PJM MIC Discussion, ESR Market Redesign

Eolian Comments - Nov 4, 2026

Chien Si Harriman, Chief Technology Officer



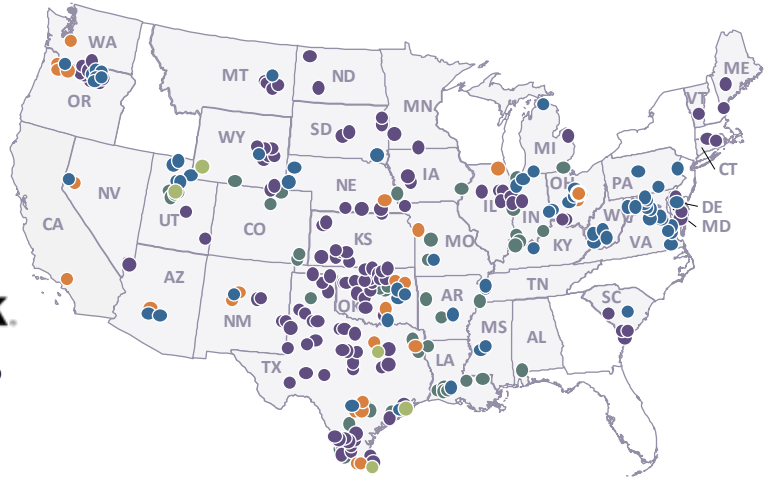
Agenda

- Introduction
- Unique attributes of battery energy storage
- T-65 window lock limitations discussion

Introduction



Eolian - Over Two Decades of Successful Grid-Scale Power and BESS Asset Development



MAP Energy, LLC
Founded as a royalty minerals investment fund

1989

First Wind Investment

2005

First Solar Investment

2009

First Battery Storage Investment

2015

GIP Fund IV partners with core management to form Eolian in rollup of 15 years of MAP fund assets and $2.5 billion of equity investment

2020

2026

Renewable Energy Project Development Over ~20 years

60+ GW Developed and Commercialized

Load + Gen Co-located Development - Multiple large load sites developed and under construction

Full-Stack Battery Storage IPP

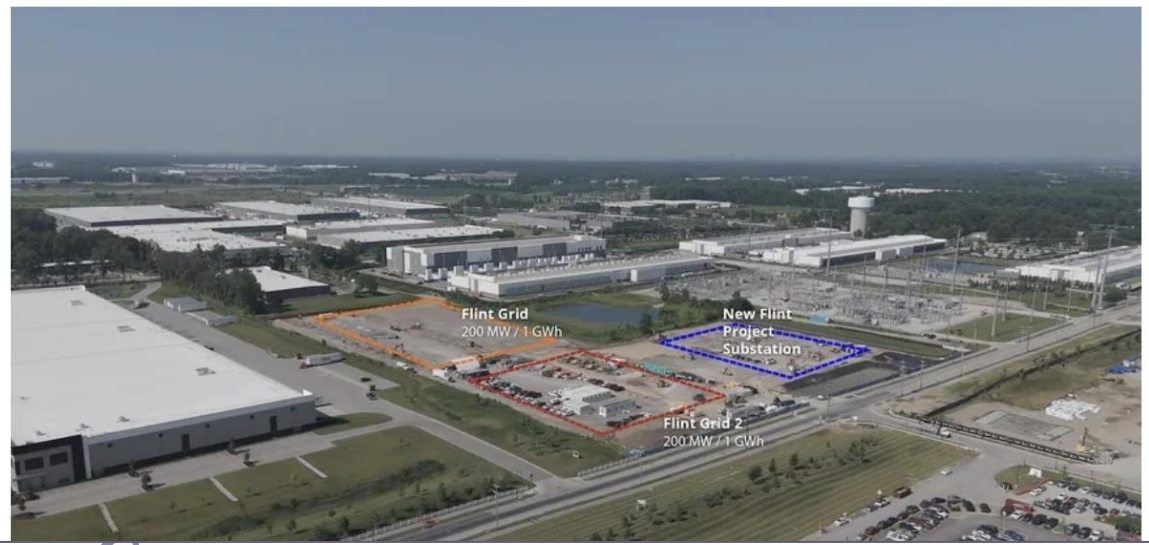
>4 GW commercialized

Biggest battery east of the Mississippi will help power AI complex

The 1-GWh battery project in Ohio will help suppress power prices and reduce grid strain from a nearby data center hub. The region could use a lot more systems like it.



By **Julian Spector**
29 July 2026



Eolian Announces 1+ GWh Flint Grid BESS: PJM's Largest Battery Energy Storage Project Now Under Construction to Support America's Fastest-Growing Data Center and Industrial Corridor near Columbus, Ohio

NEWS PROVIDED BY
Eolian Energy →
Jul 29, 2026, 08:05 ET

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Flint Grid, a 200 MW / 5.3-hour (1.06 GWh) battery energy storage project, demonstrates how Eolian's long-term investment strategy anticipated growing electricity demand and will unlock the grid using flexible resources in the core of one of the nation's most critical locations for AI datacenter development.

COLUMBUS, Ohio, July 29, 2026 /PRNewswire/ -- Eolian announced that Flint Grid, a 200MW, 5+hour duration grid-scale battery energy storage system in Jersey Township, Licking County, Ohio, has started construction ("Flint Grid Project"). Located adjacent to New Albany datacenter and industrial load, the Flint Grid Project is the first large-scale battery energy storage system to qualify for the PJM capacity market and the largest battery storage system to clear the 2027/28 Residual Capacity Auction, representing more than 50 percent of all new battery storage capacity in that capacity year.

Flint – 200 MW Phase 1 Under Construction

Directly Serving Critical Datacenter Load Growth in New Albany, OH



Eolian Energy Storage Projects Snapshot

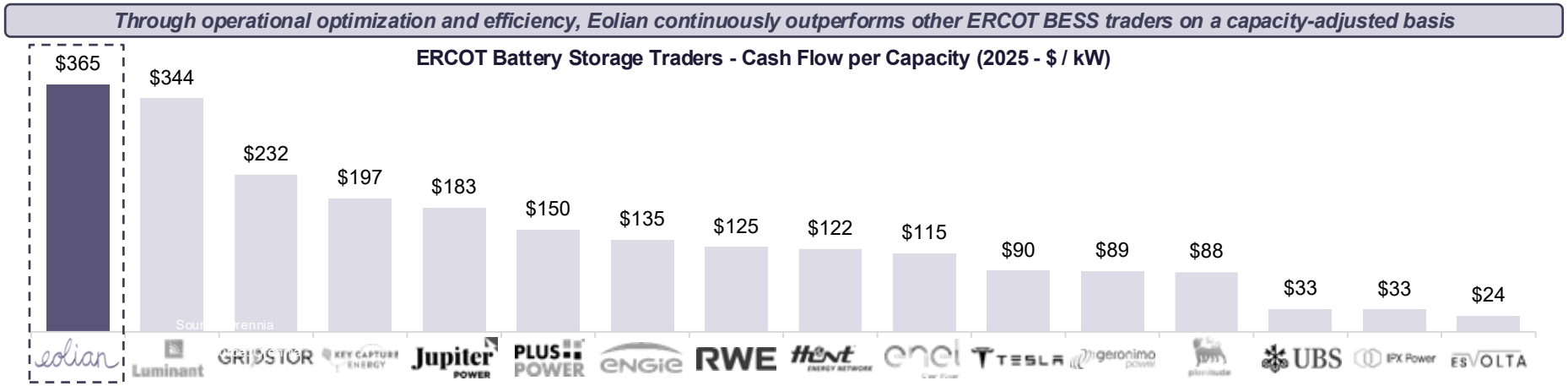
OPERATIONAL

UPCOMING



Q2 2021	Q3 2021	Q1 2023	Q3 2026	Q2 2027	Q2 2030
CAISO	**ERCOT**	**ERCOT**	**ERCOT**	**PJM**	**PJM**
11 MW, 4-hr	100 MW, 1.25-hr	200 MW, 2.5-hr	200 MW, 5-hr	Largest standalone capacity storage resource in PJM	Additional 3.5 GWh of storage

Eolian's Energy Storage Operational Track Record



Source: Orennia

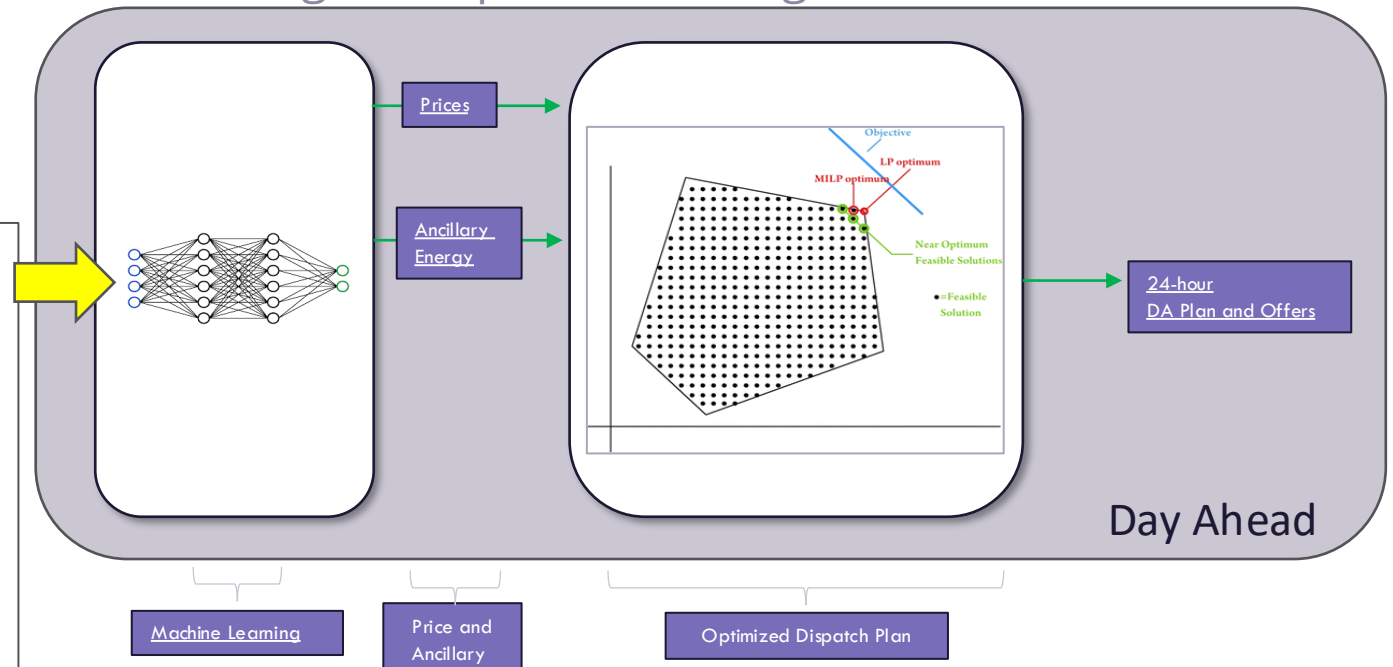
- Eolian developed an in-house real-time energy optimization controller designed to **maximize revenue while honoring state of charge constraints**
- Outlook of market prices informed by **machine learning analysis** coupled with the **ability to make high-level control decisions**
- Secondary **proprietary software system** developed to ensure compliance with market rules, facilitate obligation transfers, record transactions, and act as backup when primary offer engine fails, as needed

Battery Owners Are Entering PJM with Experienced Operators and Traders

Advanced Forecasting and Optimization Algorithms

Forecast Inputs

- Net Load, etc.
- Outage Levels
- Weather
- Reserve Levels
- Historical Prices
- Wind Forecasts
- Solar Forecasts
- Forecast Error Impact
- Loss of Unit Impact



Day Aheard Responsibility

- runs once with latest information, usually submits one hour before DA market closes
- makes planning decision on DART with information available
- tries to make plan and offers based on price and dispatch forecasts that foresee:
  - likelihood of tail risk events
  - impact on pricing if those tail events manifest
- subject to:
  - must offer requirements
  - offer caps
  - cycling limits, SOC limits
  - avoidance of market penalties, or if unavoidable, the mitigation of these market penalties
- we can enforce rules such as: ensure we clear in the day ahead, irrespective of the above
- forecasts will be subject to the largest errors

