertainty.**
  - The proposed product will be incremental to, and upon implementation help fulfill, the NYISO's previously discussed proposal to procure reserves to manage DAM net load forecast errors ("Uncertainty Reserve Requirement).
    - **The timeline and sequencing of these efforts is discussed in the Timeline section of this presentation.**

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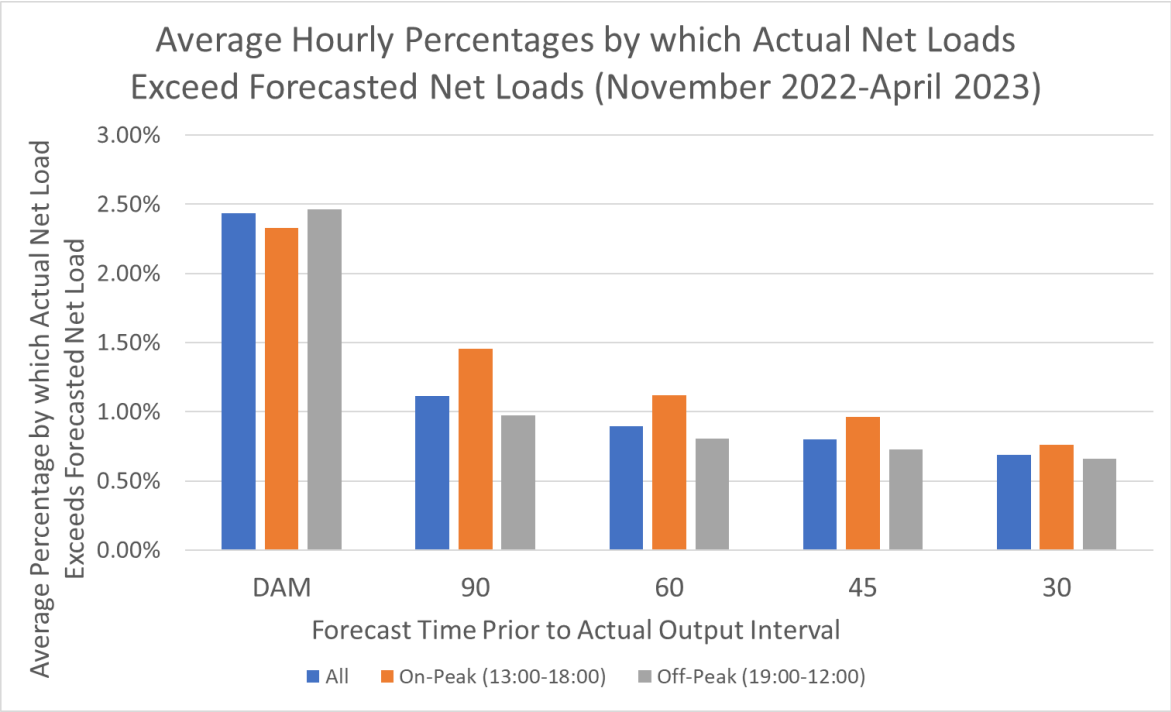
Longer Notification Time

Net Load Forecast Evolution



- **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.

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60-Minute Notification Time

- **The new reserve product will have a longer notification time of 60 minutes as opposed to 10/30 minutes.**
  - As discussed in the net load forecast error evolution, there is a certain degree of persistence of DAM net load forecast error between the DAM forecast through to the 30-min ahead forecast.
  - Instead of carrying the entire uncertainty reserves requirement as part of the 10- and 30-minute products, a portion of this requirement can be allocated to the new reserve product which could be fulfilled by resources having longer startup times and slower ramp rates.
- **This is because there is an inherent difference between uncertainty and contingency.**
  - Contingencies occur without any warning, and thus 10-minute reserves are needed to address the energy need that results from a contingency event.
  - Uncertainty can be expected throughout the various XX-Min ahead forecasts as is observed in the historical analysis and thus a 60-minute notification time reserve product can be used to address a substantial share of the energy needs that are driven by uncertainty.

