



Item 5.3.1: Real-Time Co-optimization Update – **REVISED***

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Implementation

ERCOT Board of Directors Meeting

ERCOT Public
April 7-8, 2025

- * New Slide 30: Market Costs of RUC Instructions
- * Revised Slides 11, 31: Content added
- * Revised Slide 19: Updated QSE + Resources Scorecard
- * Revised Slides 21, 22, 27, 29: Key Takeaways
- * Revised Slide 9: Formatting

Real-Time Co-optimization (RTC) Update

- **Outline of Update for Board:**

- Program Update as one-page summary
 - Appendix A contains full program update
- Code Freeze for most systems for remainder of 2025
- Explanation of three Nodal Protocol Revision Requests (NPRRs 1268, 1269, 1270) at Board in the TAC recommendations
- Appendix B contains ERCOT Analysis of NPRR 1269

- **Key Takeaway(s)**

- RTC+B Program continues to move forward on schedule.
- ERCOT working closely with Market Participants to minimize go-live risk:
 - Board being asked to consider Nodal Protocol Revision Requests 1268, 1269, 1270
 - Continuing development of market readiness materials
 - Current Dashboard of QSE Acknowledgements leading into May 5th Market Trials

RTC+B One-Page Summary

- Policy Items:
 - TAC recommendations for NPRR1268,1269,1270 (subsequent slides)
 - Initial task force discussion of State of Charge and Ancillary Service duration requirements for potential June Board consideration (future NPRR)
- Program milestones:
 - ERCOT has received initial deliveries of all vendor code on time and is running initial Operating Day testing for core applications
- Market Readiness updates:
 - [Market Notice](#) sent to all QSEs with Resources requiring response:
 - Acknowledge market trial handbooks, environments, and key dates for market trials activities beginning May 5, 2025
 - Responses were due March 31, 2025 and reflected in dashboard
 - RTCBTF reviewed two more Market Trial Handbooks and three new training segments (Demand Response, Day-Ahead Market, and Operations)
 - Operator Training Seminar includes RTC+B (weekly training from March 26- April 30)
- More information in Appendix A on these activities and QSE scorecard

NPRRs for Board consideration

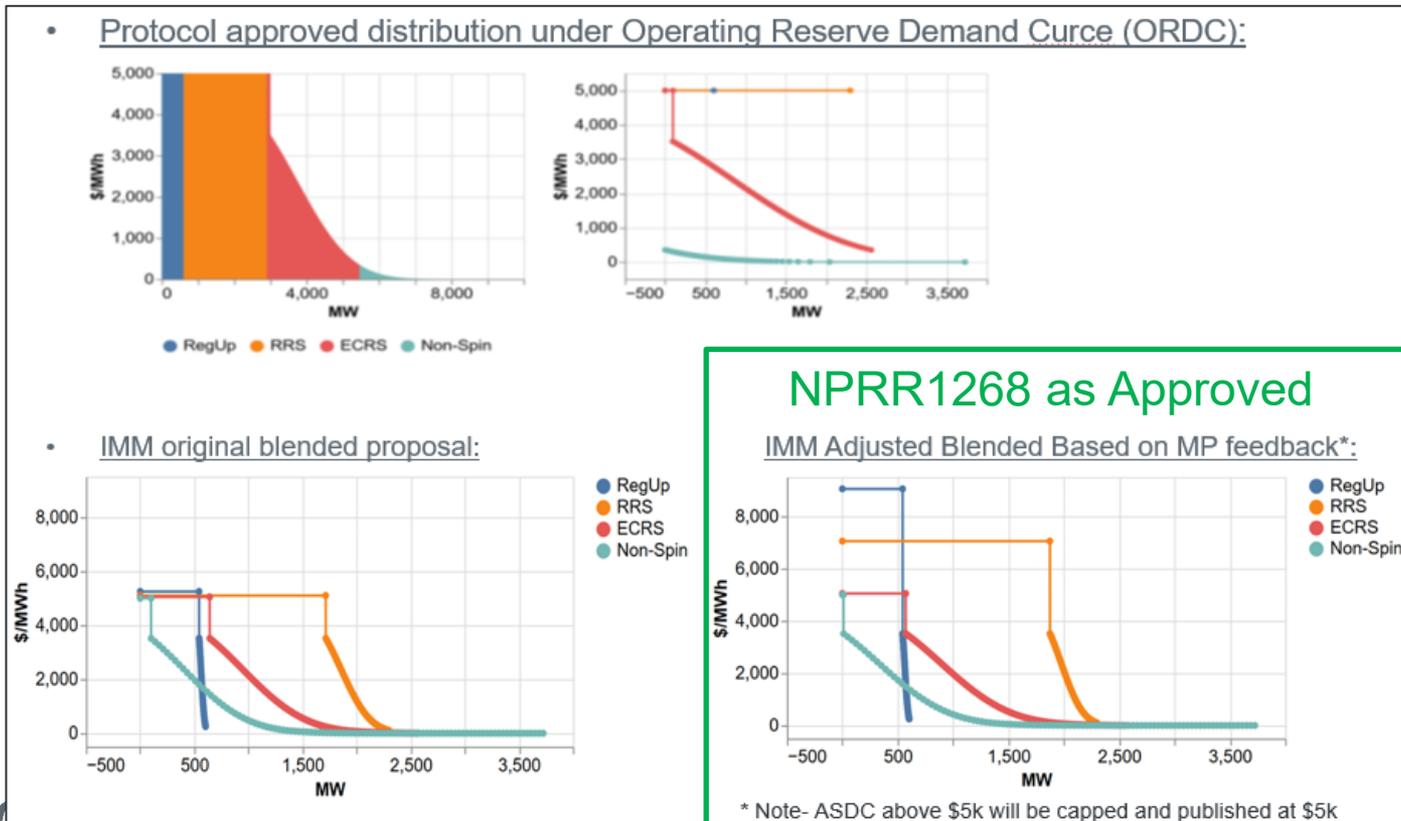
Timeline and vetting RTC+B NPRRs

File NPRRs (No impacts) Jan 28	PRS Table NPRRs Feb 12	PRS Urgency & Apprv 3/12 TAC approval March 26	Board Approval April 8	PUCT Approval May 15	
Jan 2025	Feb 2025	Mar 2025	Apr 2025	May 2025	June 2025
RTCBTF: Jan 14, 23, Feb 7, 19, March 5, 25 Stakeholder comments in Feb and March			ERCOT window for "re-factoring" development	ERCOT market trials deployed and begin on May 5, 2025	

- NPRR1268 for ASDC Modifications (IMM sponsor)
- NPRR1269 for 3 Parameter/Policy Changes (ERCOT sponsor)
 - Ramp Rate Sharing
 - AS Proxy Offer Floors
 - Ancillary Service Demand Curves (ASDCs) for Reliability Unit Commitment (RUC)
- NPRR1270 for AS Qualification details (ERCOT sponsor)