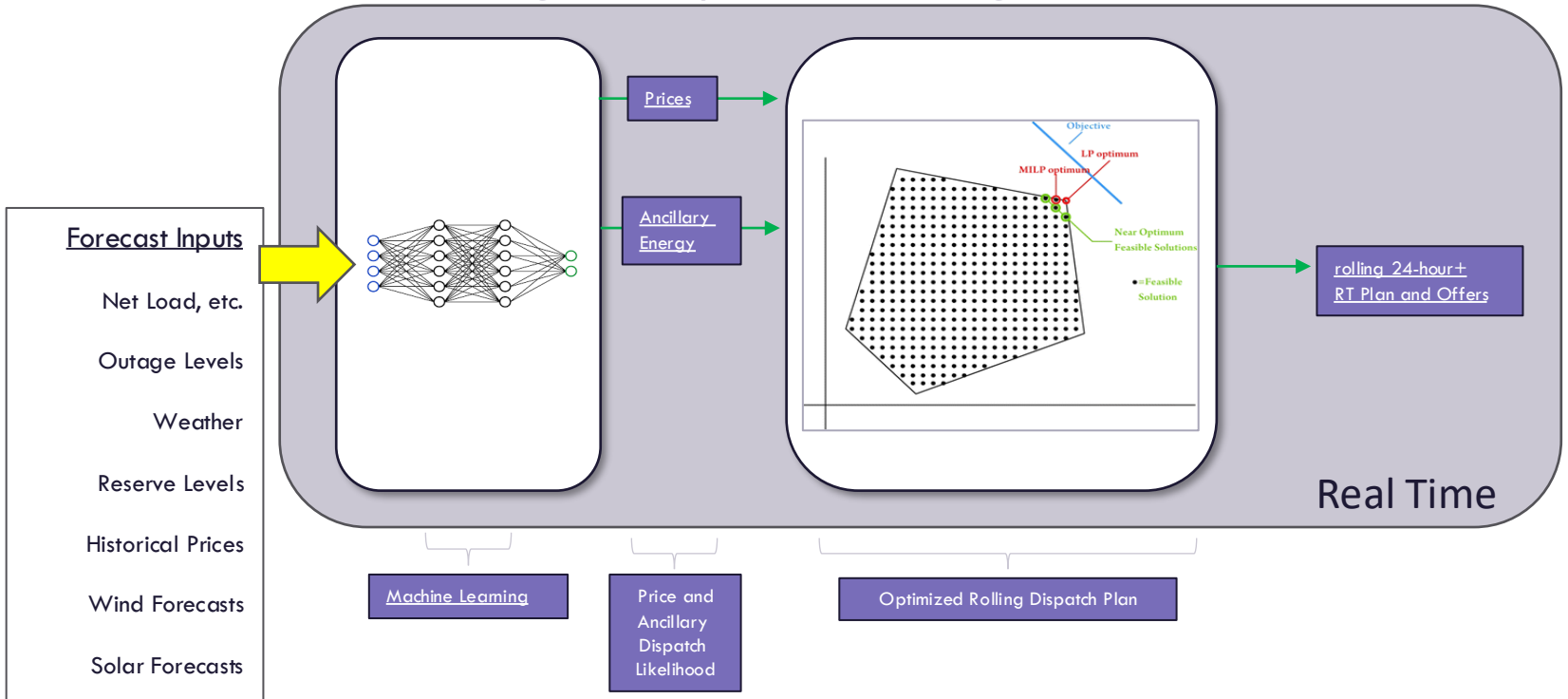
$$\max \sum_{t \in \mathcal{T}} \begin{bmatrix} q_{\mathrm{DA-SR},t}\, p_{\mathrm{DA-SR},t} + (q_{\mathrm{RT-SR},t} - q_{\mathrm{DA-SR},t}) p_{\mathrm{RT-SR},t} \\ + q^{\mathrm{sell}}_{\mathrm{DA-E,t}} (p_{\mathrm{DA-LMP},t}) + \left(q^{\mathrm{sell}}_{\mathrm{RT-E},t} - q^{\mathrm{sell}}_{\mathrm{DA-E,t}}\right) p_{\mathrm{RT-LMP},t} \\ + q^{\mathrm{buy}}_{\mathrm{DA-E,t}} (p_{\mathrm{DA-LMP},t}) + \left(q^{\mathrm{buy}}_{\mathrm{RT-E},t} - q^{\mathrm{buy}}_{\mathrm{DA-E,t}}\right) p_{\mathrm{RT-LMP},t} \\ + \sigma\, q_{\mathrm{REG},t} (p_{\mathrm{REG-CAP},t} + m_t\, p_{\mathrm{REG-PERF},t}) \end{bmatrix}$$

Takeaway:

Algorithms co-optimize energy, reserves, and regulation across the DA 24-hour horizon

Battery Owners Are Entering PJM with Experienced Operators and Traders

Advanced Forecasting and Optimization Algorithms



$$\max \sum_{t \in \mathcal{T}} \begin{bmatrix} q_{\mathrm{DA-SR},t}\, p_{\mathrm{DA-SR},t} + (q_{\mathrm{RT-SR},t} - q_{\mathrm{DA-SR},t}) p_{\mathrm{RT-SR},t} \\ +q^{\mathrm{sell}}_{\mathrm{DA-E,t}}(p_{\mathrm{DA-LMP},t}) + \left(q^{\mathrm{sell}}_{\mathrm{RT-E},t} - q^{\mathrm{sell}}_{\mathrm{DA-E,t}}\right) p_{\mathrm{RT-LMP},t} \\ +q^{\mathrm{buy}}_{\mathrm{DA-E,t}}(p_{\mathrm{DA-LMP},t}) + \left(q^{\mathrm{buy}}_{\mathrm{RT-E},t} - q^{\mathrm{buy}}_{\mathrm{DA-E,t}}\right) p_{\mathrm{RT-LMP},t} \\ +\sigma\, q_{\mathrm{REG},t}(p_{\mathrm{REG-CAP},t} + m_t\, p_{\mathrm{REG-PERF},t}) \end{bmatrix}$$

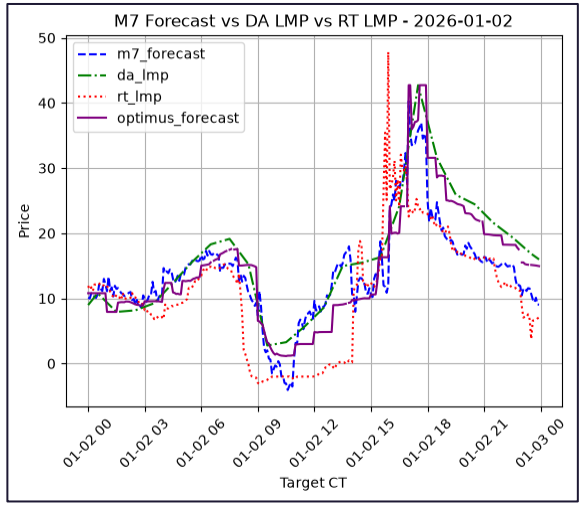
RT Responsibility

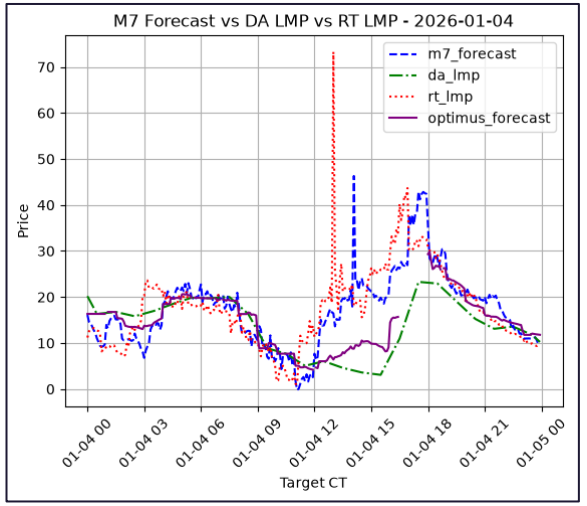
- ideally would be able to run and update every sced interval (every 5 minutes), with no time restrictions (can submit just before the next SCED interval)
- manages state of charge and re-optimizes and re-forecasts at every interval
  - updates planning decisions based on best available information
  - needs to ensure state of charge is honored while simultaneously serving markets in real time
  - planning horizon goes out 24 hours
- same subject to conditions
- forecasting should be better because we are nearer to the present, but still difficult in very volatile rt conditions due to data sparsity, predicting with absolute precision is difficult … should rewards be given by the market for great forecasting? should the operations room send some special information to boost accuracy of forecasts? should penalties be softened in certain instances?

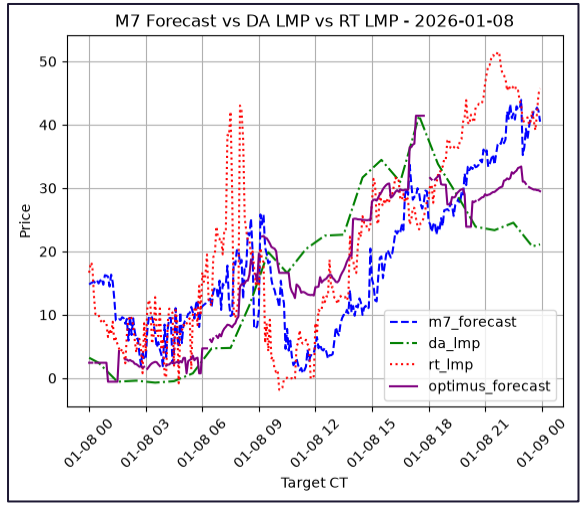
Takeaway: SCED window timing: significant investment has been made to allow our operational algorithms to recalculate dispatch plans and forecasted state of charge successfully every 5 minutes

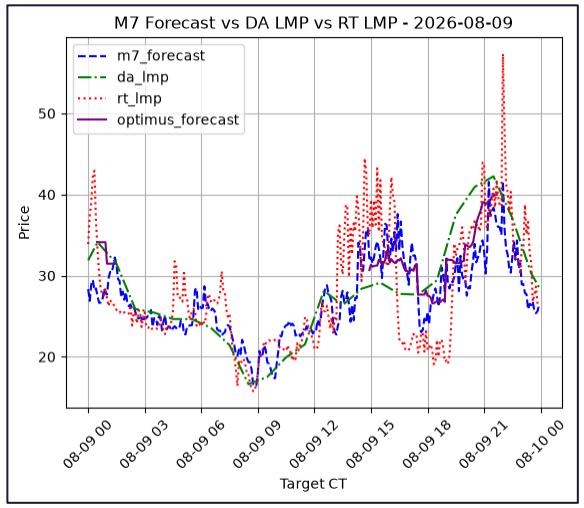
Eolian 1-hr lookahead RTLMP Forecaster Performance

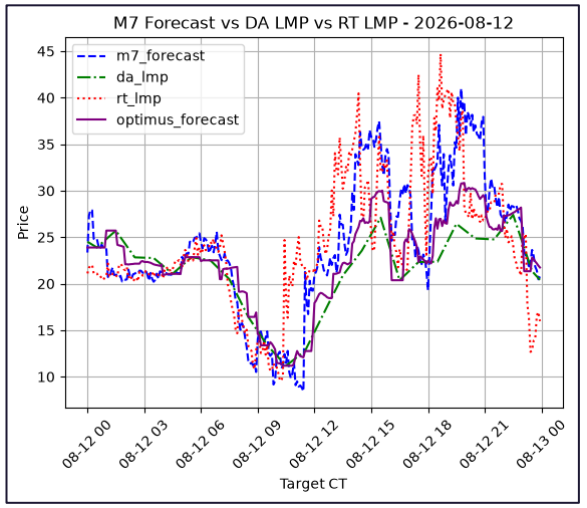
Example Days

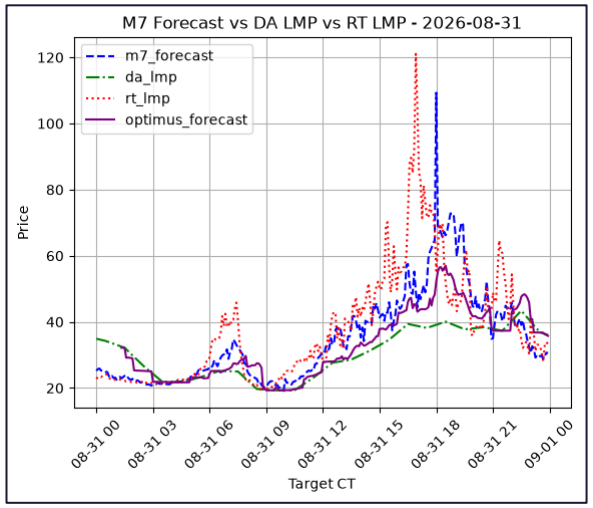












Optimus-
RTLMP Forecaster weighted more to DALMP & RT Fundamentals

M7-
RTLMP Forecaster weighted more to the movement of recent RTLMP & RT fundamentals

Important: Eolian operates at a node currently in ERCOT where:

- RTLMP > DALMP max for at least one interval 73% of all days in 2026

Forecaster Error

T + 1h (current time + 1 hr)

MAE Definition

For each hour, take how far the forecast missed the actual price, **ignoring whether it was too high or too low**. Then average those misses.

$$MAE = 1/n \times \Sigma \; | actual_t - forecast_t |$$

n = number of hours forecast; | | = size of the miss, high or low

Example: misses of +$5, −$15 and +$10 give an MAE of $30 ÷ 3 = $10

HOUR-AHEAD RTLMP FORECASTER ERROR RESULTS

$9.74
M7 forecaster average miss

$11.28
Optimus forecaster average miss

M7's typical miss is about 14% smaller

MAE as an Error Metric

Reads in dollars
$9.74 means the forecast was off by about $9.74 on average in any given 5-minute interval

Highs and lows don't cancel
A forecast that is $20 high, then $20 low is not zero, a $20 miss each time

One spike doesn't dominate
Every dollar of miss counts the same; other popular metrics like RMSE squares big misses, magnifying their error

Forecaster Error

T + 1h (current time + 1 hr)

HOW TO READ THESE CHARTS

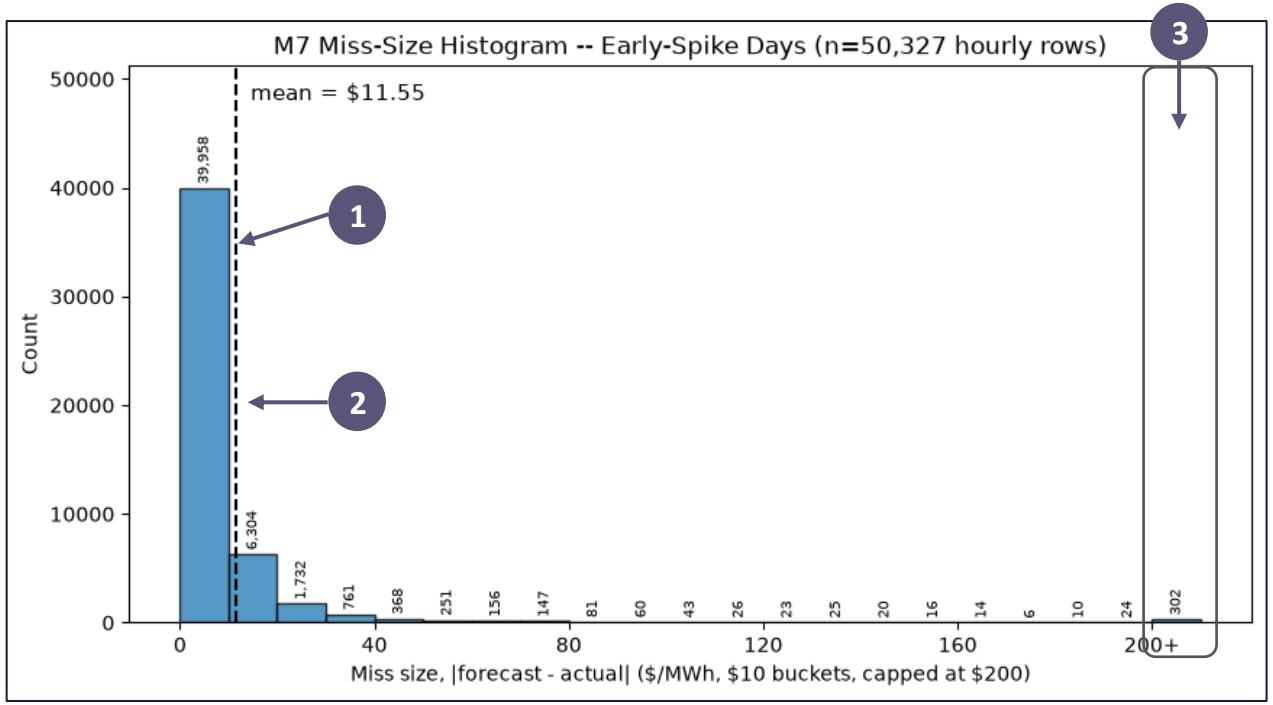
Each bar counts hours. The further right the bar, the bigger the forecast miss in that hour.

