

# NYISO 2025-2029 ICAP Demand Curve Reset

5-Minute Interval Real-Time Pricing for Storage Net EAS Model

ICAP Working Group

March 13, 2024

## Agenda

- Methodological Changes to Net Energy and Ancillary Services (EAS) Storage Model to Allow for 5-Minute Interval Pricing in the Real-Time Energy Market
- Preliminary Assessment of Potential Magnitude of Impacts Associated with Using 5-Minute Real-Time Pricing for Net EAS Storage Model

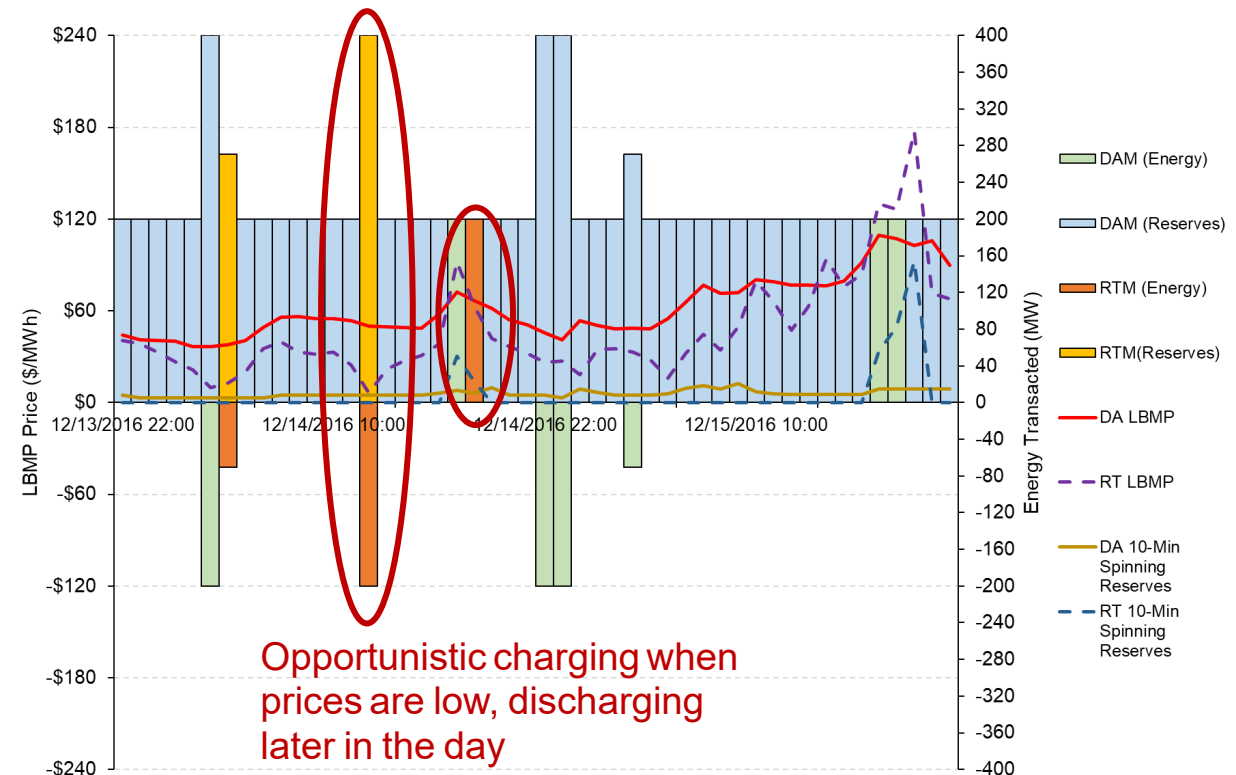
# Methodological Changes to Net EAS Storage Model to Allow for 5-Minute Interval Pricing in the Real Time Energy Market

## AG's Approach to Assess the Impact of 5-Minute Interval Pricing

- In the 01/25/2024 ICAPWG meeting, stakeholders expressed interest in understanding the potential impact of 5-minute interval pricing on the real-time energy market for the storage net EAS model
- AG expects in principle that real-time energy market arbitrage should in some cases be higher under 5-minute pricing than hourly pricing for energy storage technologies
- AG is developing model enhancements to further assess the potential impact of using 5-minute intervals for the real-time market

## Review of Hourly Real-Time Model

- For every pair of hours (A, B), where A occurs before B, the hourly model computes the incremental revenues associated with charging in hour A and discharging in hour B (and vice versa), subject to physical feasibility constraints.
  - For this assessment, the model uses time-weighted/integrated zonal real-time (RT) prices for hour A and Day-Ahead (DA) zonal prices for hour B.
- These hour pairs are sorted in descending order by incremental revenues. If the incremental revenues for the top hour exceeds a specified hurdle rate, the model takes the associated RT energy position.
  - The process repeats, until no hour pair exceeds the specified hurdle rate.
- While RT energy positions are taken based on DA prices for the second hour in the hour pair, revenues are ultimately calculated using time-weighted/integrated zonal RT prices.



## Sequential Methodology for 5-Minute Interval Real-Time Model

For each interval without a DA energy position, the model performs the following steps:

**Step 1:** Assess the incremental revenues of taking a RT energy position in that interval, and an offsetting RT energy position later in the day, net of any buyouts of DA reserve positions. If those revenues exceed a hurdle rate, commit the RT energy positions.

**Step 2:** Assess whether specific actions are required to ensure the model does not violate physical feasibility constraints (i.e., charging with state of charge (“SOC”) of 100%, or discharging with SOC of 0%).

- a. Even if the potential incremental revenues outlined in **Step 1** exceed the specified hurdle rate, the model will not dispatch in RT if physical feasibility is violated.
- b. If RT energy positions change the state of charge such that meeting DA energy or reserve commitments are no longer physically feasible, the model buys out of the affected DA positions.

**Step 3:** Assess whether specific actions are required to ensure the model ends the cycle day with the SOC implied by the DA commitment schedule. This is necessary because the DA model optimizes over multi-day horizons.

- a. For intervals where the model took a RT energy position based on the calculation of potential incremental revenues, the model takes the assumed offsetting energy position later in the day, unless subsequent RT positions (and/or DA buyouts) obviate the need for that offsetting energy position.
- b. If the model reaches the end of the cycle day with a SOC deviation from the DA schedule, it will take the required positions at the end of the cycle day to achieve the required SOC.

## Potential Impact of 5-Minute Real-Time Pricing for Net EAS Storage Model

- Note that the impact of 5-minute interval pricing on net EAS revenues will result in changes due to both *methodology* and changes due to *pricing frequency*
- Additionally, the impact of 5-minute interval pricing on **total** net EAS revenues will be substantially less than the impact on **energy-only** net EAS revenues because a substantial portion of net EAS revenues are earned in the reserve market
- Preliminary results indicate impacts potentially as high as ~10 percent of total net EAS revenues, with the highest impacts in Load Zone K.
  - Preliminary assessment was conducted using market price data for the period from September 1, 2020 through August 31, 2023

## Preliminary Observations and Next Steps

- 5-minute results for storage are subject to change as we continue to refine net EAS model enhancements. That said, the preliminary analysis suggests the following:
  1. The impact of switching to 5-minute intervals on net EAS revenues are potentially significant enough to warrant inclusion in storage net EAS model
  2. The preliminary “sequential” model logic developed to facilitate use of 5-minute real-time prices solves much faster than the real-time segment of the energy storage model from last reset, even with the run-time enhancements presented in January 2024
- AG will present initial storage net EAS model results for both hourly and 5-minute real-time pricing to the ICAPWG in April 2024.



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