Summary of NPRR 1268

- NPRR1268 RTC–Modification of Ancillary Service Demand Curves
 - Purpose: Improve shape of Ancillary Service Demand Curves in current protocols
 - History: Filed by IMM Jan 28, 2025 after RTCBTF analysis and discussion
 - Clarifying comments submitted by ERCOT and Hunt Energy
 - IMM filed minor correction in comments March 19, 2025
 - TAC unanimous approval March 26, 2025



Summary of NPRR1270

- NPRR1270 Additional Revisions Required for Implementation of RTC
 - Purpose: Clarifications including removal of automatic Ancillary Service qualification and added details on qualification for Resources providing AS in real-time.
 - Removal of automatic qualification seen as key change to ensure reliable ancillary service awards and deployment, as well as help mitigate risk of market distortion by proxy offers.
 - Proxy offers are administratively created by ERCOT when a QSE does not provide an offer price for its full range of capability for energy and/or ancillary services in the real-time market.
 - History:
 - Filed by ERCOT on January 28, 2025 after RTCBTF discussion
 - No additional comments submitted
 - TAC unanimous approval March 26, 2025

Summary of NPRR1269

- NPRR1269 RTC+B Three Parameter Policy Issues
 - Purpose: Determines and codifies a group of policy changes that were deferred from the original RTC-related Protocols developed in 2020. The three policy concepts below were developed in coordination with the RTCBTF and submitted by ERCOT:
- 1. Scaling Factors for Ramping has been supported with no additional discussion by stakeholders
- 2. Parameters for Ancillary Service Proxy Offer Floors has been an evolving discussion since November 2024.
 - Originally ERCOT proposed and IMM supported a \$0 proxy offer floor, while most RTCBTF stakeholders supported a \$2,000 proxy offer floor.
 - After extensive debate over price distortions on both extremes, ERCOT proposed a compromise of using the minimum of \$2,000 or X% of the ASDCs and was submitted as such in the original NPRR.
 - ERCOT submitted comments setting the values to 95% of the ASDC (reflective of the value used in numerous studies).
 - IMM and TIEC submitted concerns with the approach, including TIEC proposal for minimum of \$15 or 95% of the ASDCs.

Summary of NPRR1269 (continued)

- NPRR1269 RTC+B Three Parameter Policy Issues (continued)
 3. ASDCs for use in Reliability Unit Commitment (RUC): Analysis to determine the appropriate price signals within the RUC study tool to drive efficient RUC commitments (as needed by the Operator)
 - The ERCOT Operator uses the RUC study tool to ensure there is enough capacity to meet demand for Energy and Ancillary Service requirements.
 - In developing the RTC Key Principles, it was assumed and planned for that there would be an analysis to determine the appropriate ASDCs to use for RUC.
 - ERCOT provided analysis of the RUC tool and found that the ASDCs already planned for the RTM and DAM generally created effective solutions for the RUC operator and as such, could be used by RUC with only minimal changes (i.e., an ASDC floor).
 - To determine the specific value to use as an ASDC floor, ERCOT evaluated cases where there was more than sufficient capacity that could be committed by RUC or used to provide Ancillary Services, but where the RUC process would not solve for the incremental amounts of Ancillary Service shortages relative to ERCOT's Ancillary Service Plan.
 - ERCOT codified \$15 as the proposed ASDC floor in comments on March 3

Summary of NPRR1269 (continued)

- NPRR1269 RTC+B Three Parameter Policy Issues (continued)
 - TCPA comments March 4 propose applying \$15 ASDC floor to Real-Time and DAM ASDCs
 - RTCBTF has had on-going discussion of effectiveness of existing ASDCs
 - When ERCOT identified ASDC floor needed for RUC, multiple market participants voiced belief floor should apply to real-time for similar price signal for self-commitment decision
 - ERCOT provided study to PRS and TAC to demonstrate the reliability and market impacts of the \$15 floor
 - Prior to TAC, Joint Consumer Comments filed to propose ASDC floor be set to \$0 until further analysis after go-live.
- NPRR1269 approved at TAC:
 - TAC approved version reflects:
 - AS Proxy Offer Floor as minimum of \$2,000 or 95% ASDC
 - RUC ASDC with \$15 floor
 - RTM and DAM ASDCs with \$15 floor
 - Opposed by Consumer segment of TAC and one of the IREPs
- ERCOT has filed comments to clarify support of NPRR1269

ERCOT Analysis of NPRR1269

- After TAC, ERCOT filed comments to NPRR1269 to summarize its analysis and position.
 - Analysis is summarized in Appendix 2 of this presentation.
- On the two contested issues in NPRR1269, ERCOT offers the following:
 - Proxy Offer Floor: ERCOT believes the compromise achieved to use the minimum of \$2,000 or 95% of ASDCs is reasonable. Although ERCOT has not tested other specific values, all studies performed in recent months have used these values and have not observed price formation issues.
 - ASDC Floor for Real-Time and Day-Ahead: ERCOT believes the \$15 floor is appropriate and reasonable to help align and incent self-commitment to reduce risk of RUC operator commitments and to properly value the full Ancillary Service Plan. While the ASDC floor would impact energy and Ancillary Service prices, RUC instructions also impact the market in the form of inferior long-term price signals and increased costs that may exceed the costs of having an ASDC floor.

Next Steps

- Board approval needed for NPRR1268, 1269, 1270.
- ERCOT to work with stakeholders on State of Charge / Ancillary Service Duration discussion in next two task force meetings.
- Market Readiness details will be available at next Board meeting, including additional details for Market Trials and QSE dashboards.

- **Key Takeaway(s)**

- RTC+B Program on-schedule for target 12/5/25 Go-Live
- ERCOT working closely with Market Participants and policy makers to ensure alignment and no roadblocks in delivery of the program