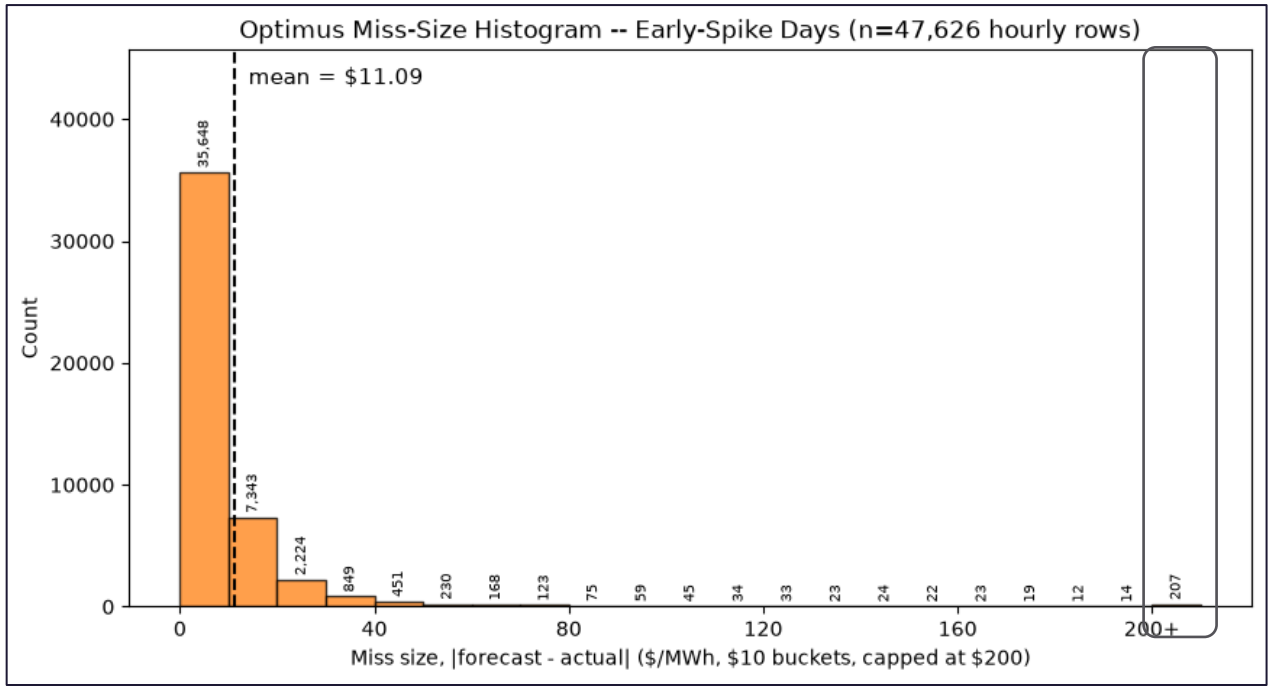
1. **Most hours sit in the first bar**
   79% of M7 hours and 75% of Optimus hours missed by under $10/MWh

2. **The dashed line is the average miss**
   It sits right of the tall bar because a few large misses pull it up

3. **$200+ misses grouped together**
   200-300 instances where misses are $200 or larger over ~50,000 SCED intervals

Both charts cover early-spike days only, so their averages differ from the previous slide.

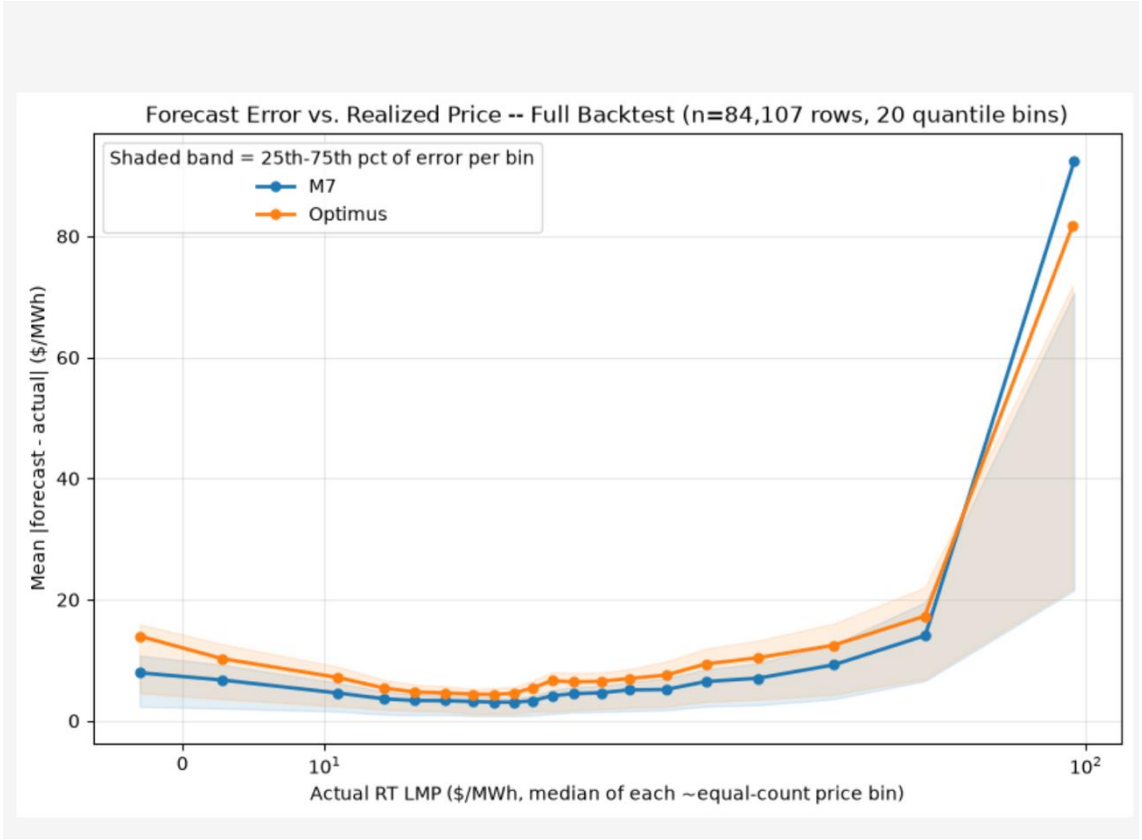




Forecast Error Grows as RTLMP prices Ris

Increasing Prices in RT brings increasing error size

Increasing Forecast Error



Increasing RTLMP

T-65 Minute Window Lock

Limitations and Opportunities



Flexibility is being Undervalued
Locking Offers Runs Counter to PJM's Flexibility Goals

- PJM is currently emphasizing the importance of BESS

> *"Battery storage is playing a growing role in supporting a reliable, resilient and diverse grid, resources like this add flexibility to the grid and help support reliability as demand continues to grow."*
>
> **- Stu Bresler, Chief Operating Officer of PJM**

- The flexibility value of storage is *its ability to react incredibly quickly to changes in price that might not have been perfectly predicted*
- The T-65 minute artificial window that locks offer curves in SCED excludes BESS units from determining when they can charge or discharge at their discretion
- When viewed through the fuel access lens (charging is ESR fuel), limiting access to the grid to effectively discriminatory



PJM Energy Storage Drivers

Storage developers are lining up just as PJM faces its **fastest demand growth in decades**

STORAGE IS COMING

67 GW

of storage applied to PJM's reopened interconnection queue in 2026, second only to gas at 106 GW[1]

13+ GW already in the pipeline
Under construction or in late-stage study as of November 2025[2]

~21 GW Virginia storage target
Plus ~8 GW of targets across Maryland, New Jersey and Illinois[3]

DEMAND IS OUTRUNNING NEW SUPPLY

3.6% a year

summer peak growth forecast for the next decade, against 0.3% in the 2021 forecast[4]

Capacity auction 6.8 GW short
Cleared at the $325/MW-day cap for a third year, with only 525 MW of new generation[5]

1 PJM, Cycle 1 interconnection requests, April 2026 (via Utility Dive) 2 PJM, "Energy Storage Resource Model Enhancements" problem statement, January 2026
3 Modo Energy, "PJM battery storage in 2026," August 2026 4 PJM, 2026 Long-Term Load Forecast Report, January 2026
5 PJM, 2028/2029 Base Residual Auction results, July 2026 6 PJM, "Powering Reliability Through Market Design," May 2026

ESR Key Attribute Takeaways

PJM rules should let storage earn its **full value**: responding economically to any grid condition, planned or unplanned, rather than serving only as a peaker replacement.

MORE THAN A PEAKER REPLACEMENT

Always available

Online around the clock, ready to charge or discharge with no start-up time

Near-instant response

Reaches full output in tens to hundreds of milliseconds, far faster than thermal units[1]

Relieves congestion

Charging off-peak and discharging at peak puts more power through existing lines and can defer upgrades[2]

1 Hitachi Energy, “Understanding the Role of Fast Frequency Response (FFR) in Modern Power Grids,” April 2026
2 Applied Energy, “Addressing electricity transmission network congestions using battery energy storage systems: a case study of Great Britain,” 2025
3 Porzio et al., Environmental Science & Technology, “Private and External Costs and Benefits of Replacing High-Emitting Peaker Plants with Batteries,” 2023

T-65 Window Lock Issue Mapping to ESR Model Enhancements Interest Identification

Market Implementation Committee

ESR Model Enhancements

Interest Identification

Instructions: List interests of all parties on this page.

1	Resource dispatch that accounts for resource costs, including opportunity costs, and aligns with system reliability needs.
2	Resource dispatch and reserve assignments that reflect resource operational constraints.
3	Market power is mitigated.
4	Market clearing results in locational market signals that guide optimal investments.
5	Rules that encourage robust participation and create efficient market results.
6	Solutions that are durable and nimble with evolution.
7	Simplicity and coherence in market design where possible.
8	Market rules that are non-discriminatory and reflect the unique characteristics of the underlying technology.
9	Transparency
10	Scalable solution that works with dozens/hundreds of ESR units
11	ESR seller can use offer prices to preserve SOC for deployment at the optimal time for reliability (does not need to rely on physical hold-back or manual phone calls to achieve optimal result)
12	ESR seller can use offer prices to manage SOC (does need need to rely on physical hold-back)
13	ESR seller can quickly respond to changes in actual and expected real-time conditions to continuously maintain SOC for optimal time
14	Market awards in energy and ancillary services are simultaneously achievable/do not conflict and are consistent with optimal SOC management
15	ESR seller is not required to do things that are impossible or that degrade reliability
16	Timely implementation relative to incoming ESR deployments (i.e., 2028)
17	Opportunity costs are based on uncertain price trends and assessments vary by participant
18	Opportunity costs include PAI risk and A/S revenues
19	Result is competetive market outcome
20	Correctly account for the use of capacity by ESRs and the supply of capacity by ESRs
20	To the extent that opportunity costs are included, those costs are calculated by IMM/PJM pursuant to clear rules
20	Energy storage gets dispatched for reliability needs
20	ESR offers reflect the owner's expected opportunity cost which should reflect the reliability needs of the system

Why Keeping the T-65 minute window lock doesn't meet Interests Identified

- Interest: Solution is durable and nimble with evolution
  - the justification for PJM's proposed solution is based on back-testing price caps on historical prices, where RTLMP spiking above DALMP prior to the evening peak, is rare. Eolian verified independently with Brattle that PJM's proposed rules work, but under the same back-testing assumptions (using historical prices)
  - As more batteries and renewables penetrate the generation stack, this will no longer be the case: the grid will see more RTLMP volatility, which is how ERCOT and CAISO have evolved
  - a lock on bids and offers, by its definition, is not nimble or open to this evolution
- Interest: Scalable solution that works with hundreds of ESRs
  - the T-65 minute lock will result in more conservative behavior from ESRs. Scaled to many ESRs, the lock could at the very least create pricing anomalies as we will demonstrate with the Winter Storm Elliott.



