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January 4, 2024

Kathleen Jackson, Interim Chair
Lori Cobos, Commissioner
Jimmy Glotfelty, Commissioner
Public Utility Commission of Texas
1701 N. Congress Avenue, Room 8-100
Austin, Texas 78711-3326

Re: Docket No. 54445, *CY 2023 Review of Rules Adopted by the Independent Organization*

Dear Interim Chair and Commissioners:

As committed in Electric Reliability Council of Texas, Inc.'s (ERCOT) December 11, 2023, letter regarding Nodal Protocol Revision Request (NPRR) 1186, *Improvements Prior to RTC-B Project for Better ESR State of Charge Awareness, Accounting, and Monitoring*, ERCOT files the attached presentation for your consideration in advance of your January 18, 2024 Open Meeting.

ERCOT looks forward to discussing this presentation with you at that meeting.

Respectfully submitted,

/s/ Chad V. Seely

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**Nodal Protocol Revision Request
(NPRR) 1186, *Improvements Prior to the
RTC+B Project for Better ESR State of
Charge Awareness, Accounting and
Monitoring***

ERCOT Update

Dan Woodfin
Vice President, System Operations

Public Utility Commission of Texas
Open Meeting

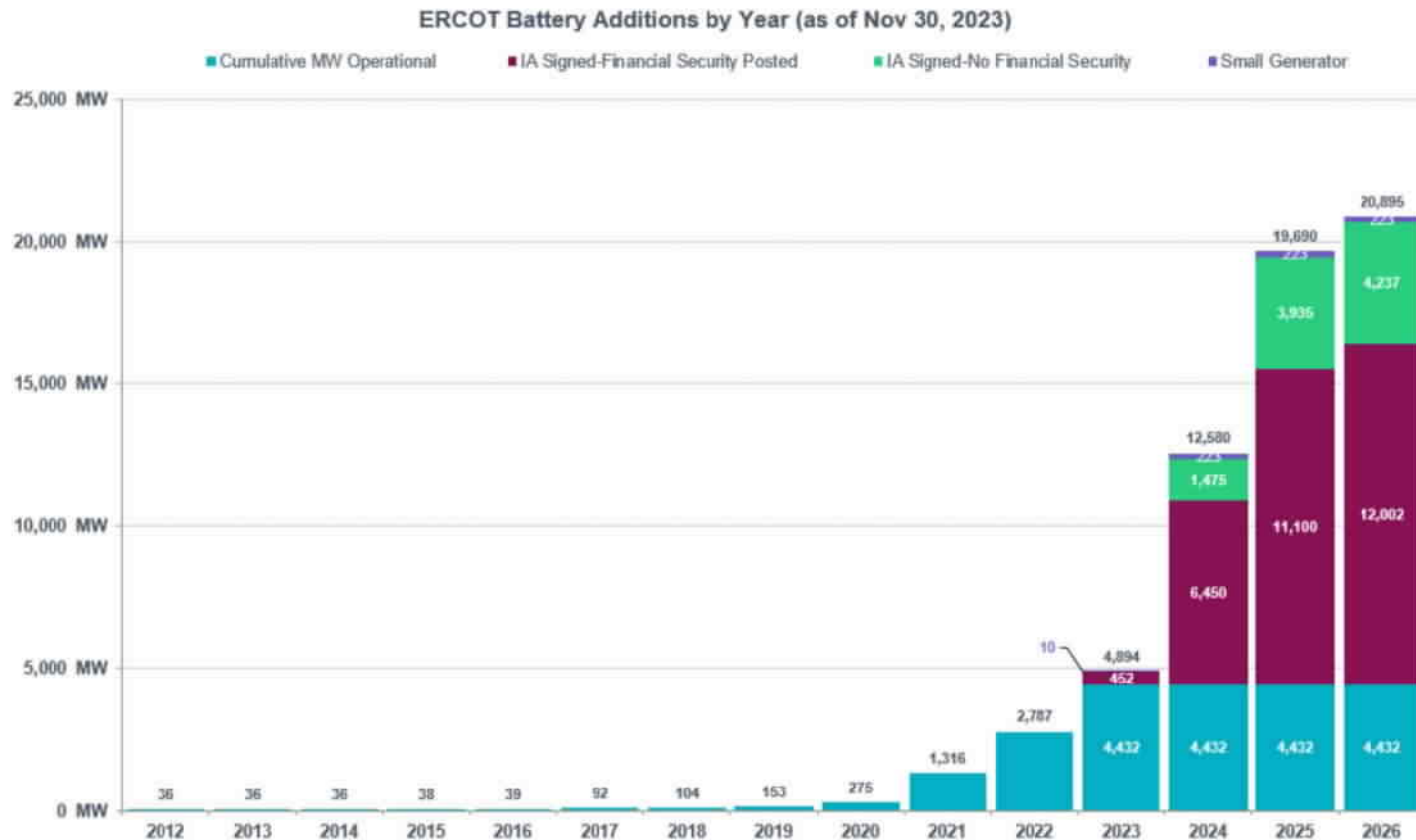
January 18, 2024

Key Points

- Unlike other Resources, Energy Storage Resources (ESRs) are always subject to a limit on the amount of energy they can store for deployment. Allowing ESRs to provide Ancillary Services (AS) that could require deployment beyond the amount of stored energy presents a risk to reliability.
- ESRs already provide the majority of Regulation Up (Reg Up) and Responsive Reserve Service (RRS), and with exponential growth of ESRs anticipated in each of the next few years (before RTC+B), ESRs will likely carry an even greater share of all AS.
- ERCOT has observed that multiple ESRs ran out of energy during AS deployments that occurred during two recent grid-shortage situations.
- Without minimum state of charge (SOC) requirements, ESR operators may choose to gamble that they will have sufficient energy to meet any AS deployments in real-time.
- ESR operators should not be allowed to take risks that may jeopardize grid reliability.
- Protocols establishing minimum SOC requirements for ESRs carrying AS are needed to guard against these risks and provide regulatory certainty. (NPRR 1186)
- Financial charges for failing to maintain sufficient SOC to meet potential AS deployment obligations are needed to address gap in existing rules that assign charges when QSEs don't preserve sufficient capability across their Resources to meet AS responsibilities. (NPRR 1209)
- These rules are not discriminatory because they address the unique duration-limited characteristics of batteries. Other Resource types are not inherently duration-limited.