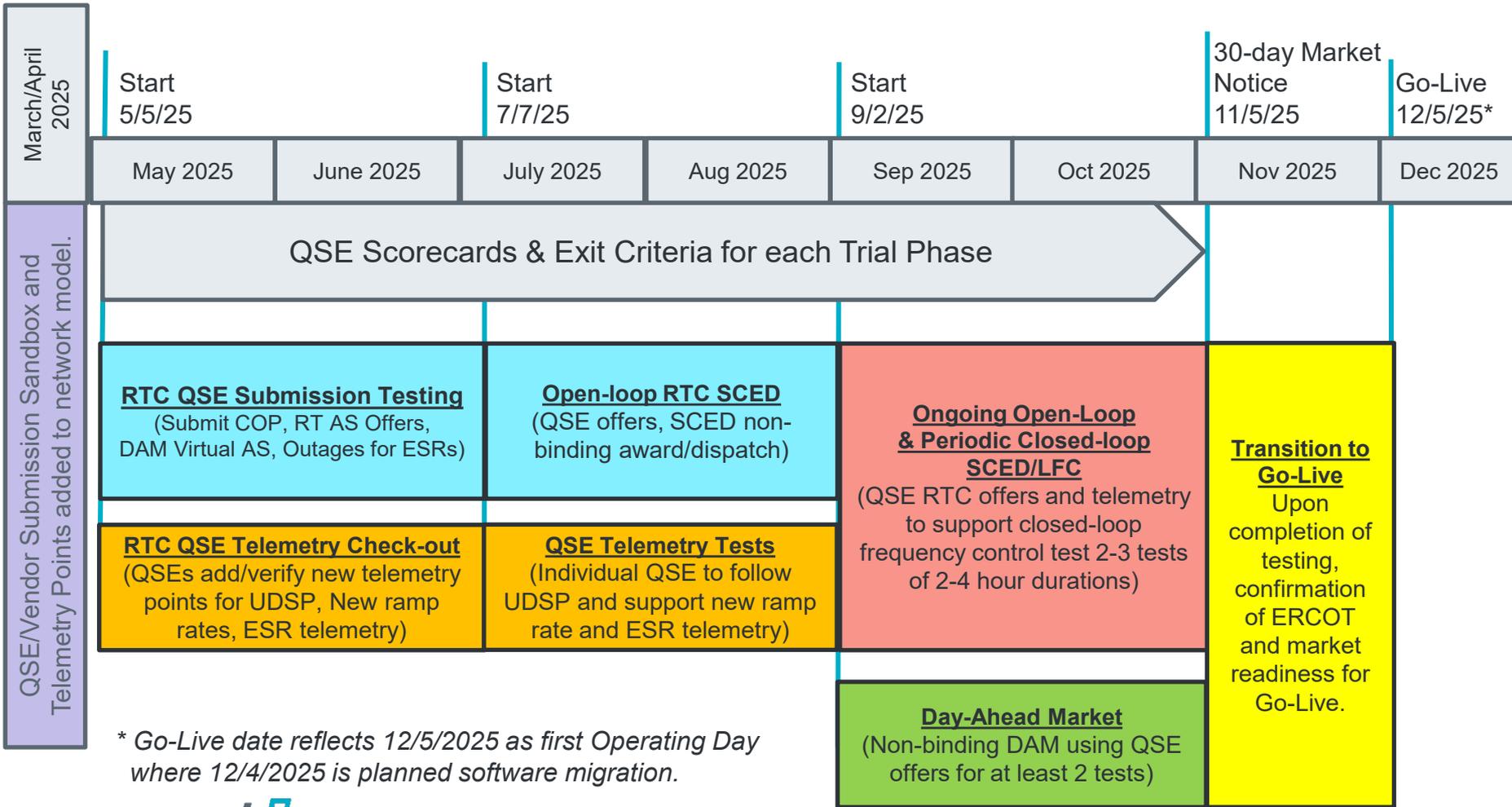
APPENDIX A RTC+B Program & Market Readiness Update

Real-Time Co-optimization (RTC) Update

- **Key updates:**
 - Internal daily activities for RTC+B
 - ERCOT has received initial deliveries of all vendor code and is running initial Operating Day testing for core applications.
 - External monthly RTCBTF meetings continue:
 - Focus on completing Revision Requests for policy issues.
 - Additional Training/Readiness and Market Trials Handbooks posted on RTCBTF website.

- **Key Takeaway(s)**
 - RTC+B Program continues to move forward on schedule.
 - ERCOT working closely with Market Participants to minimize go-live risk:
 - Board being asked to consider Nodal Protocol Revision Requests 1268, 1269, 1270
 - Continuing development of market readiness materials
 - Current Dashboard of QSE Acknowledgements leading into May 5th Market Trials

Sequence and Dates for Market Trials to Go-Live



* Go-Live date reflects 12/5/2025 as first Operating Day where 12/4/2025 is planned software migration.



RTCBTF Issues List

- First red box is NPRR1269 for 3 policy issues (April Board)
- Second red box is IMM NPRR1268 for ASDC changes (April Board)
- Third red box is a clean-up NPRR1270 and remove automatic qualification (April Board)
- Blue Box is evaluation of State of Charge and AS Duration (target June Board)



Issue to resolve	Protocol needed?	Approval	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25
Parameters for Ancillary Service proxy offers (values for the parameters)	Yes	PUCT										
Scaling Factor Values for RegUp/RegDown (ie, ramp sharing as values, dynamic or static?)	Yes	PUCT										
ASDCs for use in Reliability Unit Commitment (RUC) studies (values for parameters)	Yes	PUCT										
RTC SOC duration parameter discussion	Yes	PUCT										
RTC Simulator Analysis for periodic analysis comparing RTC and the current ORDC design – KP 1.1(8) - Historical Operating Days identified by RTCBTF - Additional review of transmission constraint max. shadow price values (Sec 22/per NPRR1211) - Review of AS Demand Curve in context of current policy - Consider AS Indifference	TBD	TBD										Market Trials
Clean-up Revision Requests to address as-builts and clarifications, as needed	Yes	PUCT										
Market Readiness												
- Release Market Trials Sequence and Potential Dates (May 2024)			Complete									
- RTC+B Technical Workshops and release interface specifications (May-June 2024)			Complete									
- Explanation of ICCP Changes (Abhi Gari Masanna- May RTCBTF)			Complete									
- Explanation of Market Submission (Nathan Smith- August RTCBTF)			Complete									
- Release and review Market Trials Plan with RTCBTF (TAC endorsed October 2024)	No	TAC	Complete									
- Execute QSE Attestation (completed August 2024)			Complete									
- Announce Planned Go-Live Date (September 2024)			Complete									
- Outline of Readiness Training modules			Complete									
- Delivery of Training modules to RTCBTF Training page												
- Market Trials Handbooks for 5/5/25 Trials (Market Submission and Telemetry Check-out)												
- Market Trials Handbook for 7/7/25 Trials (OpenLoop SCED and QSE Telemetry Testing)												
- Market Trials Handbook for 9/2/25 Trials (Closed-Loop Test and Day-Ahead Market)												
- Annual Operations Training Seminar (6-weeks)												
- Go-Live Transition Plan												
- Any protocol and/or PUCT waivers needed for market trials and/or transition to Go-Live												
- RTCBTF issues- a. Operation Procedures (e.g., removing SASM and HASL/LASL), note to include any needed discussion on triggers for initiating off-cycle SCED execution, b. Business Practice Manuals (e.g., changes to COP and telemetry), c. Market trials/training/annual seminar engagement (release plans/dates for market trials), d. Any details MPs need for designing their control systems												

Recent Progress to share

- TAC approved language for NPRR1268,1269,1270 (subsequent slides)
- State of Charge / Ancillary Service Duration initial discussion
- Market Readiness
 - Review Handbook #3- Open Loop SCED (Round 2)
 - Review Handbook #4- QSE Telemetry Tests (Round 2)
- Review 3 New training modules
 - Demand Response Training
 - Day-Ahead Market Training
 - Operations Training

Market Notice on QSE Readiness (responses due March 31)

Market Notice sent March 13 with Monday March 31 due date:

To: Notice_Operations@lists.ercot.com

Sent: 3/13/25, 4:13 PM

Subject: M-B022625-02 RTC+B Accountable Executive Response Requested for Upcoming RTC+B Market Trials

NOTICE DATE: March 13, 2025

NOTICE TYPE: M-B022625-02 Operations

SHORT DESCRIPTION: RTC+B Accountable Executive Response Requested for Upcoming RTC+B Market Trials

INTENDED AUDIENCE: All Qualified Scheduling Entities (QSEs) with Resources

DAYS AFFECTED: March 31, 2025

LONG DESCRIPTION: Each Real-Time Co-optimization Plus Batteries (RTC+B) Accountable Executive (AE) is being asked to respond regarding awareness of the upcoming RTC+B Market trials.