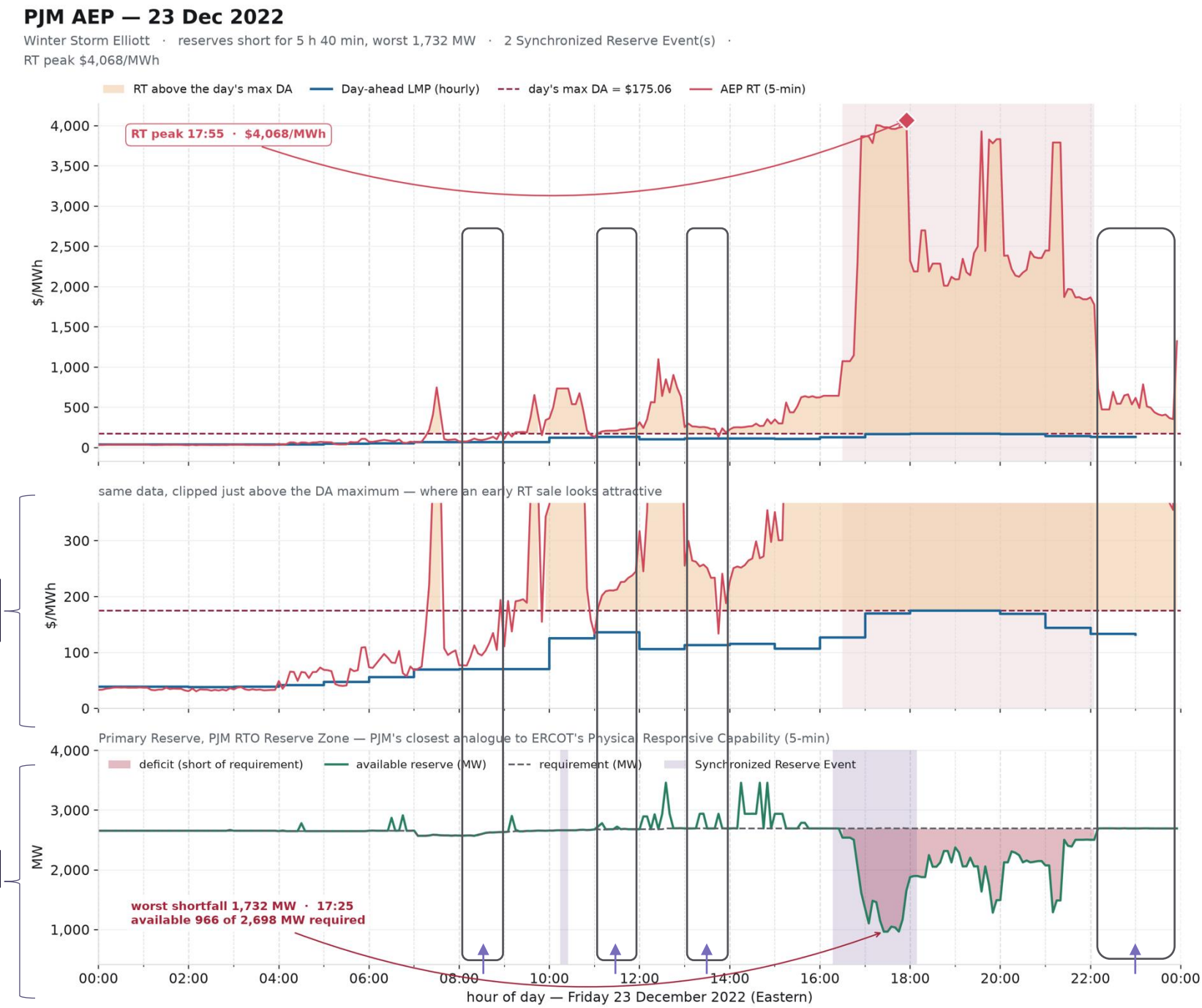
Why Keeping the T-65 minute window lock doesn't meet Interests Identified

- Interest: ESR can use prices to preserve SOC at the optimal time for delivery
  - a lock on bids and offers, by its definition, does just the opposite. The lock limits ESRs to use a curve for a full hour that is based on a forecast that is over an hour old, is suboptimal.
- Interest: ESR seller can quickly respond to changes in actual and expected real-time conditions to continuously maintain SOC for optimal time
  - requiring an ESR to freeze its offer curves 65 minutes in advance will not allow quick responses
- Interest: Result is a competitive outcome
  - ESRs subject to the offer lock will be subject to reduced revenue, that is unrecoverable, as we will see in the Elliott example below
- Interest: Energy storage is dispatched for reliability needs
  - ESR suboptimal SOC management will result in dispatch and charging recovery at the wrong times

Winter Storm Elliott PJM

Winter storm Elliott presents the ideal case study to illuminate the challenges posed by the current market construct for ESRs.

NB - each vertical grid line on the charts is one hour

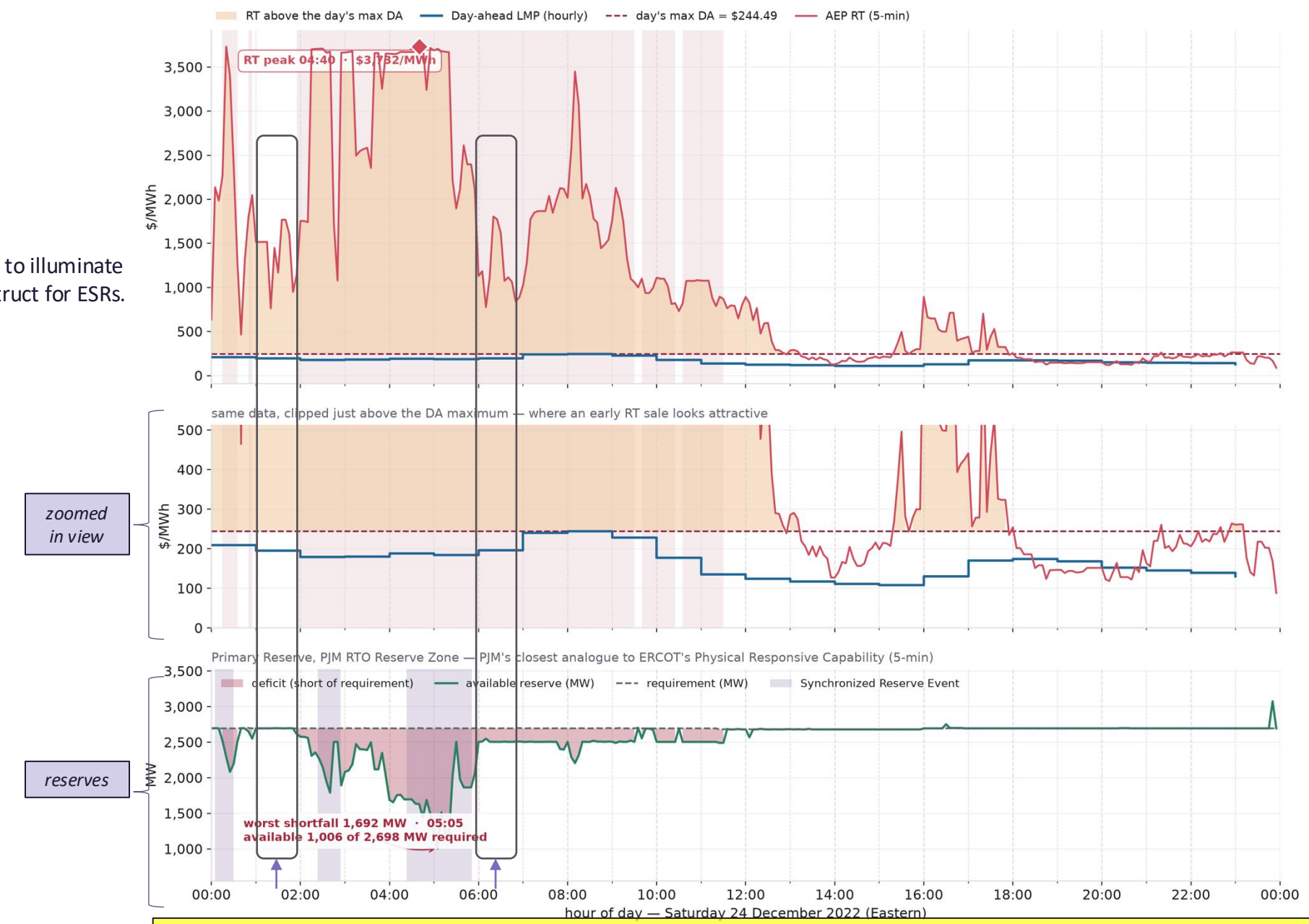


best charging opportunities (denoted by the box with arrow). These charging periods are difficult to capture with T-65 window lock.

Winter Storm Elliott PJM

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NB - each vertical grid line on the charts is one hour



best charging opportunities (denoted by the box with arrow). These charging periods are difficult to capture with T-65 window lock.

Source: PJM LMPs, PJM real-time Ordinary and Reserves and Synchronized Reserve Events via the Aurora Energy database

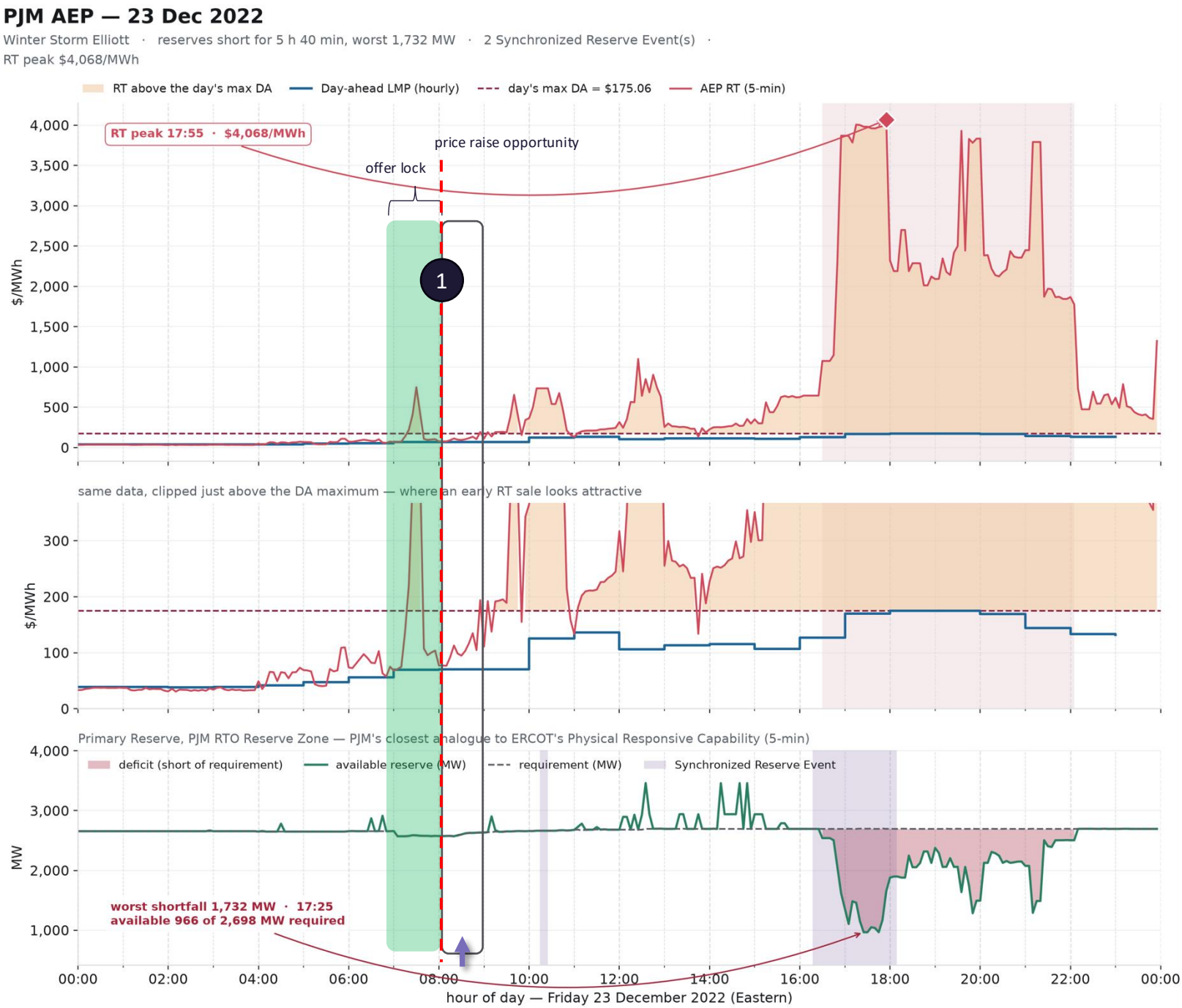
Winter Storm Elliott PJM

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NB - each vertical grid line on the charts is one hour

1 Offer curves for 08:00 must be submitted by 06:55. ESRs likely have the buy price set below current hour DA price expectations. With RT LMP going above the DA LMP max, the ESR will likely discharge near full nameplate and then due to the lock be unable to recharge.