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Longer Sustainability Requirement

Four-Hour Sustainability Requirement

- **As 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, and energy is available in RT, to address multi-hour energy needs that are not anticipated day-ahead.
- **A longer sustainability requirement would facilitate scheduling of resources that can be available to provide energy during hours of extended need.**
  - It will also send a market signal for the value of resources with greater sustainability.
- **Studies of the DAM, 90-min ahead, and 30-min ahead multi-hour forecast error durations show that the four-hour duration covers a significant amount of the sustained uncertainty observed in all these error metrics, as illustrated in the subsequent slides.**

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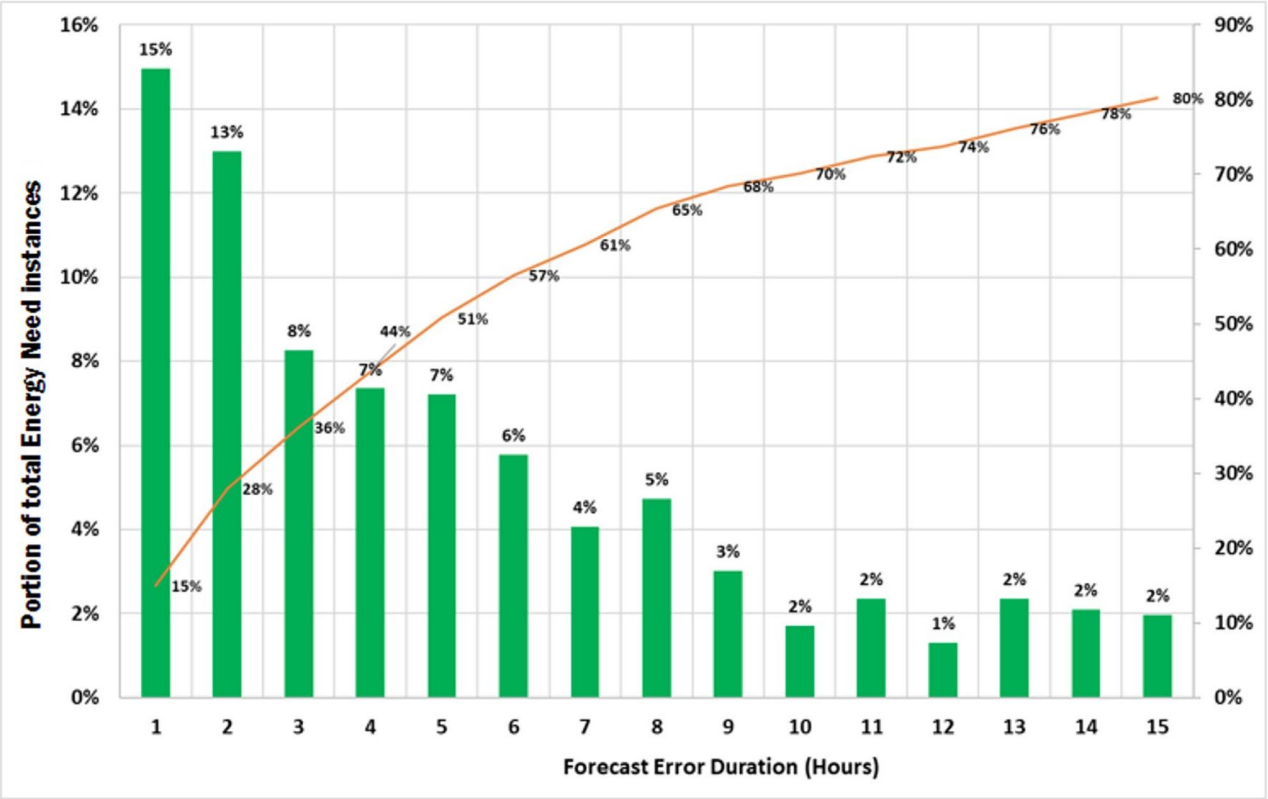
DAM Net Load Multi-Hour Forecast Error Duration Histogram with Cumulative % (Jan '21 – Dec '22)*