In August 2024, your company attested to awareness of the necessary preparations for implementation of the RTC+B initiative and identified an Accountable Executive for RTC+B readiness (RTC+B AE). With the required RTC+B Market trials beginning in a few weeks, ERCOT is requesting additional confirmation from the RTC+B AE of awareness of upcoming activities and key milestones your company will be involved in.

Please confirm that your company is aware of the following:

- ERCOT has made the RTC+B initial testing environment available to QSEs to begin optional connectivity testing as of March 7, 2025 ([Market Notice](#)).
- ERCOT has posted the first wave of Market Trials Handbooks on its public website (<https://www.ercot.com/committees/tac/rtc/btf>).
- In accordance with the Handbooks:
 - ERCOT has requested that QSEs submit new telemetry point requests prior to the May 5, 2025 Market trials so that QSEs' Resources are ready and available for testing;
 - ERCOT will begin required Market trials with QSEs on Monday, May 5, 2025;
 - ERCOT will start conducting weekly RTC+B Market readiness calls with QSEs every Monday morning at 10:00 am beginning May 5, 2025;
 - ERCOT will start publishing scorecards for QSEs after May 16, 2025; and
 - These weekly activities will continue until RTC+B go-live, which remains scheduled for Operating Day Friday, December 5, 2025.

By responding in the affirmative via email to RTCB@ercot.com, your company acknowledges awareness of these RTC+B milestones. The status of these email affirmation responses will be shared during the April meeting of the ERCOT Board of Directors.

ACTION REQUIRED: Monday, March 31, 2025 is the deadline for each RTC+B AE to email affirmation to RTCB@ercot.com, including the applicable QSE name and DUNS number for your company. A response from the primary QSEs will be applied to all applicable sub-QSEs. For QSEs who have not designated an RTC+B Accountable Executive (RTC+B AE), please so designate via your affirmation to this Market Notice. The attached Market Notice provides more information regarding the RTC+B AE ([M-A072524-01](#)).

CONTACT: If you have any questions, please contact your ERCOT Account Manager. You may also call the general ERCOT Client Services phone number at (512) 248-3900 or contact ERCOT Client Services via email at ClientServices@ercot.com.

If you are receiving email from a public ERCOT distribution list that you no longer wish to receive, please follow this link in order to unsubscribe from this list: <http://lists.ercot.com>.



QSE with Resources- Responses as of 4/4/2025

Round 2	QSE with active Resources
Y	AE TELVIEW ESS LLC
Y	AES INTEGRATED ENERGY LLC
Y	AMA QSE LLC
Y	AMERICAN ELECTRIC POWER SERVICE CORP
Y	APX INC
Y	AVANGRID RENEWABLES LLC
Y	BHER MARKET OPERATIONS LLC
Y	BHER POWER RESOURCES INC
Y	BOSTON ENERGY TRADING AND MARKETING LLC
Y	BP ENERGY RETAIL COMPANY LLC
Y	BPTX
Y	BROAD REACH QSE I LLC
Y	BROAD REACH QSE II LLC
Y	BTU
Y	BULL CREEK WIND LLC
Y	CALPINE ENERGY SOLUTIONS LLC
Y	CALPINE POWER MANAGEMENT LLC
Y	CITY OF AUSTIN DBA AUSTIN ENERGY
Y	CITY OF GARLAND
Y	CONSTELLATION ENERGY GENERATION LLC
Y	CPS ENERGY
Y	CWP ENERGY INC
Y	DELILAH SOLAR ENERGY II LLC
Y	DELILAH SOLAR ENERGY LLC
Y	DENTON MUNICIPAL ELECTRIC
Y	DERIVA ENERGY SERVICES LLC
N	DIRECT ENERGY LP
Y	EDF NORTH AMERICA
Y	ELECTRANET QSE I LLC
Y	ENEL TRADING NORTH AMERICA LLC
Y	ENEL X NORTH AMERICA INC
Y	ENERWISE GLOBAL TECHNOLOGIES LLC
Y	ENGIE ENERGY MARKETING NA INC
Y	ETC ENDURE ENERGY LLC
Y	FORMOSA UTILITY VENTURE LTD

Y	GALT POWER INC
N	GERDAU AMERISTEEL ENERGY INC
Y	GEUS
Y	GEXA ENERGY LP
Y	GOLDEN SPREAD ELECTRIC COOPERATIVE INC
Y	GOLDTHWAITE WIND ENERGY LLC
Y	GRIDBEYOND LLC
Y	GUIDEPOST ENERGY LLC
Y	GUNSIGHT MOUNTAIN WIND ENERGY LLC
Y	HABITAT ENERGY INC
Y	HANWHA ENERGY USA HOLDINGS CORP DBA 174 POWER GLOBAL
Y	HEI1 INC
Y	HEI2 INC
Y	HEI3 INC
Y	HEI4 INC
Y	HEI5 INC
Y	HEI6 INC
Y	HEN POWER MARKETING LLC
Y	INVENERGY SERVICES LLC
Y	IP LUMINA II LLC
Y	IP LUMINA LLC
Y	IP RADIAN LLC
Y	JUPITER POWER ENERGY MANAGEMENT LLC
Y	LANCIUM QSE I LLC
Y	LINEBACKER POWER FUNDING LLC
Y	LOWER COLORADO RIVER AUTHORITY
Y	LUMINANT ENERGY COMPANY LLC
Y	MCADOO WIND ENERGY LLC
Y	MERCURIA ENERGY AMERICA LLC
Y	MIAMI WIND I LLC
Y	MITSUI AND CO ENERGY MARKETING AND SERVICES (USA) INC
Y	MP2 ENERGY LLC
Y	MP2 ENERGY TEXAS LLC DBA SHELL ENERGY SOLUTIONS
Y	MP2 MESQUITE CREEK WIND LLC
Y	NEXTERA ENERGY MARKETING LLC
Y	NG RENEWABLES ENERGY SERVICES LLC
Y	NRG TEXAS POWER LLC