Because the system has seen an early price spike, if allowed to raise its price above the DALMP, it may be able to raise the sell price to $1000 at 07:55 to avoid selling early during the 09:00-11:00 price spike and subsequent 12:00 price spike



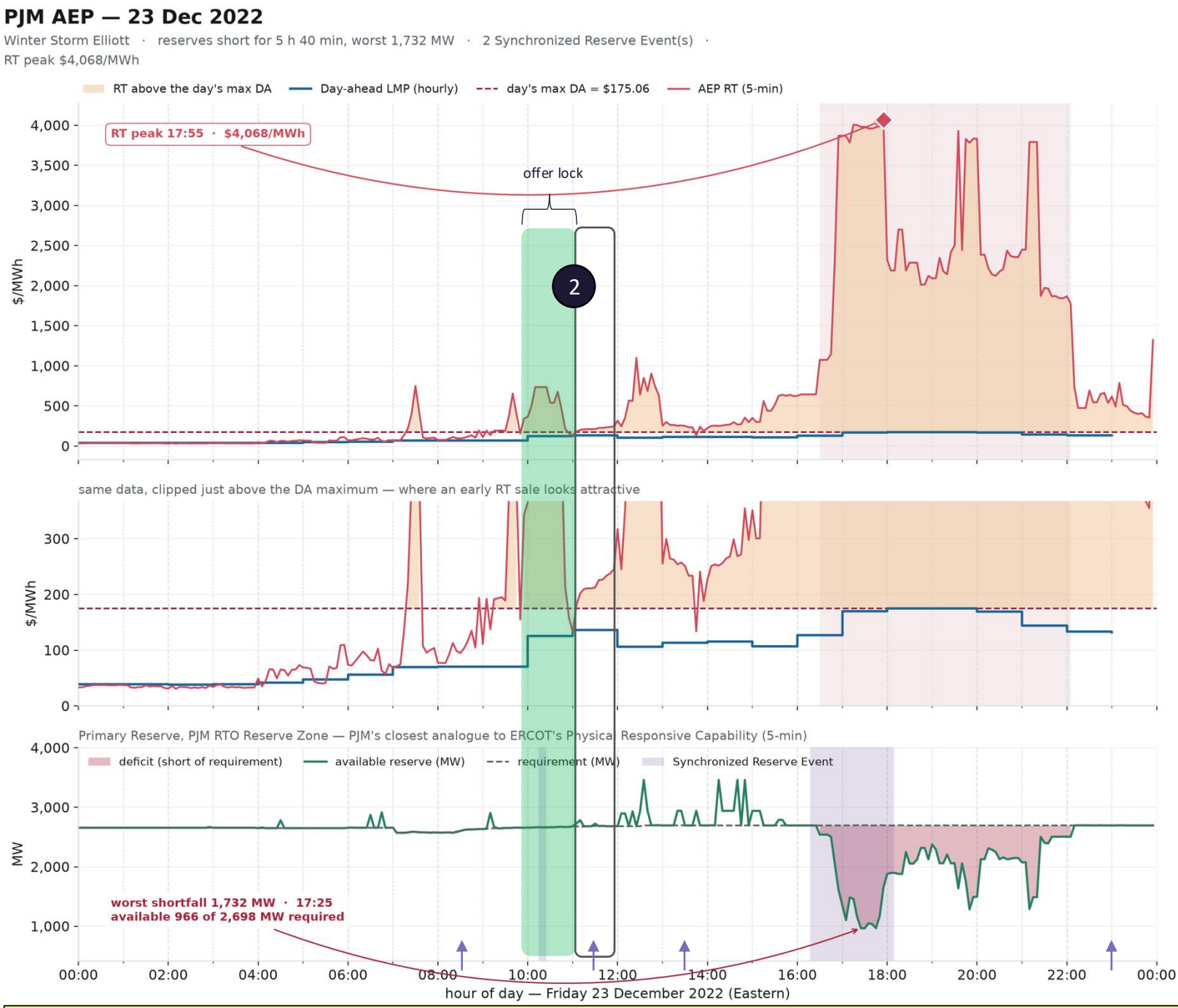
Source: PJM LMPs, PJM Real-Time Dispatched Reserves and Synchronized Reserve Events via the Astral Energy datalake.

Winter Storm Elliott PJM

Winter storm Elliott presents the ideal case study to illuminate the challenges posed by the current market construct for ESRs.

NB - each vertical grid line on the charts is one hour

2 Offer curves for 11:00 must be submitted by 09:55 AM. Given the early discharge there is a small possibility to be able to catch this buy opportunity, but it will be difficult to price the buy price correctly and capture all of it. A T-65 minute lock is a headwind that makes capturing even more difficult.



best charging opportunities (denoted by the box with arrow). These charging periods are difficult to capture with T-65 window lock.

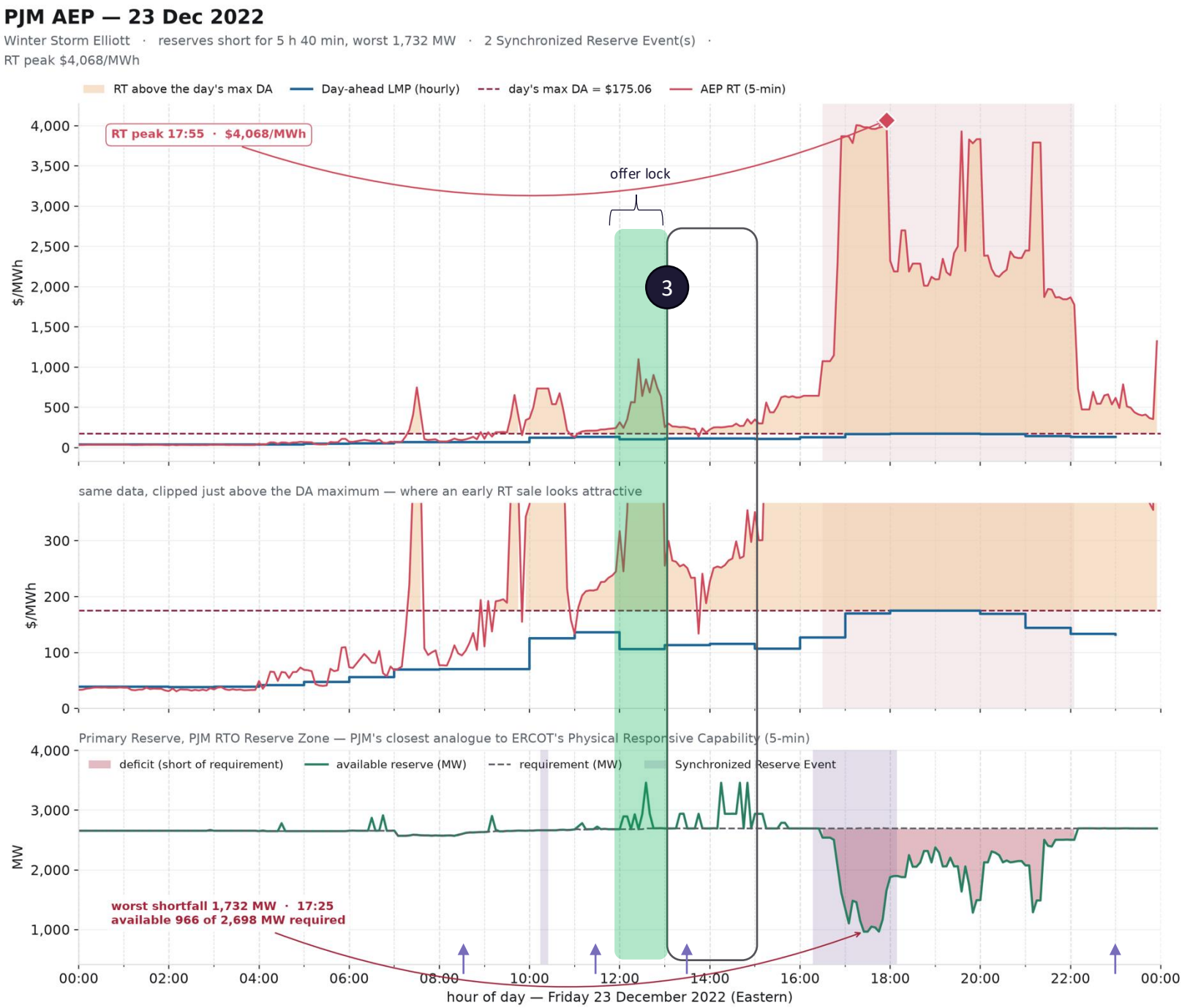
Winter Storm Elliott PJM

Winter storm Elliott presents the ideal case study to illuminate the challenges posed by the current market construct for ESRs.

NB - each vertical grid line on the charts is one hour

3 Offer curves for 13:00 must be submitted by 11:55 AM. Given the early discharge there is a small possibility to be able to catch this buy opportunity, but again it will be difficult to price the buy price correctly and capture all of it.

A T-65 minute lock is a headwind that makes capturing even more difficult.



best charging opportunities (denoted by the box with arrow). These charging periods are difficult to capture with T-65 window lock.

Winter Storm Elliott PJM

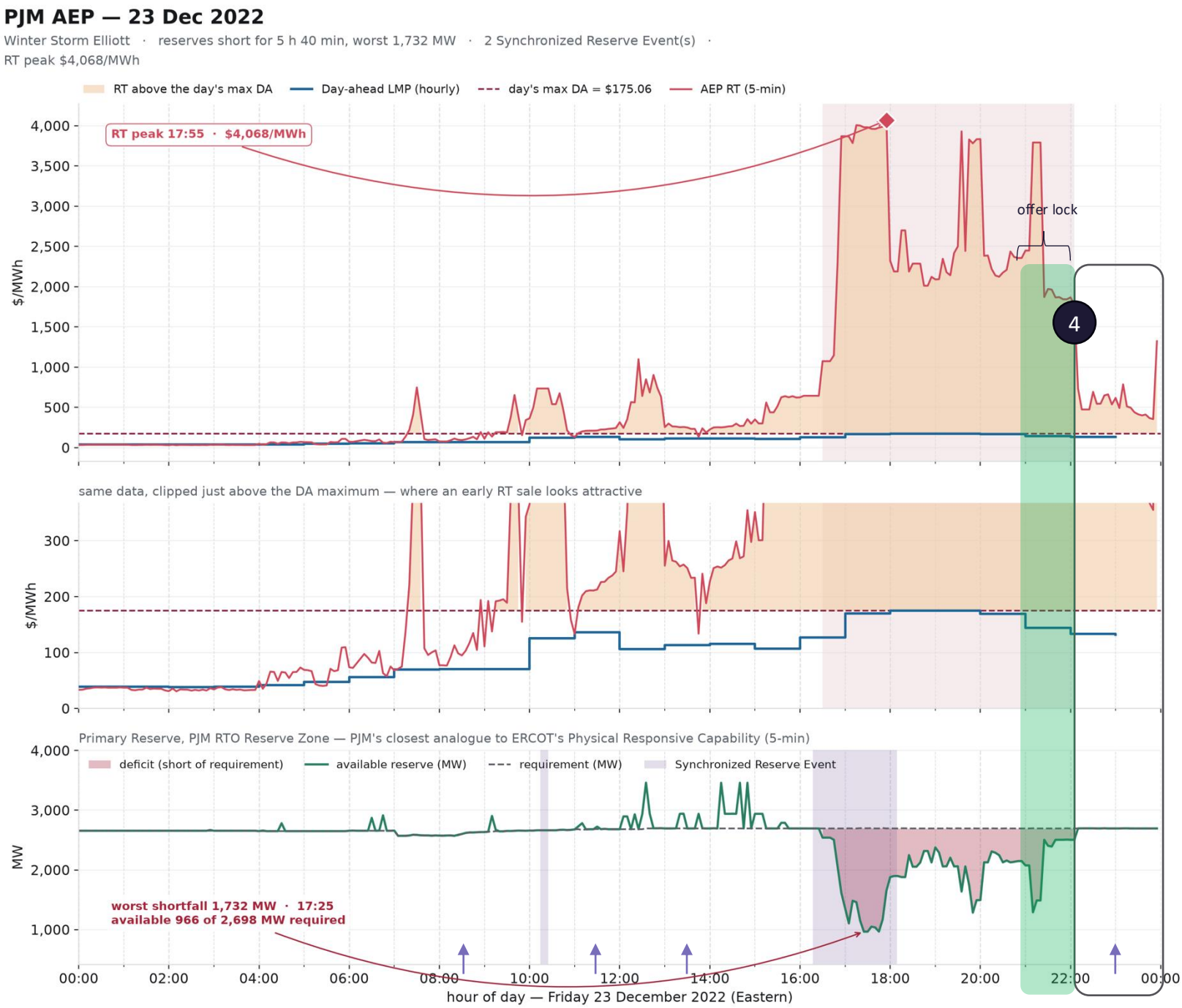
Winter storm Elliott presents the ideal case study to illuminate the challenges posed by the current market construct for ESRs.

NB - each vertical grid line on the charts is one hour

4 Offer curves for 22:00 must be submitted by 20:55. Difficult to predict when reserves shortfall might end, and also difficult to price.

Buy prices reflective of current market conditions will be higher, possibly extending high prices.

A T-65 minute lock is a headwind that makes capturing even more difficult.



best charging opportunities (denoted by the box with arrow). These charging periods are difficult to capture with T-65 window lock.