Background

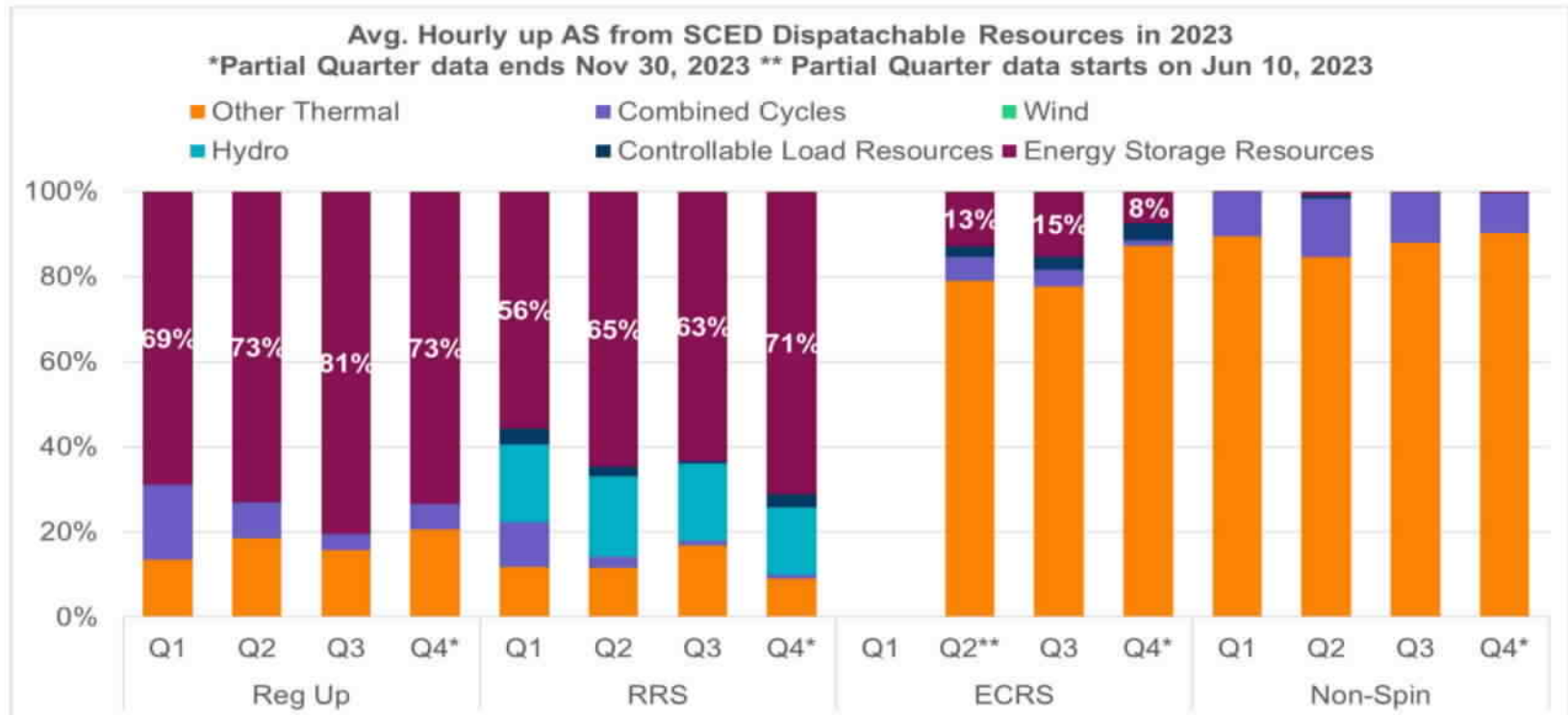
- ERCOT has observed a steady growth in installed ESR capacity in recent years; ESR capacity is already forecast to more than triple by 2026, when RTC+B is expected to be implemented:



Key Takeaway: ESR capacity could grow from 4.4 GW to more than 20 GW by 2026.

Background (continued)

- ESRs are already providing 73% of ERCOT's Regulation Up (Reg Up) and 71% of RRS AS, with lower amounts of ECRS and Non-Spin. These percentages will only increase with the exponential growth in ESR capacity expected.



Key Takeaway: ESRs provide majority of one-hour AS products today.

Background (continued)

- Unlike other Resources, an ESR can only provide up to the amount of energy that has been stored in the battery. At some point, a battery will run out of energy. Thus, the amount of energy remaining in the battery—its “State of Charge” (SOC)—is critical to its ability to meet an AS deployment obligation.
- For a thermal Generation Resource (gas, coal, nuclear, etc.), the analog to SOC is the Resource’s remaining fuel supply. But thermal Generation Resources only occasionally experience fuel supply disruptions and are otherwise able to generate power up to their maximum output level on an indefinite basis. When fuel supply disruptions do occur, the Resource’s COP status and High Sustained Limit (HSL) can be updated to reflect the limitations on fuel. Telemetry of an SOC equivalent for thermal Resources would not provide material value because COP and HSL telemetry already provide the necessary information on capability.
- By contrast, an ESR is always inherently subject to a limited energy supply. And the fact that ESRs frequently charge and discharge many times a day raises a material, ongoing risk of SOC exhaustion that simply does not arise in the context of thermal Generation Resources.
- This risk is heightened when a QSE assigns an ESR a responsibility to provide AS, since ERCOT may need to deploy that AS to address unexpected events on the grid.

Key Takeaway: ESRs are unlike thermal Generation Resources because they present a constant risk of energy depletion.

Background (continued)

- ERCOT Protocols do not currently specify minimum SOC requirements for ESRs carrying AS. ERCOT's Business Practice Manual (BPM) was revised in December 2022 to capture ERCOT's expectations regarding each QSE's management of its ESRs' SOC, but the BPM does not have independent legal effect and does not provide the same regulatory certainty as PUC-approved Protocols.
- ERCOT systems, studies, and processes, including Day-Ahead Market (DAM), Reliability Unit Commitment (RUC), and Security-Constrained Economic Dispatch (SCED), do not currently account for SOC limitations of ESRs.
 - RUC assumes that a 100 MW ESR can provide 100 MW indefinitely, which introduces a risk that RUC will incorrectly assume an ESR's capacity will be available in future hours. This could result in ERCOT failing to commit sufficient generation.
 - SCED may deplete an ESR's SOC that may be needed to meet its AS Responsibility in the remainder of the hour. This could result in the ESR not being able to provide obligated reserves if deployed.
- The RTC+B project is expected to mitigate reliability concerns associated with SOC accounting in an efficient manner but will not be in place until late 2026.

Key Takeaway: ESRs play an increasingly critical role in supplying AS, but their inherent duration limitation introduces a new variable that thermal Generation Resources do not present and must be addressed in the Protocols.

What does NPRR 1186 Do?

- Provides a mechanism for ERCOT systems (SCED and RUC) to take ESR SOC into account when dispatching ESRs and evaluating the need for incremental unit commitments.
- Requires QSEs that use ESRs to provide AS to ensure those selected ESRs have sufficient SOC to provide the services if called upon.
 - Establishes a clear standard for a sufficient level of SOC that can consistently be applied across all ESRs.
 - Addresses a unique vulnerability of ESRs (i.e., limited duration) so that they are treated equitably with respect to other Resources when providing AS.
 - Provides a clear definition on AS duration needs to the market.
- Preserves SOC for AS even if it turns out that the AS did not need to be deployed.
 - This is similar to requiring a Resource's capacity to be reserved to provide AS even if that AS does not end up being deployed, as provided in current Protocols.
 - ERCOT comments submitted in September 2023 addressed the “stranded energy” concern by sloping the minimum SOC requirement to zero at the end of each hour.
- Changes proposed in NPRR 1186 have been designed so that they can be completed in a small window of project implementation availability without slowing down RTC+B development while still having a meaningful impact in reducing reliability risk as the ESR fleet continues to grow and increases its participation in ERCOT markets.

Key Takeaway: NPRR 1186 is needed to provide regulatory certainty and to ensure ERCOT can maintain system reliability until RTC+B is implemented.

Risks if NPPR 1186 is not approved

- ERCOT systems will continue to lack any visibility of and accounting for ESR SOC until RTC+B is implemented and will continue to be at risk of assuming that ESRs have energy that can be dispatched when they do not. This may lead to insufficient available capacity and an inability to use the AS that consumers are paying for.
- Without SOC requirements, ESR operators would be allowed to place the reliability of the ERCOT system at significantly greater risk by selling AS that they may be unable to provide in the event of a deployment.
- Existing financial penalties for failure to provide energy when deployed are not sufficient to incent appropriate reservation of SOC. This increases the likelihood that ESRs will exhaust their SOC earlier in a deployment, thereby increasing the risk of an energy shortage and possible load shed.
- Except for Regulation Service, AS products are not frequently deployed; if there are no SOC requirements, there is less of a market signal to incent longer-duration ESRs and regulatory uncertainty for all existing ESRs. ESR operators that do reserve sufficient SOC capability to meet AS responsibilities could be disadvantaged relative to those that don't.

Key Takeaway: Without the changes introduced by NPPR 1186, ERCOT is exposed to reliability risks attributable to a lack of visibility of ESR SOC.