Y	NUENERGEN LLC
Y	OCCIDENTAL POWER SERVICES INC
Y	OCTOPUS ENERGY LLC
N	PATTERN ENERGY MANAGEMENT SERVICES LLC
Y	PERFECT POWER LLC
Y	PRIORITY POWER MANAGEMENT LLC
Y	PROLOGIS ENERGY LLC
N	RATTLESNAKE WIND I LLC
Y	RAYBURN COUNTRY ELECTRIC COOPERATIVE INC
Y	RIESEL HOLDCO LLC
Y	RPOWER TXMOC LLC
Y	RWE CLEAN ENERGY QSE LLC
Y	SAMSON SOLAR ENERGY II LLC
Y	SAMSON SOLAR ENERGY III LLC
Y	SAMSON SOLAR ENERGY LLC
Y	SANDY CREEK ENERGY ASSOCIATES LP
Y	SANTA RITA EAST WIND ENERGY LLC
Y	SANTA RITA WIND ENERGY LLC
Y	SCURRY COUNTY WIND II LLC
Y	SCURRY COUNTY WIND LP
Y	SHELL ENERGY NORTH AMERICA (US) LP
Y	SOUTH TEXAS ELECTRIC CO OP INC
Y	SOUTHERN POWER COMPANY
Y	STANTON WIND ENERGY LLC
Y	SUSTAINING POWER SOLUTIONS LLC
Y	SYSO INC.
Y	TENASKA POWER SERVICES CO
Y	TOTALENERGIES GAS AND POWER NORTH AMERICA INC
Y	TURKEY TRACK WIND ENERGY LLC
Y	TYR ENERGY LLC
Y	UMBRA ASSET MANAGEMENT LLC
Y	VIRIDITY ENERGY SOLUTIONS INC
Y	VOLTUS INC
Y	WAKE WIND ENERGY LLC
Y	ZEPHYR ASSET MANAGEMENT LLC

- Response is not officially part of RTC+B Market Trials Scorecard
- ERCOT to confirm awareness from four entities with delayed responses

APPENDIX B

Analysis of NPRR1269

ASDC Price Floors Study Impacts

Overview for NPRR1269 ASDC Price Floor Study Impacts

- **Purpose**

This presentation is intended to provide ERCOT's perspective and analysis on potential impacts to the Real-Time Market (RTM) in having a floor value for the Ancillary Service Demand Curves (ASDCs), as approved by the Technical Advisory Committee with Nodal Protocol Revision Request (NPRR) 1269, RTC+B Three Parameters Policy Issues.

- **Voting Items / Requests**

ERCOT staff's position is that the Board approve NPRR1269, as approved by TAC.

- **Key Takeaways**

- There is a legitimate concern that Day-Ahead Market (DAM) and RTM pricing may be insufficient to incent self-commitment of Resources for the tail amounts of Ancillary Services and lead to increased Reliability Unit Commitment (RUC) instructions, even when there is sufficient Resource capability otherwise.

Overview for NPRR1269 ASDC Price Floor Study Impacts

- **Key Takeaways continued**

- \$15 per MW per hour is a relatively modest ASDC price for smaller levels of shortages and the impact to average overall prices is minimal (\$0.34/MWh, or 0.4% for the more extreme estimate of energy prices and ignoring the impacts of RUCs on market costs without an ASDC floor in place). The floors also help to lessen smaller levels of Ancillary Service shortages when there are sufficient competitive offers.
- For those more concerned about the Ancillary Service Plan quantities, a more thorough review of the process for determining these quantities is already underway. Any ASDC floor that is applied would automatically adjust and have less effect on outcomes overall with reduced Ancillary Service Plan quantities.

ERCOT's Perspective on the Concept of a ASDC Floor for the DAM and RTM, as Proposed by TCPA

- ERCOT is generally in favor in this concept moving forward:
 - In light of Ancillary Service quantities we see today and in the near-term, there is a legitimate concern that DAM and RTM pricing may be insufficient to incent self-commitment of Resources for the tail amounts of Ancillary Services and may lead to increased RUC instructions, even when there is sufficient Resource capability otherwise.
 - \$15 per MW per hour (the ASDC floor proposed by ERCOT for RUC) is a relatively modest ASDC price for smaller levels of shortages and well below the minimum prices for Regulation Service (Reg) and Responsive Reserve Service (RRS) already included in NPRR1268. It can also allow Ancillary Service Offers below \$15 per MW per hour to clear and support meeting the Ancillary Service Plan when that may not have been possible otherwise.

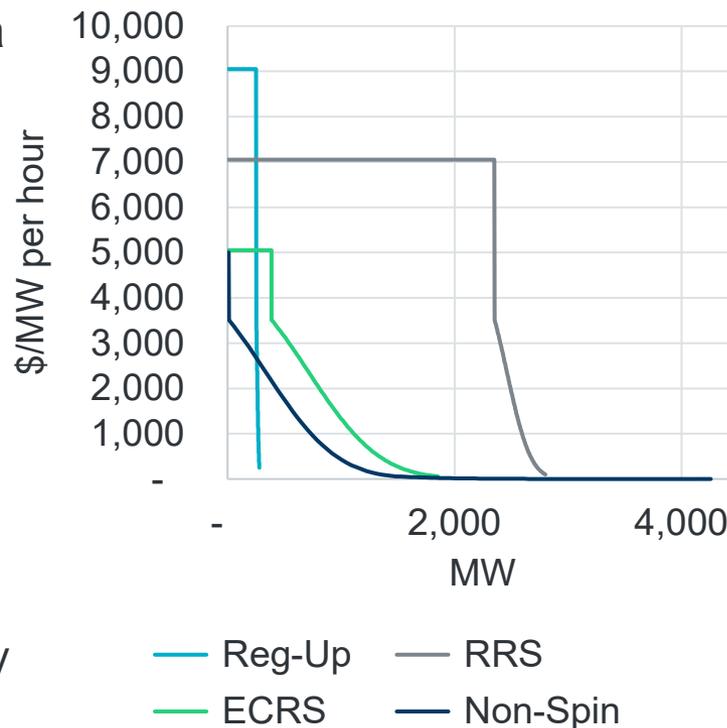
ERCOT's Perspective on the Concept of TCPA's Comments cont.

- The distinction that this is a floor on the ASDCs and not a floor on the price for Ancillary Services is important. To the degree there are sufficient Ancillary Service offers and Resource capability, those offers would be setting the price, not the ASDCs. This is equivalent to what is seen in DAM today where current penalty prices are ~\$5,000 per MW per hour, although that is almost never the clearing price.
- The deeper concern for those opposed to the concept seems to be the quantities that feed into the Ancillary Service Plan generally. A more thorough review of the process for determining these quantities is already underway with the development of a “full statistical” analysis tool and the consideration of “closer to the Operating Day” Ancillary Service quantity determination. If there are Ancillary Service quantity reductions, this concept will automatically adjust to account for that.

ASDCs within the Optimization

- ASDCs are included as inputs into the optimization and represent a willingness to procure a volume of an Ancillary Service at a given price.
 - The lower the price the more MW the optimization is willing to procure, and vice versa.
- Under NPRR1269, a floor on an ASDC then represents a maximum price that is willing to be paid to achieve the full Ancillary Service Plan published by ERCOT.
 - To the degree there is sufficient Resource capability to meet demand for electricity and the Ancillary Service Plan, offers are generally driving prices, not the ASDCs. A floor can also allow more offers to be awarded.
 - ASDCs and the proposed floors primarily come into play when procurement is “short” relative to the Ancillary Service Plan.

Example ASDCs using the NPRR1268 Approach



Individual ASDCs are derived from the shape of the Aggregate Operating Reserve Demand Curve (AORDC).