Winter Storm Elliott PJM

Three strategies evaluated

Case A - follow DA expectations.
Buy when prices < $50, sell when prices > $175

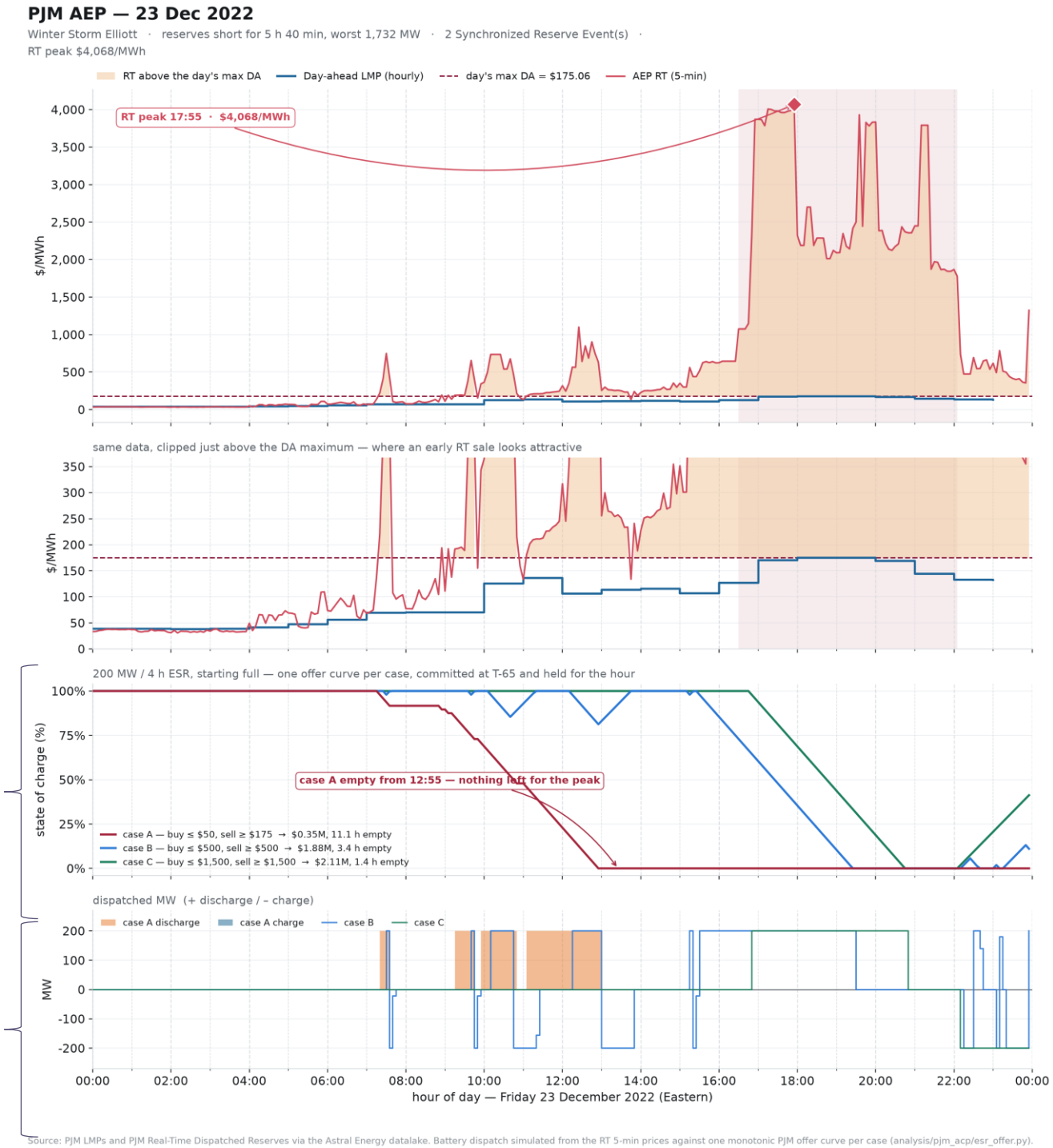
Case B - adjust moderately to RT price volatility.
Buy when prices < $500, sell when prices > $500

Case C - aggressively adjust to RT price volatility
Buy when prices < $1500, sell when prices > $1500

NB - each vertical grid line on the charts is one hour

state of charge evolution for 3 strategies

dispatch patterns



Source: PJM LMPs and PJM Real-Time Dispatched Reserves via the Astral Energy datalake. Battery dispatch simulated from the RT 5-min prices against one monotonic PJM offer curve per case (analysis/pjm_acp/esr_offer.py).

Winter Storm Elliott PJM

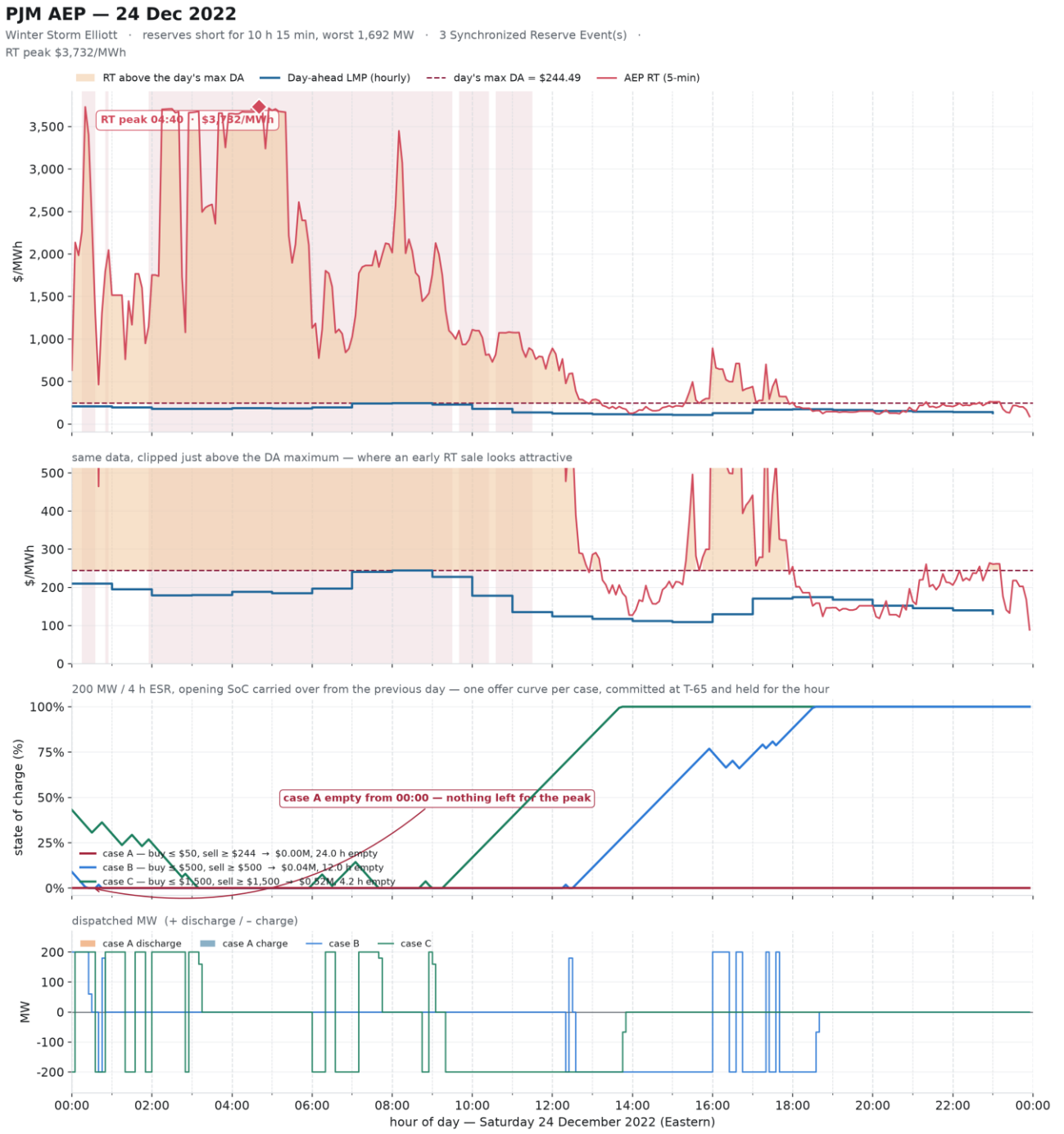
Three strategies evaluated (SOC carries over from day before)

Case A - follow DA expectations.
Buy when prices < $50, sell when prices > $175

Case B - adjust moderately to RT price volatility.
Buy when prices < $500, sell when prices > $500

Case C - aggressively adjust to RT price volatility
Buy when prices < $1500, sell when prices > $1500

NB - each vertical grid line on the charts is one hour



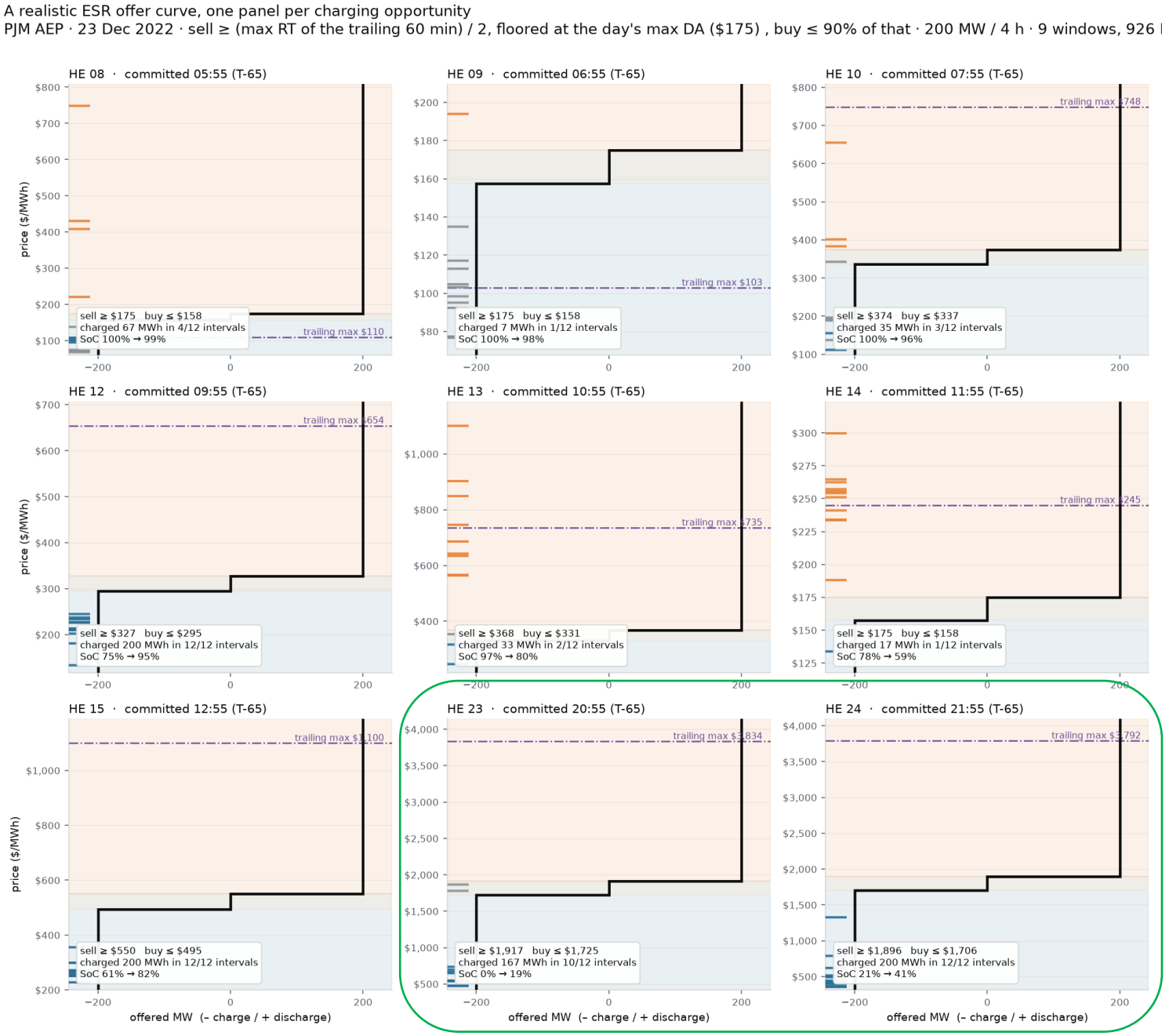
Source: PJM LMPs and PJM Real-Time Dispatched Reserves via the Astral Energy datalake. Battery dispatch simulated from the RT 5-min prices against one monotonic PJM offer curve per case (analysis/pjm_acp/esr_offer.py).

Winter Storm Elliott PJM

Plausible Energy Offer Curves on 12/23/2022.

Making special note of HE 23 and HE 24. The T 65-minute window lock makes these curves particularly hard to shape given how old the forecasts are at the time of their creation, and the ESR's potential desperation to avoid PAI penalties. This could lead to excessive buy prices.