Examples of ESR Failures to Perform

- Commissioners have requested examples where insufficient SOC resulted in failures to perform—i.e., to comply with an actual deployment of AS.
- ERCOT conducted an analysis of hour ending 20 on each of the four days in summer 2023 in which RRS was released to SCED (8/17, 8/25, 8/30, and 9/6).
 - For each period of RRS deployment, ERCOT compared actual deployment levels to the required deployment level for each ESR (required deployment level equals the sum of Updated Desired Base Point, Regulation Instruction, and Primary Frequency Response deployment obligation).
 - ERCOT extracted all five-minute intervals in which the difference between actual and required deployment levels exceeded the greater of 3 MW and 3%.
 - To isolate performance issues related to low SOC, ERCOT identified only those intervals where ESRs were operating below 20% SOC.
- Summary of results (see Appendix A for details):
 - On 8/17, five ESRs were short as much as 113 MW to their dispatch instruction due to insufficient SOC.
 - On 9/6, seven ESRs were short as much as 74 MW to their dispatch instruction due to insufficient SOC.
 - No ESRs carrying AS were short to their dispatch instruction on 8/25 or 8/30.
 - This analysis only considered ESRs carrying AS responsibilities for the evening hours on these 4 days; other hours could include failure to perform due to limited SOC.

Key Takeaway: Recent, real-life examples demonstrate that ESRs have failed to maintain enough SOC to meet actual AS deployment instructions. Some of these failures occurred during EEA conditions, when energy is most needed. These data show that letting ESRs “self-regulate” SOC without clear requirements or accountability introduces reliability risk.

Current “Failure to Provide” Framework

Existing Protocols define “failure to provide” based on both a forward-looking projection and real-time analysis of whether capacity will be or has been preserved to meet a QSE’s AS responsibility in a given hour:

6.4.9.1.3 Failure to Provide Ancillary Service

- (1) . . . **A QSE is considered to have failed to provide its Ancillary Services Supply Responsibility when** ERCOT determines, in its sole discretion, that **some or all of the QSE’s Ancillary Service capacity will not be available in Real-Time**, was not available during any interval for which the QSE had an Ancillary Service Supply Responsibility, or that the QSE assigned all or part of an Ancillary Service Supply Responsibility to a Resource that was not qualified to provide that Ancillary Service. This Section does not apply to a failure to provide caused by events described in Section 6.4.9.1.2, Replacement of Infeasible Ancillary Service Due to Transmission Constraints.

Today, if Current Operating Plan (COP) data or telemetry indicates that a QSE is not preserving sufficient capacity to meet its AS obligations, ERCOT may deem the QSE to have “failed to provide” its AS responsibility—regardless of whether AS was deployed in that hour.

Existing Protocols require ERCOT to “claw back” AS revenues for an identified failure to provide:

6.4.9.1.3 Failure to Provide Ancillary Service

- (3) **ERCOT shall charge each QSE that has failed to provide its Ancillary Service Supply Responsibility**, according to paragraph (2) above for a particular Ancillary Service for a specific hour, in the manner described in Section 6.7.3, Charges for a Failure to Provide Ancillary Service.

Key Takeaway: The Protocols allow ERCOT to assess charges for failure to provide whenever a QSE is expected to be unable to meet its AS Supply Responsibility in a future hour or is short on its reserved capacity for AS in real-time. These rules are designed to ensure sufficient capacity is reserved for AS for all types of Resources, including ESRs, regardless of likelihood of deployment.

Examples of Very Low SOC on ESRs Carrying AS for Multiple Consecutive Hours

- ERCOT has observed numerous instances in which QSEs have allowed an ESR's SOC to fall to near-zero levels for multiple consecutive hours in which the QSE has assigned the ESR an AS Resource Responsibility (see three recent examples in Appendix C).
- These examples suggest that QSEs are wagering that ERCOT will not deploy their ESRs for AS for any material duration for many of the hours that ESRs are carrying AS responsibilities.
- This behavior puts grid reliability at risk. Allowing QSEs to decide for themselves how much energy their ESRs should store for possible AS deployments creates significant reliability risk because QSEs will sometimes choose not to charge their ESRs based on a conclusion that the risk of deployment is low relative to the cost of charging the battery during those hours.
- Whether sufficient energy should be retained for AS deployment is not a commercial decision; it is a non-negotiable requirement for reliability.

Key Takeaway: QSEs representing ESRs have frequently maintained near-zero levels of SOC, creating reliability risk. This further illustrates why allowing ESRs to self-regulate SOC without any clear requirements jeopardizes reliability.

Existing AS Compliance Criteria in Protocols

- In addition to the financial penalties required under the failure to provide process, the Protocols also establish AS capacity compliance criteria for QSEs based on telemetry and performance of Resources in their portfolios, including ESRs.
- Under Protocols Section 8.1.1.3 (see full text in Appendix E), if a QSE's telemetry indicates that it "is not providing sufficient capacity to meet its Ancillary Service responsibility," ERCOT must notify the QSE and must "report non-compliance of Ancillary Service capacity requirements to the Reliability Monitor for review."
- ERCOT relies on several indicators of insufficient capacity, including a comparison of the sum of AS Resource Responsibilities to the QSE's total AS Supply Responsibility.
- The potential for ESRs to have insufficient SOC is a new risk beyond capacity availability that threatens a Resource's ability to provide AS, due to the ESR's duration-limited nature. Capacity deficiencies and SOC deficiencies both create risks of AS unavailability.
- NPRR 1186's SOC compliance criteria are aligned with existing capacity criteria and address the unique vulnerability that ESRs present (i.e., limited duration). Requiring an ESR to meet only a capacity requirement would not be sufficient to ensure it would have the energy needed to meet its AS responsibilities.
- Note: Non-ESRs are required to have fuel limitations reflected in the HSL values provided for the Resource. As a result, these fuel limitations are already captured in the existing compliance and market frameworks.

Key Takeaway: Existing compliance criteria are designed to ensure sufficient capacity is reserved for AS for all types of Resources, regardless of deployment. NPRR 1186 addresses the unique, incremental risk that ESRs present regarding SOC in the same way that the Protocols currently address risk of insufficient capacity.

What does NPPR 1209 do and why is it needed?

- Protocols currently include provisions that claw back AS payments made to QSEs that do not reserve sufficient Resource capacity to meet their AS responsibilities.
- Under the existing framework, ERCOT conducts failure-to-provide analysis on an ad-hoc basis. ERCOT is in the process of implementing NPPR 1149, which will automate the determination of failed quantities and the assessment of claw-back AS payments when QSEs do not reserve sufficient capacity to meet their AS Supply Responsibilities.
- NPPR 1209 would include SOC deficiency as a "failed quantity" that would result in automatic claw-back of AS payments, consistent with ERCOT's treatment of capacity deficiencies for all Resources under NPPR 1149.
 - When QSEs fail to maintain sufficient SOC on the ESRs they've designated to provide AS, this creates the same risk to future AS availability as a QSE not maintaining sufficient capacity across its Resource portfolio to cover its AS Supply Responsibility. In both cases, the capability to provide AS has not been preserved. Thus, it is appropriate to take SOC deficiencies into account when determining failures to provide.
 - Ancillary Service failed quantity logic is applied at the QSE level and considers all Resources (including ESRs) within a QSE's portfolio; QSEs can move AS responsibilities between their Resources in Real-Time using telemetry.
- Eolian has argued that treating SOC insufficiency as a failure to provide discriminates against batteries in favor of other technologies. But this is incorrect: QSEs are not able to assign AS responsibility to a Generation Resource if that Resource's HSL is insufficient to cover the AS. In such a case, that QSE is liable for a charge for failure to provide. Considering SOC deficiency in this process is entirely consistent with ERCOT's existing treatment of other Resources because:
 - SOC insufficiency is a new vulnerability unique to ESRs due to their limited duration, which impacts their capability to provide AS.
 - ESR HSLs don't inherently capture "fuel" limitations, as they do for other Resource types.