The Ancillary Service Plan and the AORDC

- As it stands today, the AORDC is guaranteed to go to \$0 per MW per hour at 10 GW of Ancillary Services and goes to pennies per MW per hour well before that.
 - In many hours, such as in May, the optimization is unwilling to procure the Ancillary Service Plan unless it would free or nearly free without an ASDC floor.
- While a floor will not affect the ASDCs at all in some hours, in others it may be the only means for procuring the Ancillary Service Plan, even if there is more than sufficient Resource capability that would otherwise be available.
 - This is particularly relevant to ERCOT Contingency Reserve Service (ECRS) and Non-Spinning Reserve Service (Non-Spin).

Summed 2025 Ancillary Service Plan by Hour and Month in MW (Excluding Reg-Down)

Hour Ending	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	6,075	5,947	5,816	5,951	6,312	5,341	5,866	5,679	5,282	5,759	5,809	6,493
2	6,088	5,823	5,894	5,884	6,338	5,268	5,760	5,604	5,202	5,661	5,826	6,285
3	6,719	6,757	6,056	6,306	7,055	5,809	6,068	5,605	5,086	5,637	6,147	6,970
4	6,742	6,764	6,039	6,423	6,884	5,857	6,049	5,560	5,077	5,549	6,122	6,806
5	6,799	6,863	6,109	6,376	6,999	5,912	6,026	5,592	5,080	5,759	6,184	6,878
6	6,945	6,877	6,136	6,494	6,856	5,810	6,087	5,643	5,119	5,721	6,139	6,990
7	7,929	7,725	7,671	7,610	9,024	6,977	7,896	6,823	6,100	6,918	7,309	7,374
8	8,048	7,774	7,930	7,691	9,832	7,862	8,332	6,826	6,121	6,990	7,767	7,506
9	8,695	9,094	9,029	9,031	10,730	8,764	9,493	8,121	7,266	8,028	9,015	7,853
10	9,303	9,236	9,593	9,428	10,480	8,642	9,663	8,086	7,322	9,112	8,609	8,065
11	8,721	8,415	9,061	9,147	10,756	9,708	9,475	8,169	7,700	8,594	8,514	8,039
12	8,154	7,845	8,735	8,853	10,607	9,292	9,178	8,005	7,343	8,326	8,314	7,593
13	7,967	7,852	8,572	8,394	10,660	9,353	8,674	7,122	7,063	8,272	8,249	7,741
14	8,119	8,159	8,487	8,546	10,726	9,286	8,905	7,011	7,014	8,212	8,592	8,378
15	8,240	9,394	9,618	8,656	9,929	7,716	7,443	6,984	7,471	7,274	9,030	8,960
16	8,087	9,294	10,027	8,938	10,130	8,285	7,803	7,271	7,766	7,355	9,226	9,159
17	8,513	9,274	10,073	8,962	10,298	8,000	7,750	7,691	7,886	7,471	9,006	9,079
18	8,317	8,810	9,962	9,260	10,287	8,018	7,811	7,768	8,213	7,486	8,307	8,549
19	7,729	8,311	8,026	8,100	9,722	8,679	7,398	6,659	7,371	7,020	6,785	7,890
20	7,735	7,479	7,215	7,780	9,070	8,100	6,833	6,350	6,530	6,866	6,727	7,827
21	7,695	7,351	7,145	7,234	8,703	7,718	6,788	6,229	6,400	6,675	6,655	7,787
22	7,612	7,336	6,765	6,942	8,761	7,583	6,596	6,051	6,224	6,466	6,584	7,719
23	6,743	6,212	6,051	5,897	6,682	6,118	6,037	5,814	5,589	6,293	6,277	6,472
24	6,638	6,147	5,996	5,909	6,846	5,939	5,818	5,599	5,394	6,104	6,199	6,482



Analysis Framework for RTM Impacts

Scenarios Evaluated

- Case 1: Real-Time Co-optimization (RTC) without ASDC floors
- Case 2: RTC with \$15 per MW per hour ASDC floors
- Case 3 (for prices): Derived from case 1 and 2 outputs to explicitly isolate the impacts of the ASDC floor and address the lack of Ancillary Service Offer data available for the simulations.

Dataset (~12,000+ intervals across 7 months and 216 Operating Days)

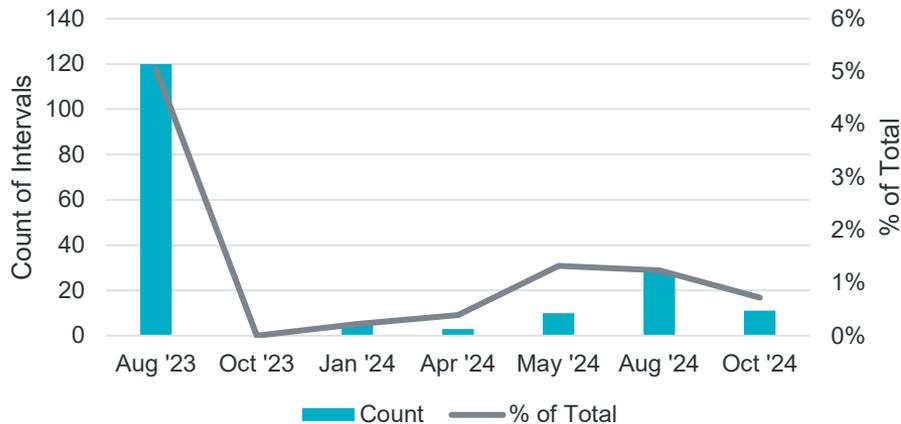
- Aug. '23 (hours ending 4-5, 13-14, and 20-21)
- Oct. '23 (hours ending 4-5, 13-14, and 20-21)
- Jan. '24 (hours ending 4-5, 13-14, and 18-19)
- Apr. '24 (hours ending 20-21)
- May '24 (hours ending 13-14)
- Aug. '24 (hours ending 4-5, 13-14, and 20-21)
- Oct. '24 (hours ending 4-5, 13-14, and 20-21)

Key Takeaways

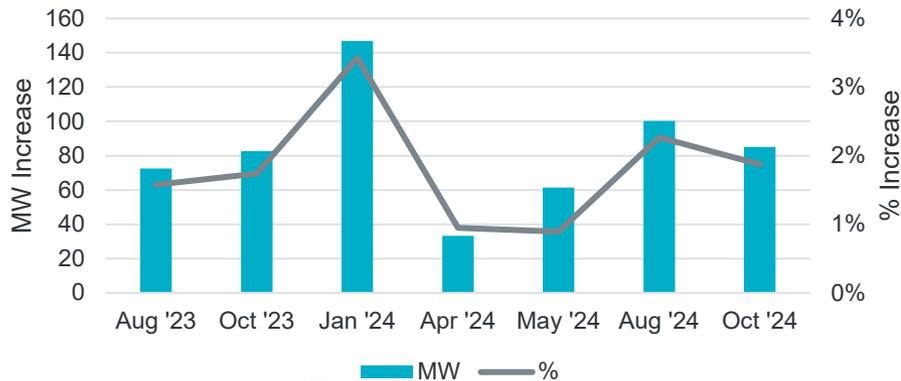
- Simulations of historical days are hampered by a lack of existing Real-Time Ancillary Service Offers. This means that the simulation results can be dominated by proxy offers.
- Combined, cases 2 and 3 attempt to address this and provide the range of potential pricing outcomes with actual outcomes falling in between, being dependent on offer behavior, and likely being closer to the case 3 results.