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

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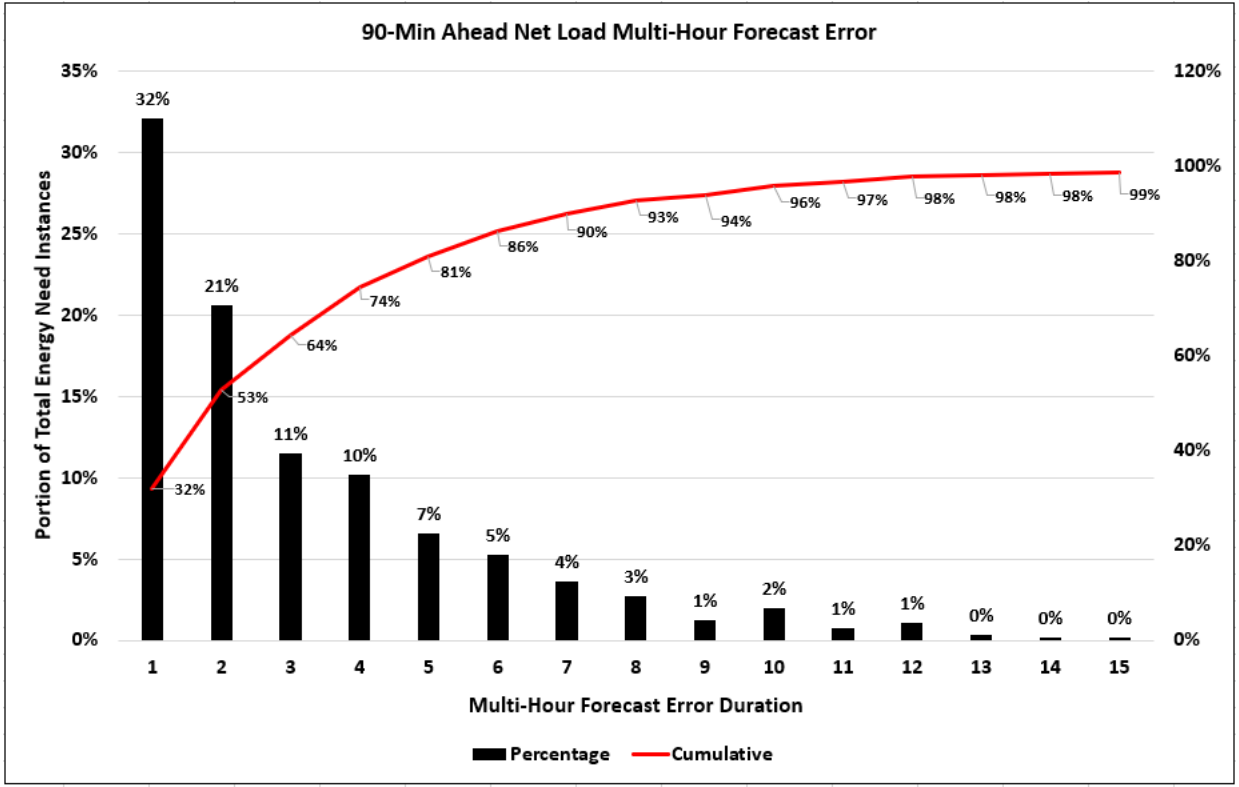
90-Min Ahead Net Load Multi-Hour Forecast Error Duration Histogram & Cumulative % (Nov '22 – Apr 23')



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

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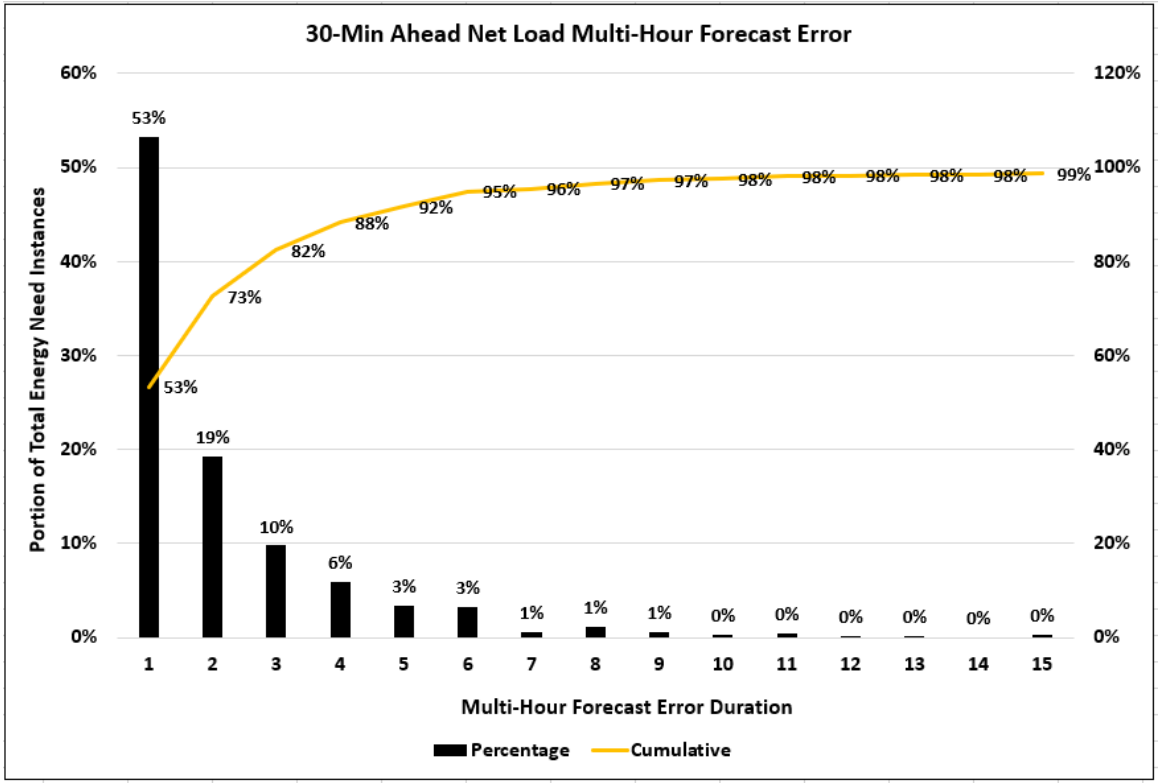
30-Min Ahead Net Load Multi-Hour Forecast Error Duration Histogram & Cumulative % (Nov '22 – Apr 23')