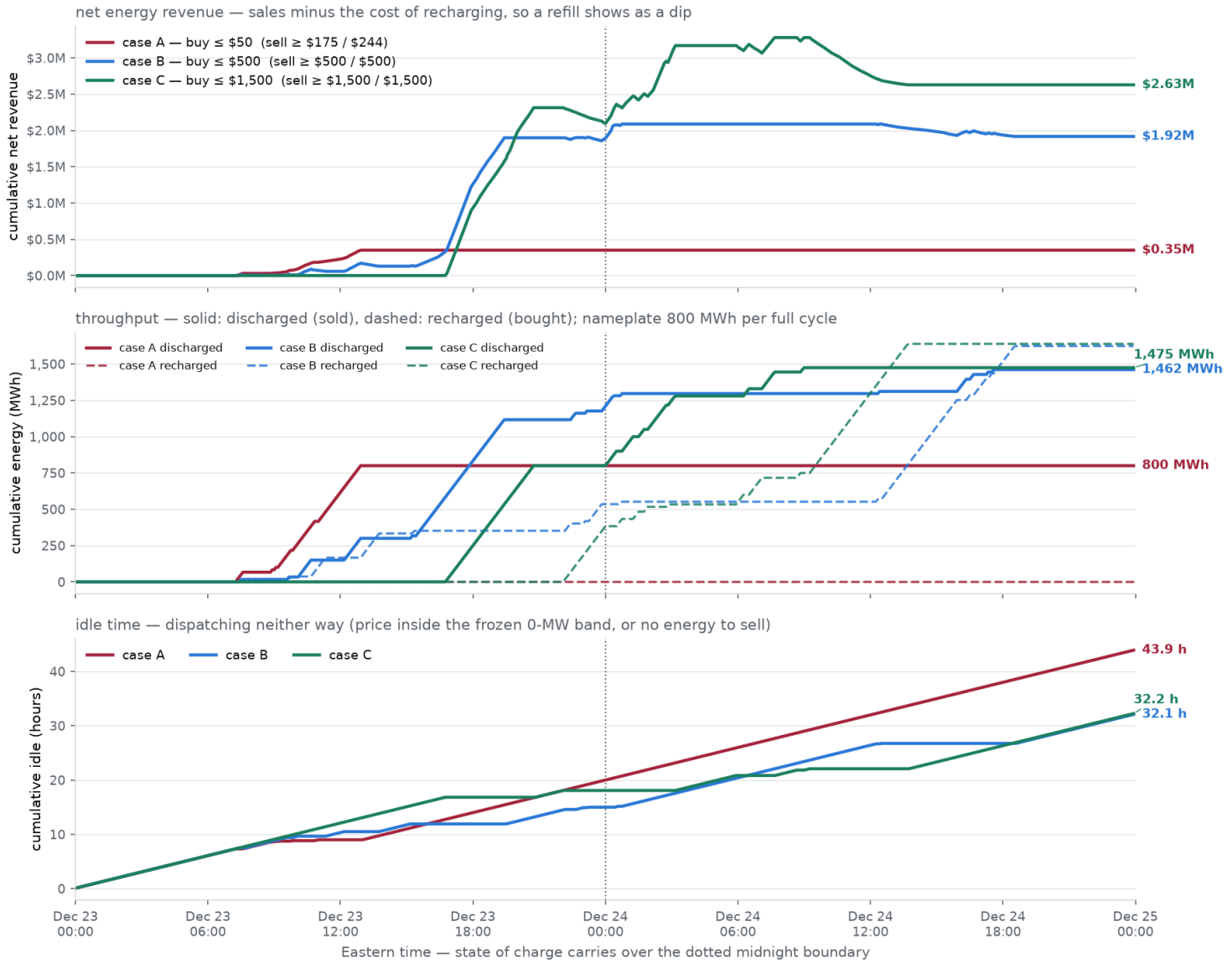
At scale (with GW of batteries on the system), this could lead to challenging operating conditions where batteries are over-pricing their buy prices as they are running out of state of charge but trying to maintain SOC during a PAI event.



Causal by construction: each curve uses only prices published at or before its T-65 deadline, so it is one the operator could actually have submitted. Left-edge ticks are the hour's realised 5-minute prices, coloured by what cleared — blue charged, orange discharged, grey idle. The buy price is the break-even spread (sell x round-trip efficiency); monotonicity forbids placing it above the sell price (wiki/pjm_esr_offer_curve.md).

Winter Storm Elliott PJM

PJM ESR offer policies — two-day running totals
PJM AEP · 23–24 Dec 2022 · 200 MW / 4 h, starting full, state carried across midnight



One monotonic offer curve per case per day, committed at T-65 and held for the hour; the sell floor is the day's max DA where monotonicity allows it and just above the buy price where it does not (wiki/pjm_esr_offer_curve.md). Revenues are ex post.

WHAT THE CHARTS SHOW

One 200 MW / 4-hour battery in PJM's AEP zone, Dec. 23–24, 2022, under three offer policies

Recharging mid-storm paid off

Cases B and C bought power back during the storm and sold it again

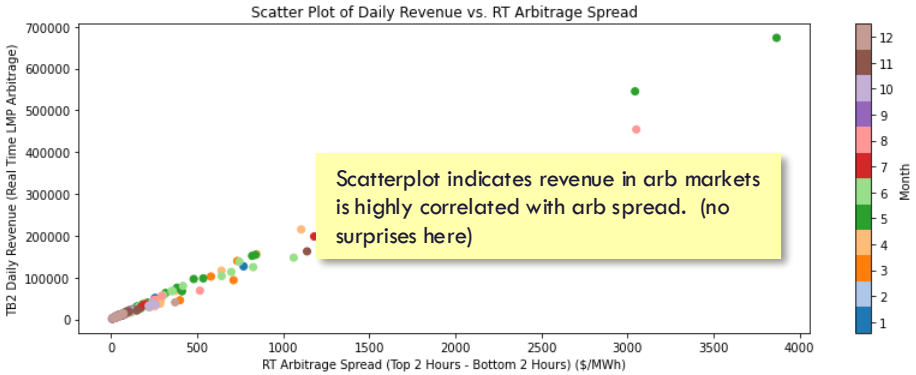
~1,470 MWh delivered vs. 800

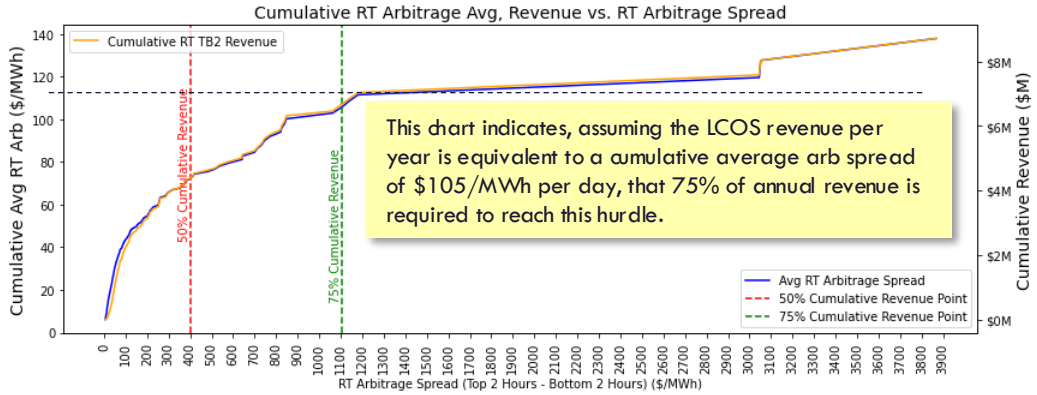
Nearly two full cycles, against one for the cautious policy (A)

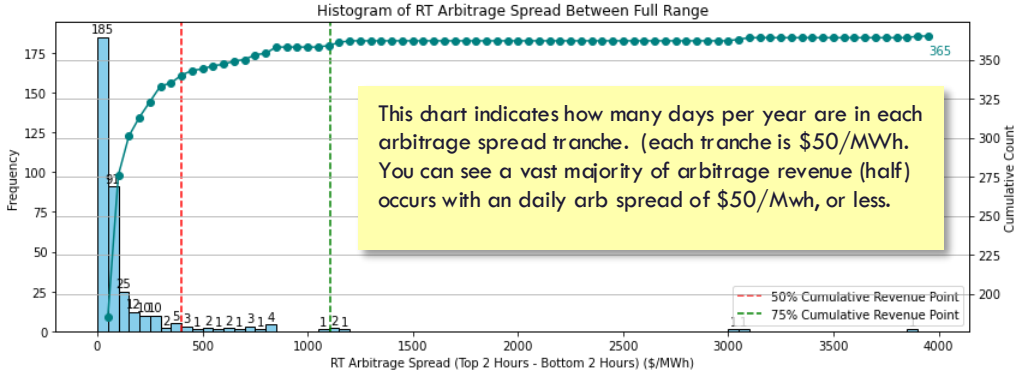
$1.9–2.6M vs. $0.35M

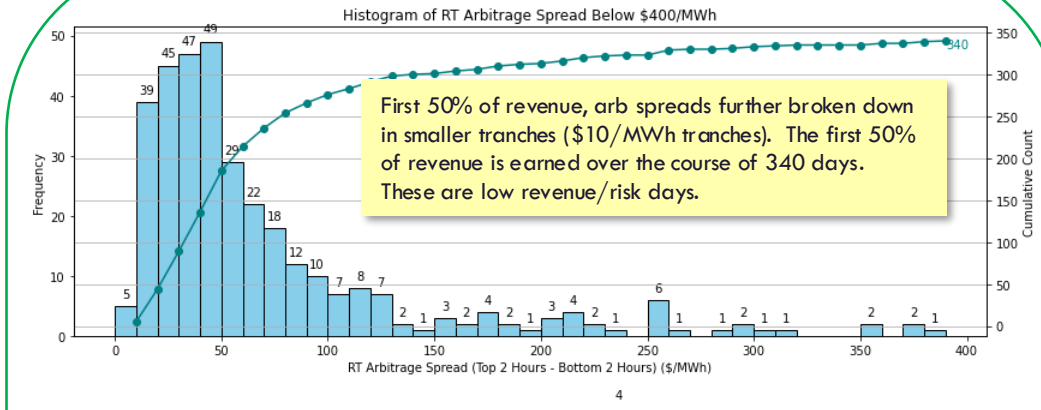
5–7x the net revenue of case A, the worst case

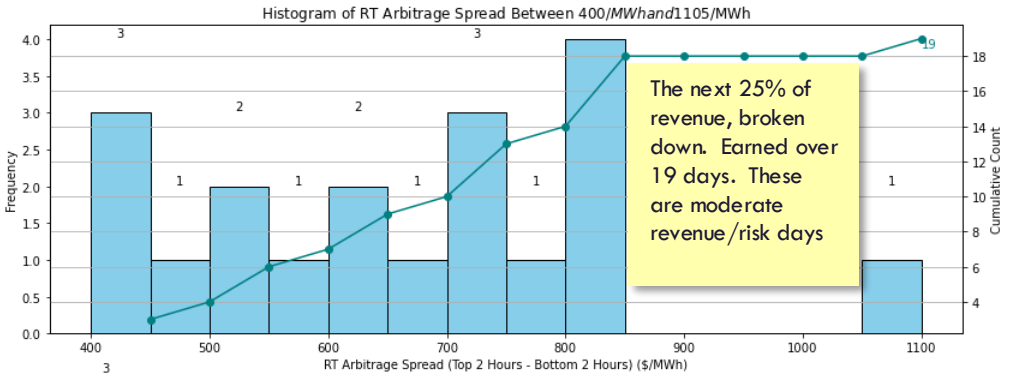
Storage Resource Energy Arbitrage Revenue Generation - ERCOT 2024 Pricing, 2-hour battery example

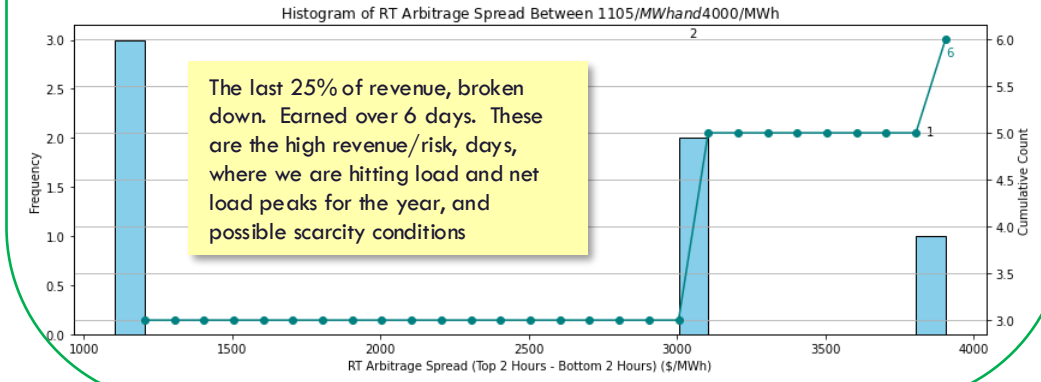












Key Takeaway: Money is lost on lucrative days, e.g. - a 50% cut in 25% revenue made over the six extreme days of the year leads to a potential 12.5% reduction in revenue.