Key Takeaway: NPPR 1209 will assign failure to provide charges to QSEs that assign AS responsibilities to ESRs that lack sufficient SOC to meet future AS obligations; this is necessary to address risks associated with the inherent duration limitation of ESRs and is consistent with the way ERCOT treats other Resources.

Summary of the AS Capacity Process – Before and After

Process	Currently	Proposed under NPPR 1186
AS Capacity Compliance	<ul style="list-style-type: none"> • QSEs assign AS Resource Responsibilities to their Resources to preserve capacity to meet their AS Supply Responsibility. QSEs can change these AS Resource Responsibilities in Real-Time, as they see fit, to account for Resource changes or optimize their portfolio. • These AS Resource Responsibilities are validated against a Resource's limits (HSL/LSL/MPC/LPC). This includes all Resources types (Generation/Load/ESR). For ESRs, these limits do not account for "fuel" limitations (i.e., SOC). • If the sum of AS Resource Responsibilities is less than the AS Supply Responsibility, the QSE is short and may be deemed non-compliant. If short, a sufficient amount of capacity to provide AS was not reserved, regardless of actual energy deployed. • <u>There is no clear, transparent process to also ensure that sufficient ESR SOC was reserved.</u> 	<ul style="list-style-type: none"> • No change • No change • No change • <u>Because the HSL/LSL/MPC/LPC for an ESR don't account for SOC, the AS Resource Responsibility assigned an ESR by the QSE is used to determine a min. SOC requirement. Min. SOC requirements automatically adjust when AS Resource Responsibilities are updated. A QSE may be deemed non-compliant if ESRs with QSE-submitted non-zero AS Resource Responsibilities don't have sufficient reserved SOC to meet min. SOC requirements.</u>

Summary of the Failure-to-Provide Process – Before and After

Process	Current (includes NPPR 1149)	Proposed (NPPR 1209)
Failure-to-Provide	<ul style="list-style-type: none"> • QSEs assign AS Resource Responsibilities to their Resources to preserve capacity to meet their AS Supply Responsibility. QSEs can change these AS Resource Responsibilities in Real-Time, as they see fit, to account for Resource changes or optimize their portfolio. • These AS Resource Responsibilities are validated against a Resource's limits (HSL/LSL/MPC/LPC). This includes all Resources types (Generation/Load/ESR). For ESRs, these limits do not account for "fuel" limitations (i.e., SOC). • <u>There is no clear, transparent process to also ensure that sufficient ESR SOC was reserved. No additional step taken.</u> • If the sum of AS Resource Responsibilities is less than the AS Supply Responsibility, the QSE is short and will automatically be charged for that shortage. If short, a sufficient amount of <u>capacity</u> to provide AS was not reserved, regardless of actual energy deployed. 	<ul style="list-style-type: none"> • No change • No change • <u>Additionally, because the HSL/LSL/MPC/LPC for an ESR don't account for SOC, the AS Resource Responsibility assigned an ESR by the QSE is used to determine a min. SOC requirement. Min. SOC requirements automatically adjust when AS Resource Responsibilities are updated. If an ESR's SOC doesn't meet the min. SOC requirement, the QSE-provided AS Resource Responsibility is adjusted down.</u> • If the sum of AS Resource Responsibilities (<u>including adjustments</u>) is less than the AS Supply Responsibility, the QSE is short and will automatically be charged for that shortage. If short, a sufficient amount of <u>capability</u> to provide AS was not reserved, regardless of actual energy deployed.

ERCOT's Recommendation

- ERCOT recommends the unanimously Board-endorsed version of NPRR 1186 as the best way to mitigate the reliability risks associated with limited-duration Resources.
 - NPRR1186 was approved by TAC with a vote of 29 in favor and one against.
- ERCOT intends to continue pursuing approval of NPRR 1209 to ensure QSEs relying on ESRs appropriately bear settlement consequences of SOC insufficiency.
- Joint Commenters' recommendation to delete all compliance requirements in NPRR 1186 would remove all expectations about SOC behavior.
 - Would remove any explicit standard for measuring SOC insufficiency—even for advisory purposes.
 - Would create regulatory uncertainty and raise questions about standard used for enforcement.
 - ERCOT advises against this.
- ERCOT notes that the PUC always has the ability to exercise discretion in the enforcement of its rules and ERCOT Protocols.

Rejection of SOC Requirements Would Require Additional Clarification

- If the SOC compliance criteria in NPRR 1186 are rejected, ERCOT and Market Participants will need guidance on SOC expectations.
- As the Director of PUC Division of Compliance and Enforcement (DICE) noted at November 30, 2023 Open Meeting, PUC Rule 25.503(f)(6) and (g)(3) already implicitly require QSEs representing ESRs to maintain sufficient SOC to meet future-hour AS responsibilities.
- Without clear expectations concerning SOC for ESRs providing AS, the development of ESRs will be impaired by regulatory uncertainty.

Appendix A

Appendix A Overview

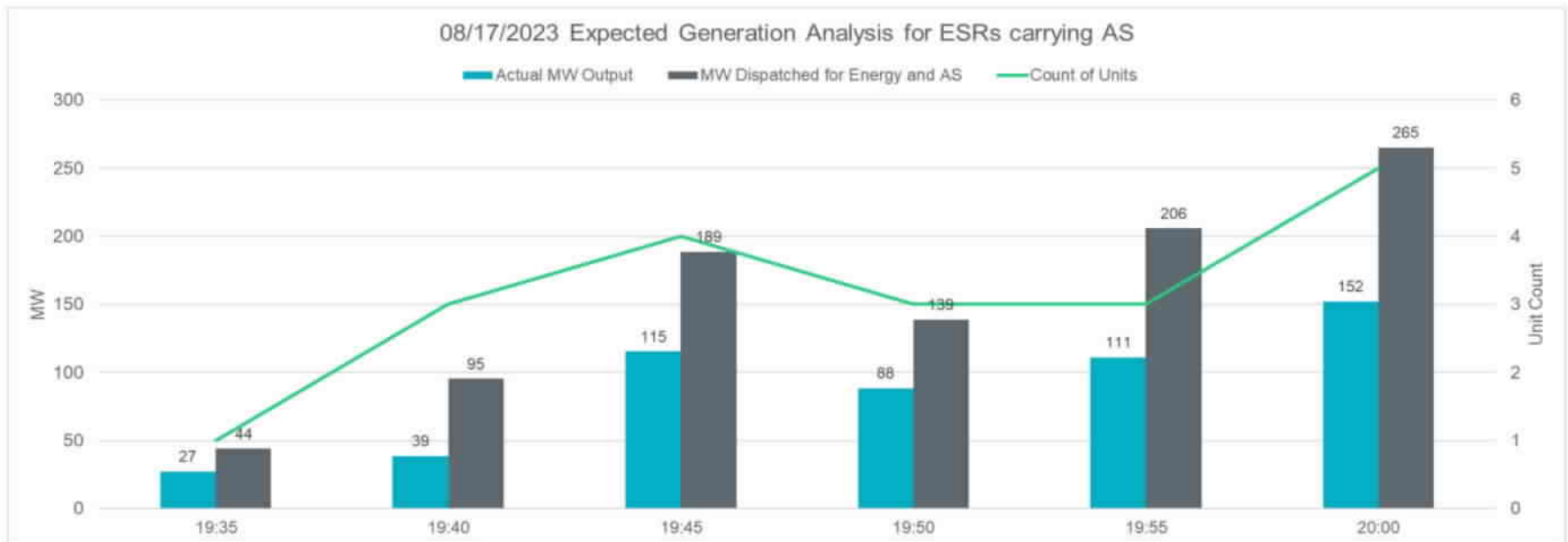
The following slides describe, and provide graphical illustrations of, the two following analyses ERCOT conducted:

- ERCOT conducted an analysis of hour ending 20 on each of the four days in summer 2023 in which RRS was released to SCED (8/17, 8/25, 8/30, and 9/6).
 - For each period of RRS deployment, ERCOT compared actual deployment levels to the required deployment level for each ESR (required deployment level equals the sum of Updated Desired Base Point, Regulation Instruction, and Primary Frequency Response deployment obligation).
 - ERCOT extracted all five-minute intervals in which the difference between actual and required deployment levels exceeded the greater of 3 MW and 3%.
 - To isolate performance issues related to low SOC, ERCOT identified only those intervals where ESRs were operating below 20% SOC
- ERCOT also conducted a similar analysis using the GREDP metrics for Generation Resources (i.e., non-ESRs) carrying AS to evaluate performance.
 - For non-ESR generation AS providers for the same time period, ERCOT compared actual deployment levels to the required deployment level.
 - ERCOT extracted all five-minute intervals in which the difference between actual and required deployment levels exceeded the greater of 8 MW and 8%.