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

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Four-Hour Sustainability Requirement (cont'd)

- **The NYISO has conducted a fleet capability analysis, which has revealed several observations regarding the value of a four-hour sustainability requirement:**
  - Assuming "cold start" conditions, (i.e., units have been for an extended period), about 1,500 Minimum Generation MW could be brough online between 30 minutes and 4 hours.
  - Assuming "warm start" conditions, (i.e., units have not been offline very long), about 4,300 Minimum Generation MW could be brough online between 30 minutes and 4 hours.
  - Actual available MW in a given interval will likely be lower due to the fact that some resources may already be committed.
- **Ensuring an uncertainty reserve provider sustainability for 4 hours to address the sustained uncertainty can provide leeway for longer lead time resources to be committed to address any further needs that online resources are unable to address due to limited duration/fuel supply issues.**

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Additional Product Details

Non-Overlapping

- **Suppliers of 10S, 10T, and 30T won’t necessarily be eligible to supply this 60min notification time / 4h sustainability product due to this product's longer sustainability requirement**
- **As a result, this new reserve product will be a non-overlapping product.**
  - This product will not be cascaded with the existing reserve products.
  - This product will have its own "uncertainty" reserve demand curve which will not be nested with the other operating reserve demand curves.
  - This product will not only be a NYCA-wide product, since uncertainty reserve requirements will be set for reserve regions as discussed in previous presentations.
- **A separate requirement will be set for this new reserve product which will not be nested into the current operating reserve requirements.**
  - Requirement setting will ensure double procurement does not occur. For example, if the total Uncertainty Reserve Requirement is 600MW and 400MW is procured via the 60m/4h product, then the procurement within the 10s/10t/30t product structure would only be 200 MW.

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Additional Details

- The requirement for this product would be calculated in each DA and RT interval.
- The product will be a Total ("60T") product, combining both synchronous and non-synchronous supplier contributions.
- Eligibility to supply the 60min/4h product would be via registration parameters for resources without duration limits and calculated in SCUC/RTS for duration limited resources.

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Summary and Next Steps

Uncertainty Reserve Product Summary

- The uncertainty reserve product will have a notification time of 60 minutes.
- This product will have a sustainability requirement of 4 hours.
- This product will not be overlapped with our existing operating reserve products.
- This product will have a NYCA-wide requirement and nested reserve region requirements.
- A separate requirement will be set for this uncertainty reserve product, which will not be nested into the current operating reserve requirements.

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Deployment Timeline

Uncertainty Reserve Requirement – 2025 Deployment

1h Notification w/ 4h Duration Reserve Product – 2026 Deployment

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 sustainability requirement.
  - It may be prudent to continue to evaluate best target implementation date for this component of the project based on the actual evolution of the resource mix.
    - This product will have particular value in a future grid characterized by more duration-limited resources.

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Next Steps

- **Q4 2023**
  - Return to ICAPWG/MIWG to review MDCP on the new uncertainty reserve product.
- **2023 Project Milestone: Q4 Market Design Concept Proposed. Targeting November completion.**

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Appendix

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.[1]
- SPP is implementing a 60-minute uncertainty product with a 1-hour sustainability requirement.[2]
  - 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:[3,4]
  - 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

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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 60 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.

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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.

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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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