Summary of Results Across All Datasets Analyzed

Intervals w/ ASDC Floor Setting the Price (ECRS or Non-Spin)



Avg. Interval Increase in Procurement - Cases 2/3 Over Case 1 (ECRS and Non-Spin)



Key takeaways

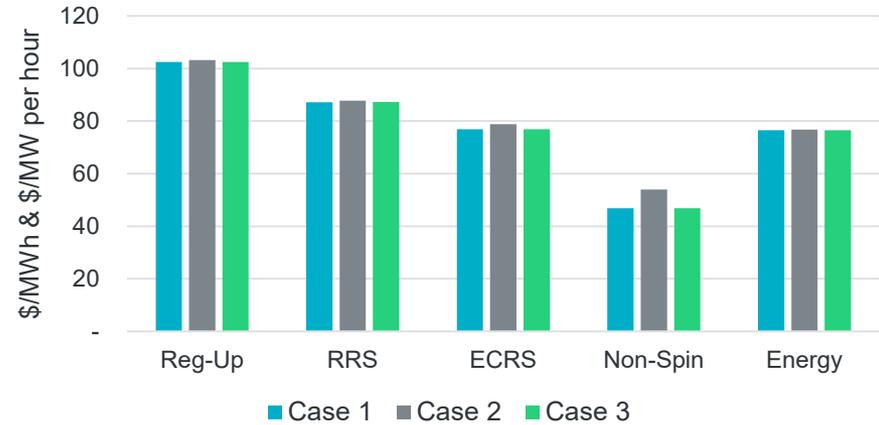
- Across the full study window, the ASDC floor for ECRS or Non-Spin set the price for only 177 intervals (1.4%).
- Average hourly procurement for ECRS and Non-Spin increases by ~92 MW (2.0%)
 - Procurement increases are for intervals where shortages were relatively marginal, i.e., not deeper levels of scarcity.
 - ASDC floors improve procurement amounts but shortages are not eliminated, and it should not be expected that all shortages are eliminated.

Summary of Results Across All Datasets Analyzed cont.

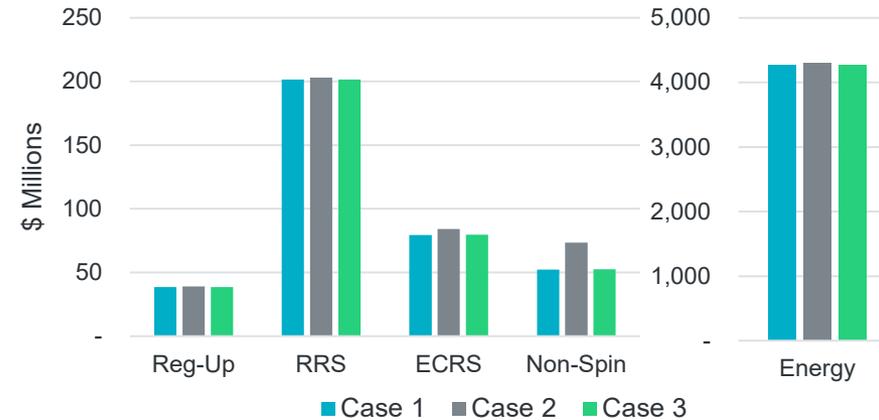
Key takeaways

- With the lack of Real-Time Ancillary Service offers, case 2 provides a higher-end evaluation of potential price changes. Case 3 numbers provide the other end of the range of outcomes and is more in alignment with expectations.
- The increase in prices and values between cases 1 and 3 is negligible.
- Even with case 2 being more extreme:
 - The change in overall prices and values is incremental with the percent increases in average energy prices and total energy value at 0.4% and 0.5%, respectively.
 - While ECRS and Non-Spin prices increase, they are in alignment with other Ancillary Services and historical outcomes. The more extreme estimate of increased energy and Ancillary Service value combined is 1.1%.

Avg. Real-Time Prices for Energy and Ancillary Services



Total Real-Time Energy and Ancillary Service Value



"Value" Measured as Price Multiplied by Awards (Base Points or Ancillary Services)



Market Costs of RUC Instructions

- Analysis for the previous slides does not attempt to account for the cost of RUC instructions, but they also have an impact on the market costs in the form of:
 - RUC commitment costs; and
 - Impacts to energy and Ancillary Service prices associated with the Reliability Deployment Price Adder.
- While the second impact is more difficult to quantify, ERCOT evaluated the first impact by estimating the RUC commitment cost of a ~92MW generator for the study period for the case of not having an ASDC floor in place (case 1). The average commitment cost across multiple Resources analyzed was estimated at \$3.1M.
 - 92MW comes from the increase in average ECRS/Non-Spin awards observed with having the proposed ASDC floor in Real-Time.
- Although only a portion of the potential impacts, accounting for these costs results in:

Case	Energy and Ancillary Service Costs	RUC Commitment Costs	Total Increased Costs Compared to Case 1 (Energy, Ancillary Service, and RUC Commitment)
Case 1 (baseline/no floors)	\$4,644.8M	\$3.1M	-
Case 2 (extreme high-end estimate)	\$4,695.7M	\$0	\$47.7M (1.0%)
Case 3 (low-end estimate but closer to expectations)	\$4,646.0M	\$0	-\$1.9M (-0.04%)

Conclusions

- There is a legitimate concern that DAM and RTM pricing may be insufficient to incent self-commitment of Resources for the tail amounts of Ancillary Services and lead to increased RUC instructions, even when there is sufficient Resource capability otherwise.
- \$15 per MW per hour is a relatively modest ASDC price for smaller levels of shortages and the impact to average overall prices is minimal (\$0.34/MWh, or 0.4% for the more extreme estimate of energy prices and ignoring the impacts of RUCs on market costs). The floors also help to lessen smaller levels of Ancillary Service shortages when there are sufficient competitive offers.
- For those more concerned about the Ancillary Service Plan quantities, a more thorough review of the process for determining these quantities is already underway. Any ASDC floor that is applied would automatically adjust and have less effect on outcomes overall.