8/17/2023 Failure to Perform

- 800 MW of RRS-PFR released at 19:09
- Additional 93 MW of RRS-PFR released at 19:34
- Large system-level expected generation deviation
- Frequency below deadband for 35 minutes
- System Lambda was ~\$5001/MWh from 19:00-19:45
- Minimum PRC of 2912 MW at 19:35

In each case, Actual Output < Dispatch for energy and AS

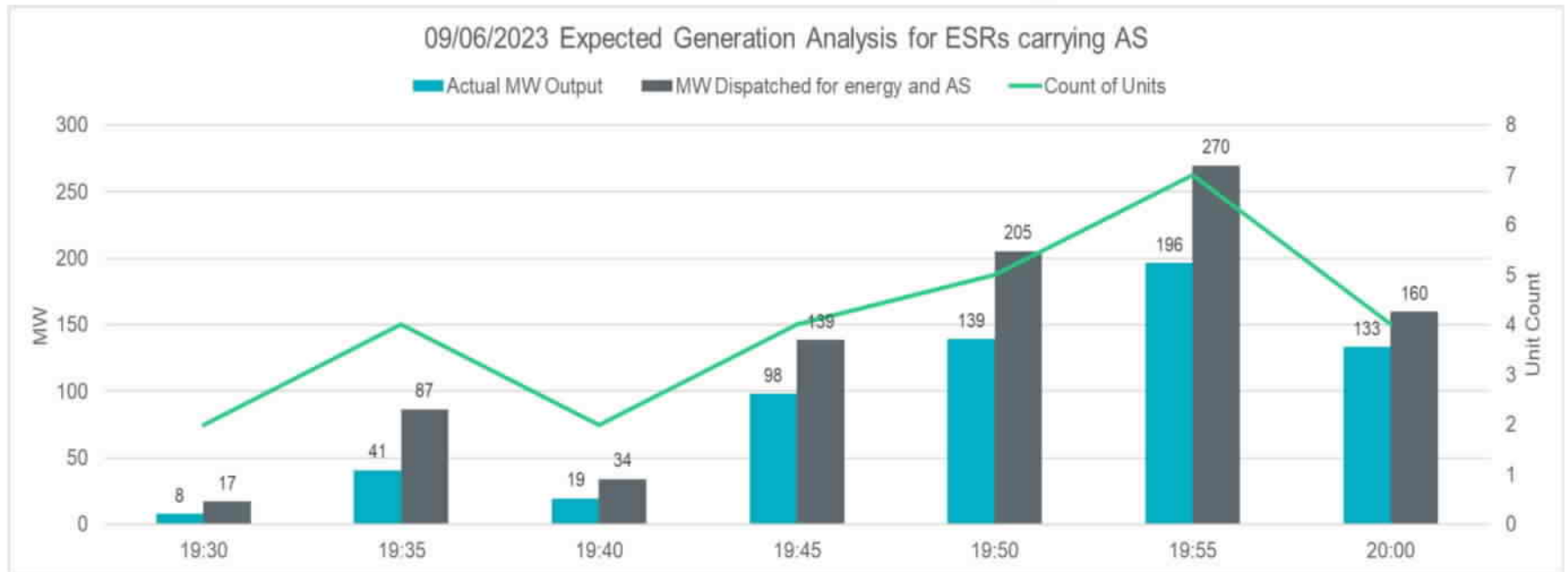


Key Takeaway: Up to 5 ESRs that were carrying up AS obligation between 19:35 and 20:00 did not meet total deployment obligations due to low SOC.

9/6/2023 Failure to Perform

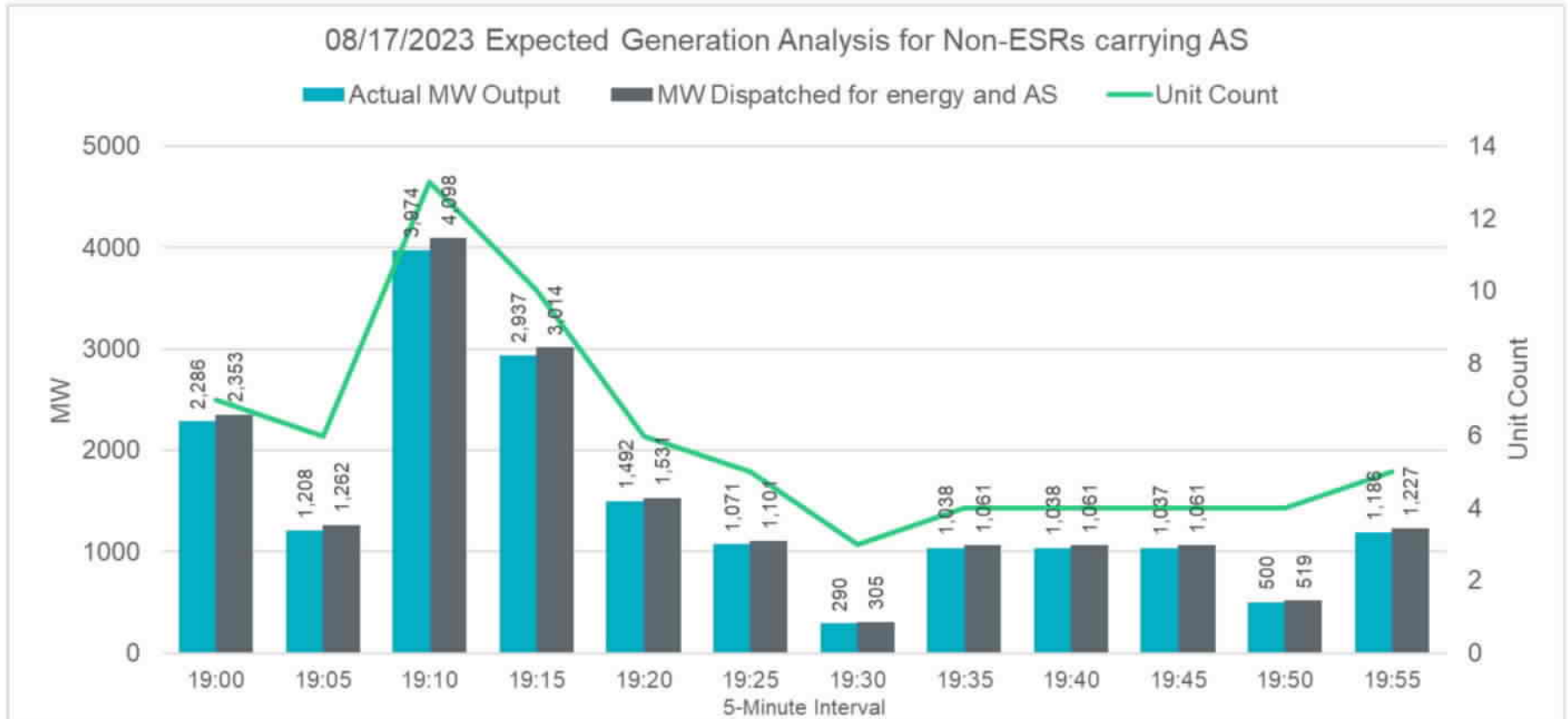
- 500 MW of RRS-PFR released at 18:59
- Additional 600 MW RRS-PFR released at 19:13
- System Lambda was ~\$5001/MWh from 19:10-19:35
- Minimum Frequency 59.77 Hz at 19:25
- Minimum PRC of 2104 MW at 19:42