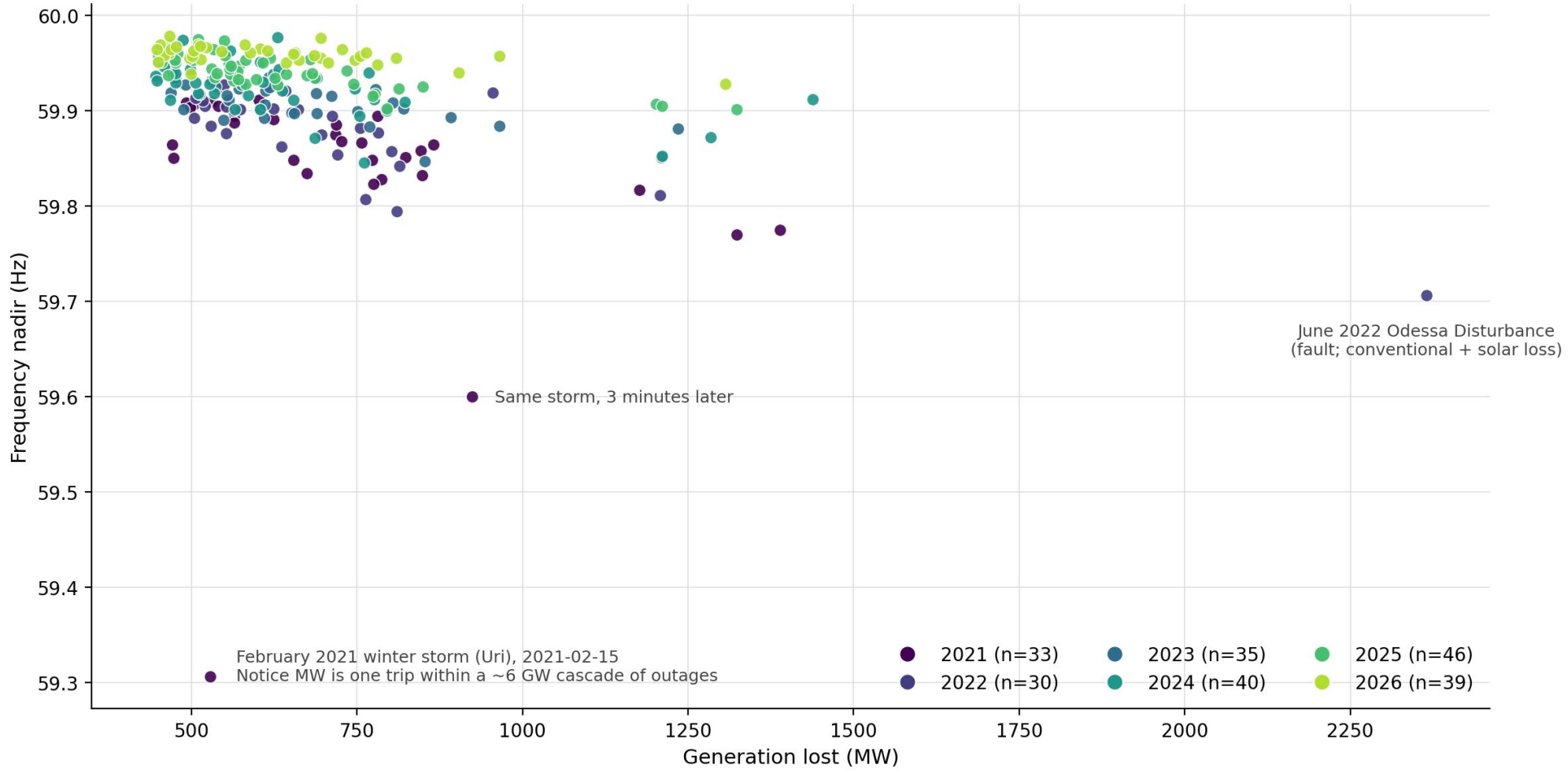
Battery Energy Storage Systems

Unique Attributes and Opportunities



ERCOT Plot of Frequency nadir vs generation lost by year

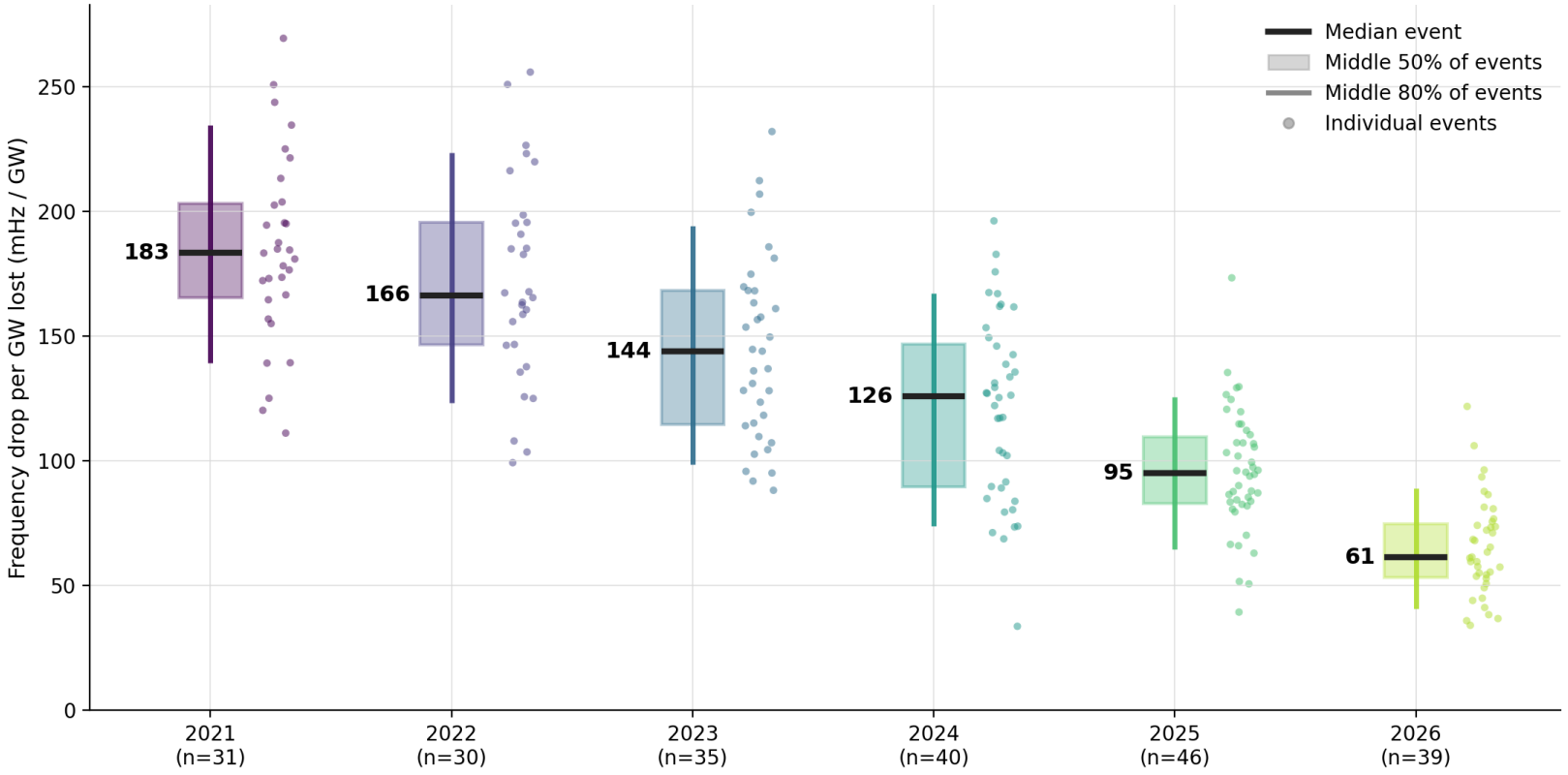
All 223 events. Three outliers are explained on the next slide.



Source: ERCOT public notices of sudden loss of generation > 450 MW (via NRGStream stream 3376), Jan 2021 – Oct 2026.

ERCOT Frequency drop per GW lost fell about two-thirds as storage penetration increased

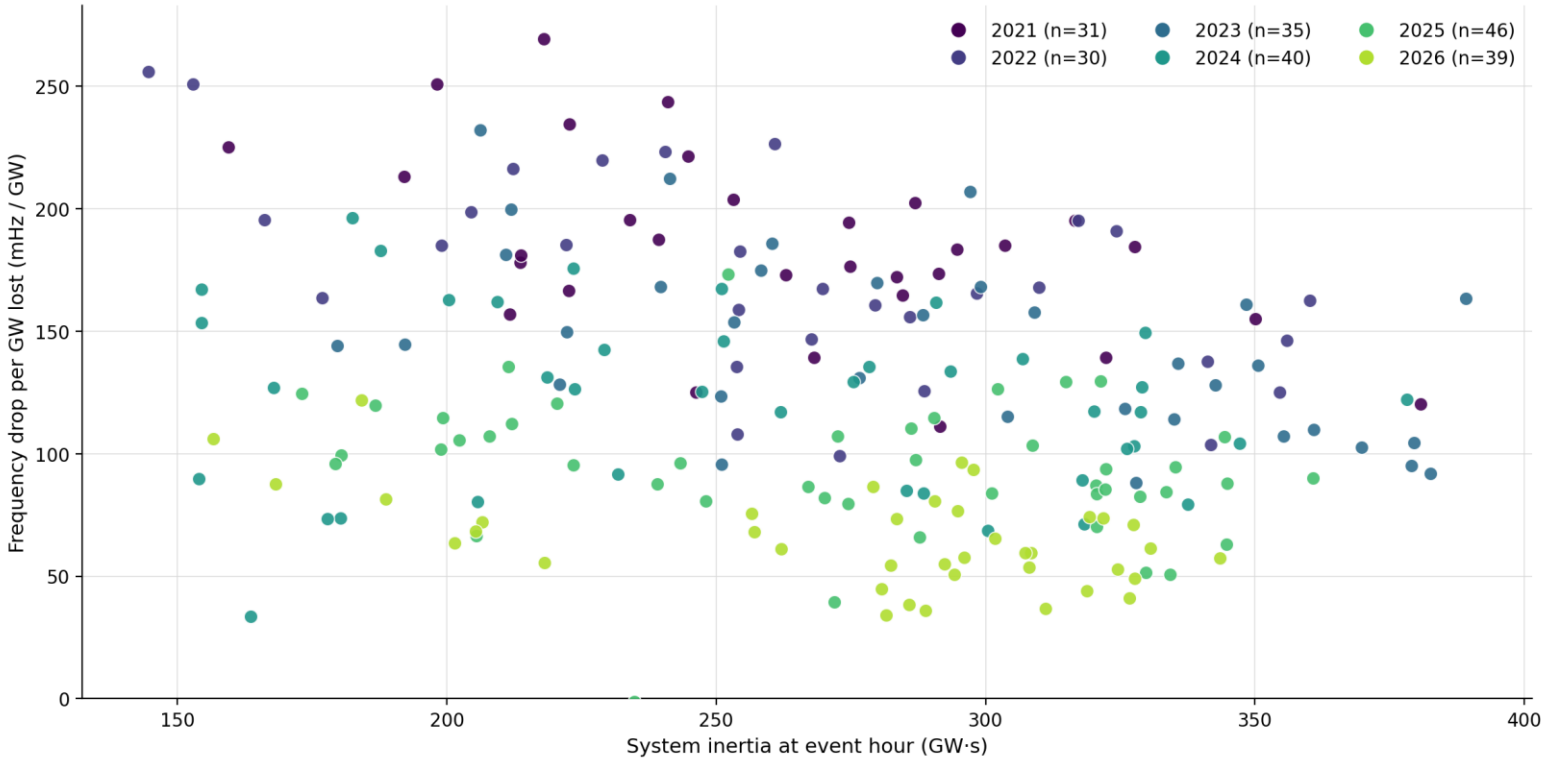
Boxes show the middle 50% of events, lines the middle 80%. The typical event in 2026 drops one-third as far per GW as in 2021.



Drop = pre-event frequency (Yes Energy raw, 5-minute average ending 2 min before the event) minus ERCOT-reported nadir. Sudden-loss notices >450 MW; excludes the two Feb 2021 winter storm near-collapse events (2021-02-15 01:54, 01:57). 2026 through Oct 5.

ERCOT’s Frequency Control Improvements hold at every level of system inertia

Years separate vertically at the same inertia; inertia itself did not fall.



- Median inertia: 230 GW·s (2021) → 272 GW·s (2026)
- Low end stable: 5th percentile ~145–165 GW·s
- At fixed inertia, drop per GW falls ~19% per year
- Higher inertia still helps, as expected

Source: ERCOT sudden-loss notices (NRGStream 3376); Yes Energy SYSTEM_INERTIA, RTLOAD, WIND_RTI, GENERATION_SOLAR_RT, NET_LOAD_RT (hour of event). Excludes the two Feb 2021 winter storm near-collapse events.

Storage Lessons from ERCOT and CAISO

Texas and California added batteries at scale and served **record demand while summer wholesale prices fell by almost half** since 2021.

ERCOT (TEXAS)

42% lower

average summer wholesale price than in 2021, even with load up 30% and battery capacity up 26-fold[1]

~$3.55B saved this summer
Wholesale energy costs, June–August 2026 vs. 2021[1]

No conservation appeals in 2024 or 2025
ERCOT issued 11 in 2023, before batteries covered the evening peak[2]

CAISO (CALIFORNIA)

51% lower

average summer wholesale price than in 2021, as battery capacity grew nearly sevenfold[1]

~$2.5B saved this summer
Wholesale energy costs, June–August 2026 vs. 2021[1]

No Flex Alerts since 2022
11 alerts in 2022; over 17 GW of batteries now online[3,4]

1 SEIA, summer wholesale price analysis (June–Aug., 2021 vs. 2026), October 2026; compares two summers and does not isolate gas prices or weather
2 Federal Reserve Bank of Dallas, Texas grid analyses, January and November 2025 3 California Energy Commission, summer 2026 reliability update, May 2026
4 CAISO, summer grid briefing to the California Senate Energy Committee, 2025

Final Thoughts

Market Context



For PJM Consideration - On BESS

1. The best offer strategies are often far better than typically following the DA as renewables+BESS proliferate
2. Eolian's offer strategy is among its peers at the top, and it is highly optimized around price forecasts but also forecasted probabilities of market conditions and other considerations
3. In RT, Eolian is able to offer every five minutes to the market, and in discussion with peers, this is industry standard to maximize value
4. Hour-ahead forecasts can still be significantly wrong, and the magnitude of error grows under stressful market conditions. Locking in offers an hour ahead will significantly reduce value from batteries, and can reduce earnings

Additional PJM Consideration - On BESS

- **A net positive for the grid** — Batteries improve grid reliability and increase the utilization of transmission assets. They have revolutionized the market and **reduced costs for consumers** when allowed to proliferate. Happy to provide more material if PJM stakeholders disagree.
- **Unlock ESR speed** — Batteries are fast-acting. To get the most out of them, that speed has to be unlocked — **not just for regulation, but for energy and reserves. Placing a window lock on batteries will make them more conservative in operations, and lead to improper SOC management.**
- **"The grid is our fuel source"** — Much of PJM's time is spent fairly treating fuel costs for traditional generators, in a construct where **PJM is not responsible for the thermal-gen fuel network**. ESRs present a unique situation where collaboration is required to work within your market construct to make access to this fuel fair — in both redesigning the bidding rules and the collapsing the limiting time windows on which bids are made.
  - **Put in thermal gen terms** — Imagine an opportunity for a thermal generator to buy fuel cheaply, but PJM's own constructs prevented it, and PJM suggest: ***"You have to wait until tomorrow."*** By then the spot price may already be marked up.