Additional Background information

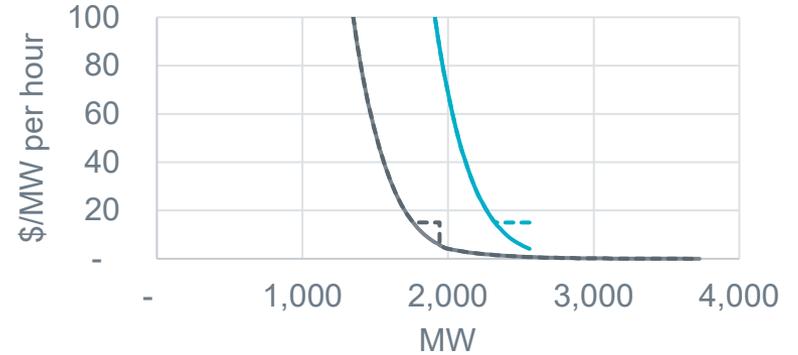
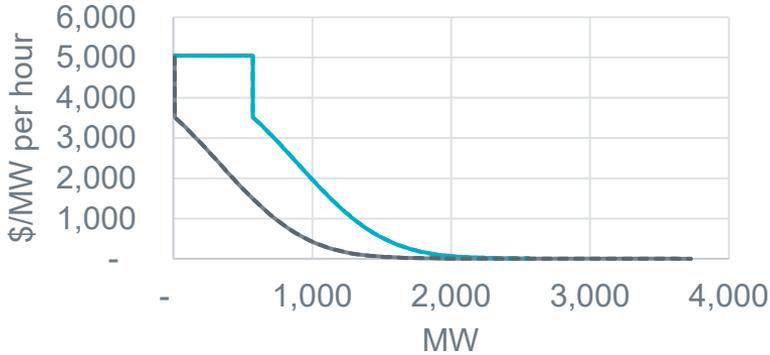
Illustration of ASDCs with a Floor (ECRS and Non-Spin)

ECRS Plan: 2,559 MW

Non-Spin Plan: 1,942 MW

Aug. '24 Hour Ending 20

Aug. '24 Hour Ending 20



— ECRS - No Floor — Non-Spin - No Floor
 - - - ECRS - w/ Floor - - - Non-Spin - w/ Floor

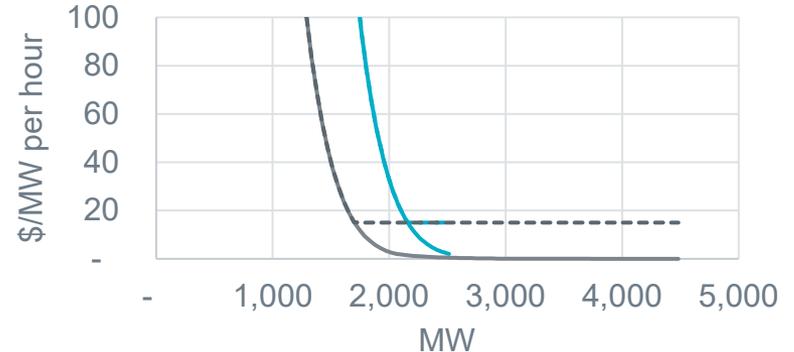
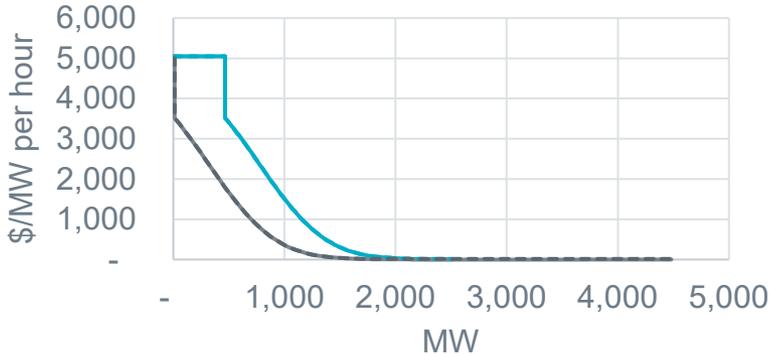
— ECRS - No Floor — Non-Spin - No Floor
 - - - ECRS - w/ Floor - - - Non-Spin - w/ Floor

ECRS Plan: 2,514 MW

Non-Spin Plan: 4,482 MW

May '24 Hour Ending 14

May '24 Hour Ending 14

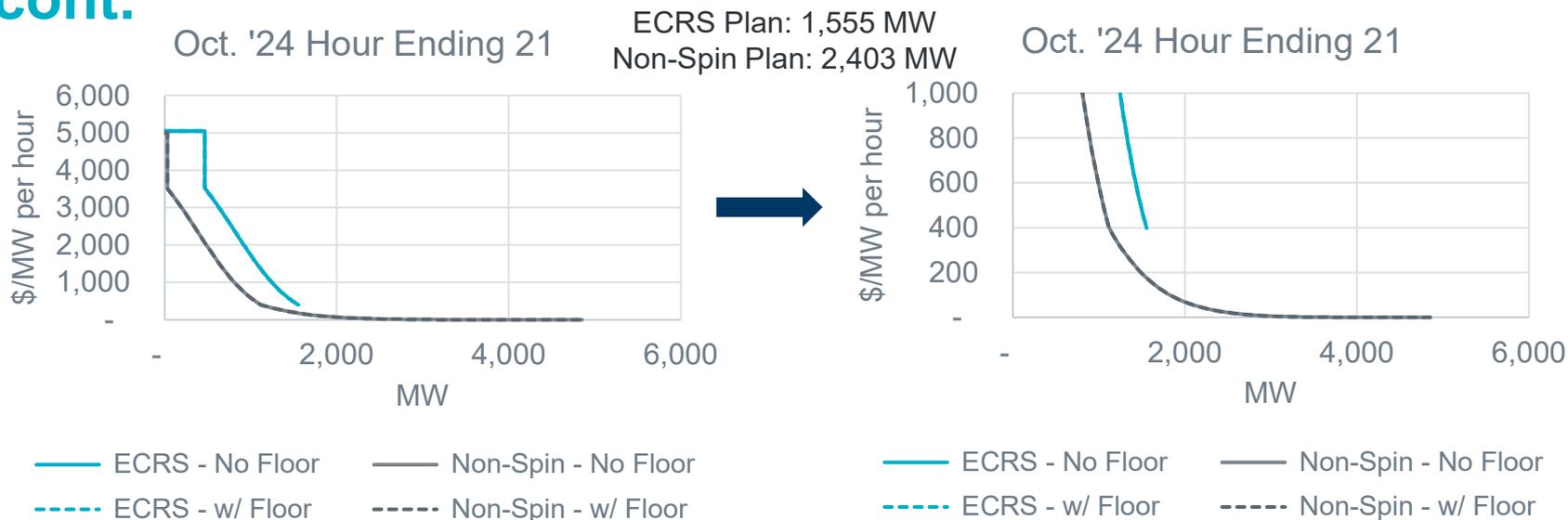


— ECRS - No Floor — Non-Spin - No Floor
 - - - ECRS - w/ Floor - - - Non-Spin - w/ Floor

— ECRS - No Floor — Non-Spin - No Floor
 - - - ECRS - w/ Floor - - - Non-Spin - w/ Floor



Illustration of ASDCs with a Floor (ECRS and Non-Spin) cont.



The actual effects of a floor on the ASDCs will vary by month and hour.

- For some hours, like this October period, there is no impact to the ASDCs whatsoever.
 - In reviewing 2024, ASDCs for 32% of the month/hour ending combinations would not have been impacted by the ASDC floor proposal.
- For others, like the May period on the previous slide, the floor creates a long tail to encourage self-commitment to meet the Ancillary Service Plan when true scarcity does not otherwise exist. It also allows non-zero offers to help in meeting the Ancillary Service Plan.
- In all cases, the general shape of the ASDCs remains intact with the impact focused on the tail of the curves.