In each case, Actual Output < Dispatch for energy and AS

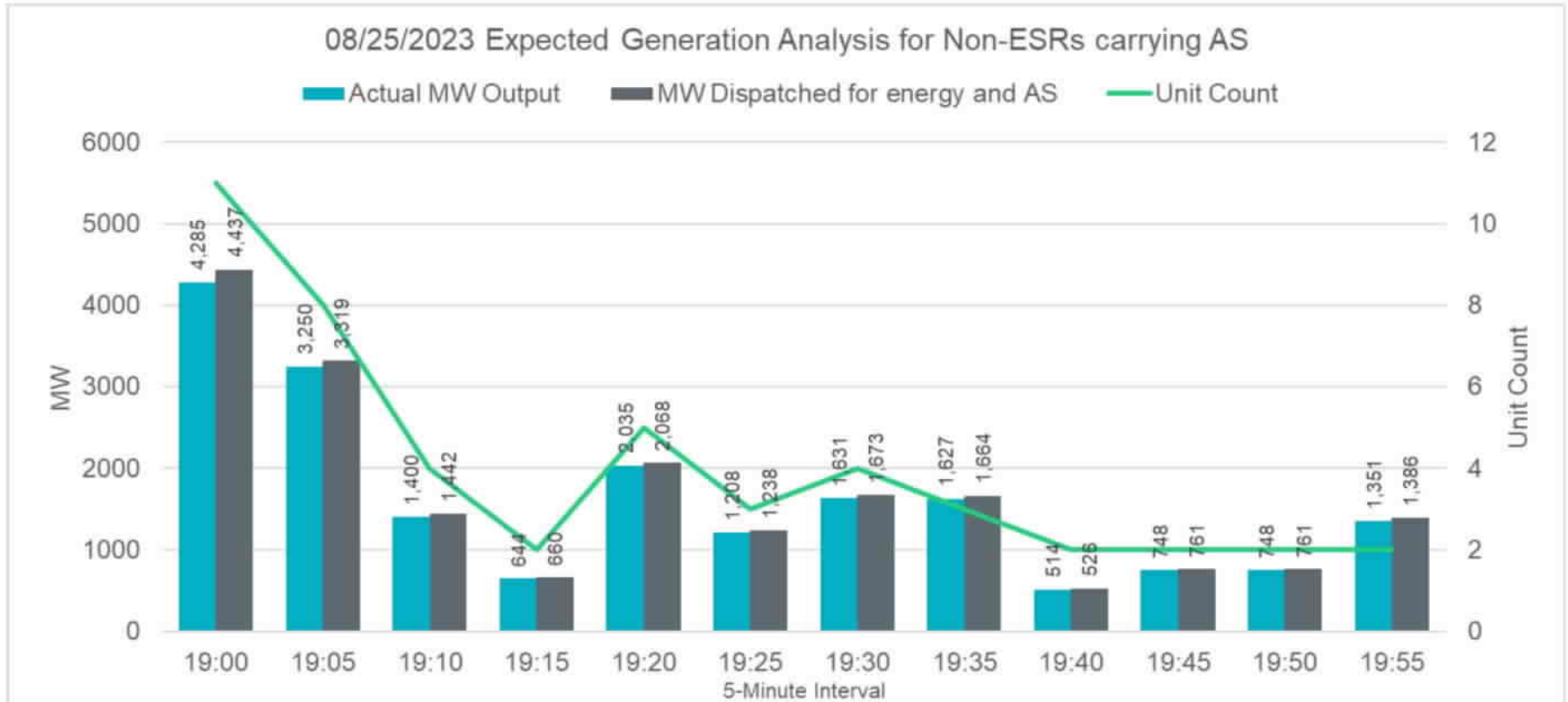


Key Takeaway: Up to 7 ESRs that were carrying up AS obligation between 19:35 and 20:00 did not meet total deployment obligations due to low SOC.

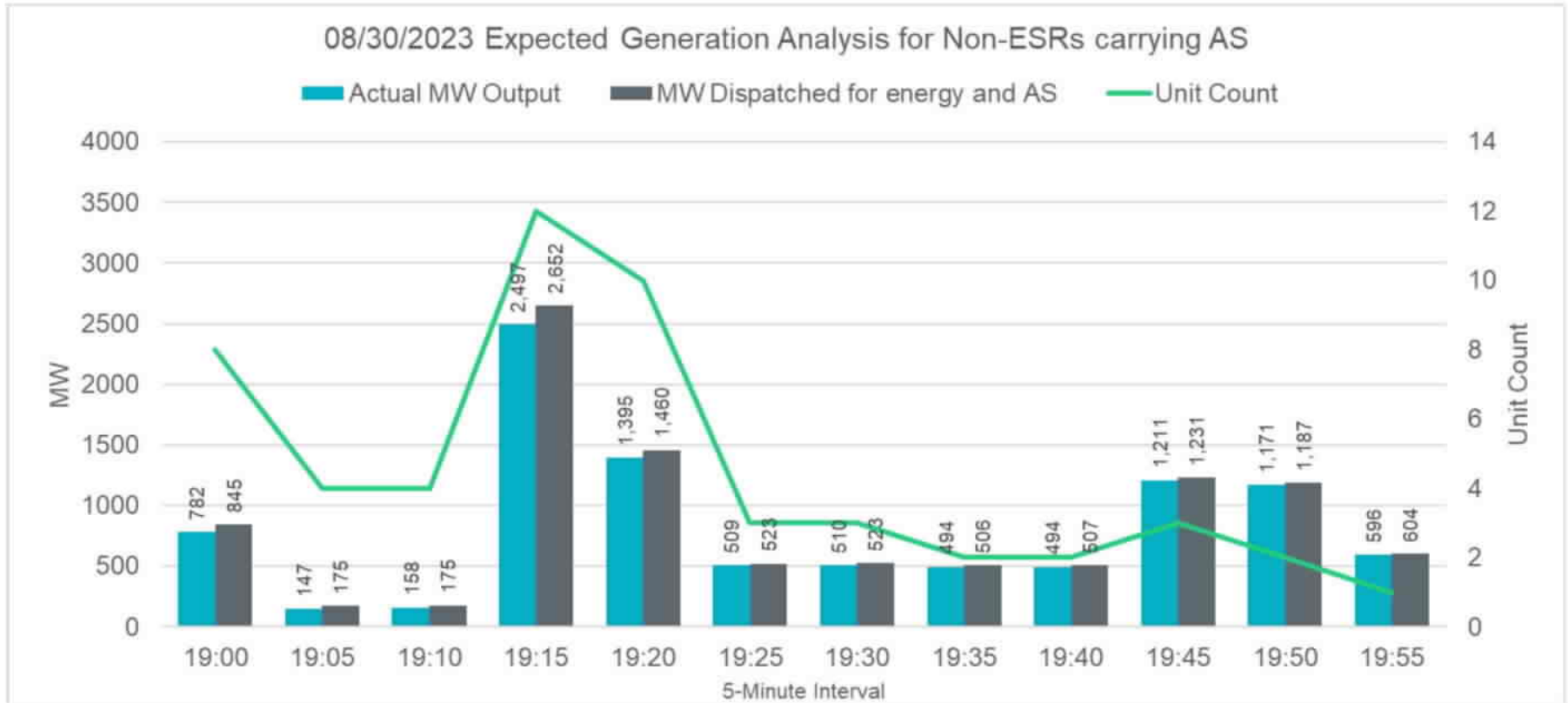
08/17/23 Non-ESR AS Providers - Expected Generation Analysis



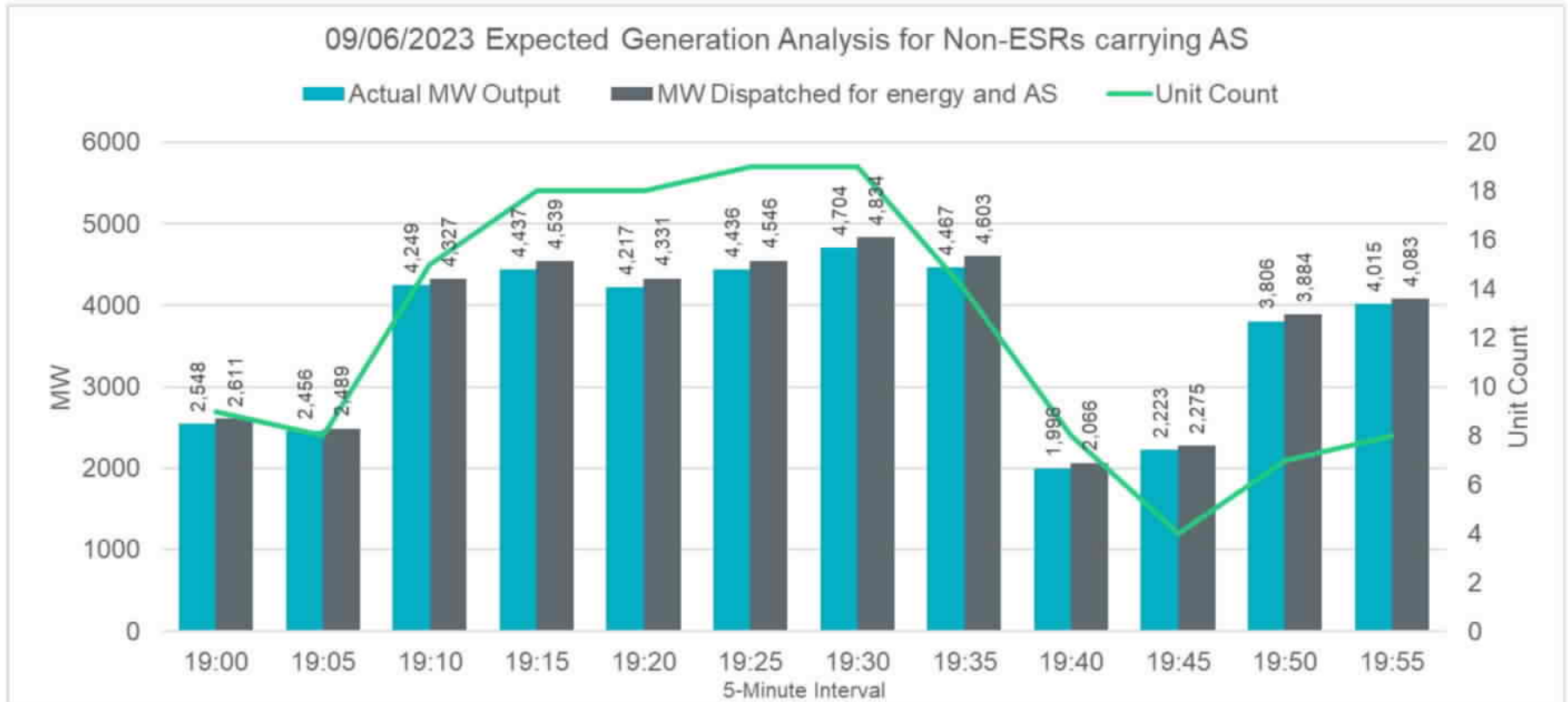
08/25/23 Non-ESR AS Providers - Expected Generation Analysis



08/30/23 Non-ESR AS Providers - Expected Generation Analysis



09/06/23 Non-ESR AS Providers - Expected Generation Analysis



Appendix B

Appendix B Overview

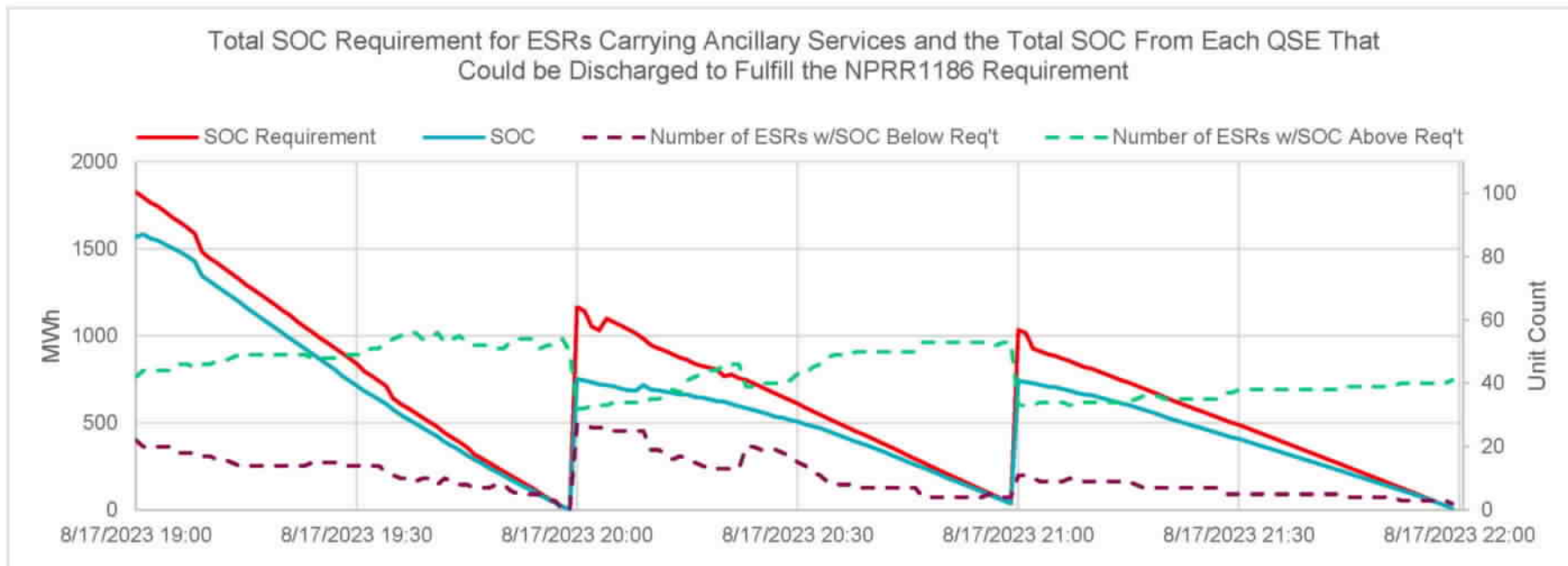
- The following slides describe an analysis ERCOT conducted to assess how ESRs would be evaluated for compliance with the SOC requirement proposed in NPRR 1186 during recent periods with low reserves from this past summer.
- ERCOT analyzed evening hours on each of the four days in summer 2023 in which RRS was released to SCED (8/17, 8/25, 8/30, and 9/6).
- The analysis reviews all 1-minute intervals from 19:00-22:00 and applies the NPRR 1186 SOC compliance requirement as if it had been approved and implemented.
- The charts show that a number of ESRs would have violated the SOC requirement proposed in NPRR1186.

Examples of Application of NPRR1186 SOC Requirements

- Summary of results for 1-minute intervals for hours 19:00-22:00 (see later slides for details):
 - On 8/17, 34 ESRs would have failed to meet the NPRR 1186 SOC requirements at some point during this period, with a maximum of 27 ESRs failing at any one time. 98.9% of intervals had at least 1 unit below the SOC requirement. In aggregate, SOC was short for the entirety of each hour from 19:00 through 22:00.
 - On 8/25, 12 ESRs would have failed to meet the NPRR 1186 SOC requirements at some point during this period, with a maximum of 8 ESRs failing at any one time. 29.4% of intervals had at least 1 unit below the SOC requirement. In aggregate, SOC was short for several intervals at the top of the hours of 19:00 through 22:00.
 - On 8/30, 35 ESRs would have failed to meet the NPRR 1186 SOC requirements at some point during this period, with a maximum of 28 ESRs failing at any one time. 42.7% of intervals had at least 1 unit below the SOC requirement. In aggregate, SOC was short for several intervals at the top of the hours of 19:00 through 22:00.
 - On 9/6, 34 ESRs would have failed to meet the NPRR 1186 SOC requirements at some point during this period, with a maximum of 24 ESRs failing at any one time. 93.3% intervals had at least 1 unit below the SOC requirement. In aggregate, SOC was short for the entirety of each hour from 20:00 through 22:00.

Key Takeaway: ESRs would have failed to meet the proposed NPRR 1186 requirements on each of the four days in which ERCOT deployed RRS this summer.

08/17/2023 Failure to Provide Under NPRR 1186 SOC Requirement



Key Takeaway: Many ESRs that were carrying up AS obligations between 19:00 and 22:00 would not have met the NPRR 1186 SOC requirement. In aggregate, SOC was short for almost the entirety of each hour.

08/25/2023 Failure to Provide Under NPPR 1186 SOC Requirement

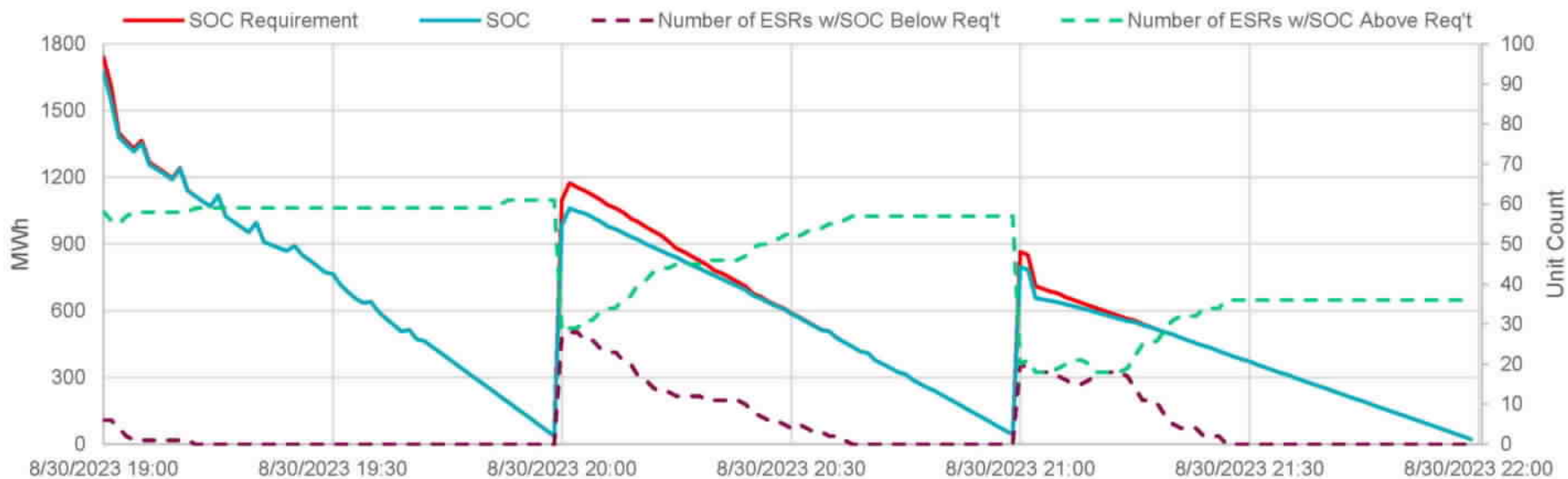
Total SOC Requirement for ESRs Carrying Ancillary Services and the Total SOC From Each QSE That Could be Discharged to Fulfill the NPPR1186 Requirement



Key Takeaway: Many ESRs that were carrying up AS obligations between 19:00 and 22:00 would not have met the NPPR 1186 SOC requirement. For each hour there are some failures to meet the SOC requirements.

08/30/2023 Failure to Provide Under NPPR 1186 SOC Requirement

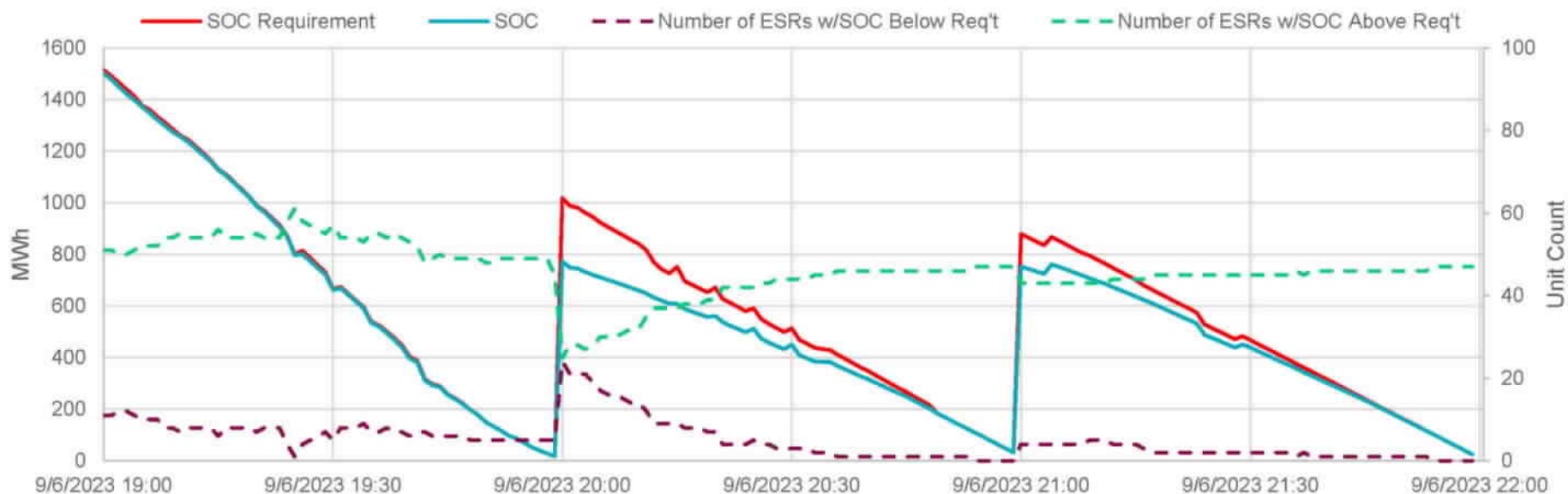
Total SOC Requirement for ESRs Carrying Ancillary Services and the Total SOC From Each QSE That Could be Discharged to Fulfill the NPPR1186 Requirement



Key Takeaway: Many ESRs that were carrying up AS obligations between 19:00 and 22:00 would not have met the NPPR 1186 SOC requirement. For each hour there are some failures to meet the SOC requirements.

09/06/2023 Failure to Provide Under NPPR 1186 SOC Requirement

Total SOC Requirement for ESRs Carrying Ancillary Services and the Total SOC From Each QSE That Could be Discharged to Fulfill the NPPR1186 Requirement



Key Takeaway: Many ESRs that were carrying up AS obligation between 20:00 and 22:00 would not have met the NPPR 1186 SOC requirements. In aggregate, SOC was short for almost the entirety of each of the last two hours.

Appendix C

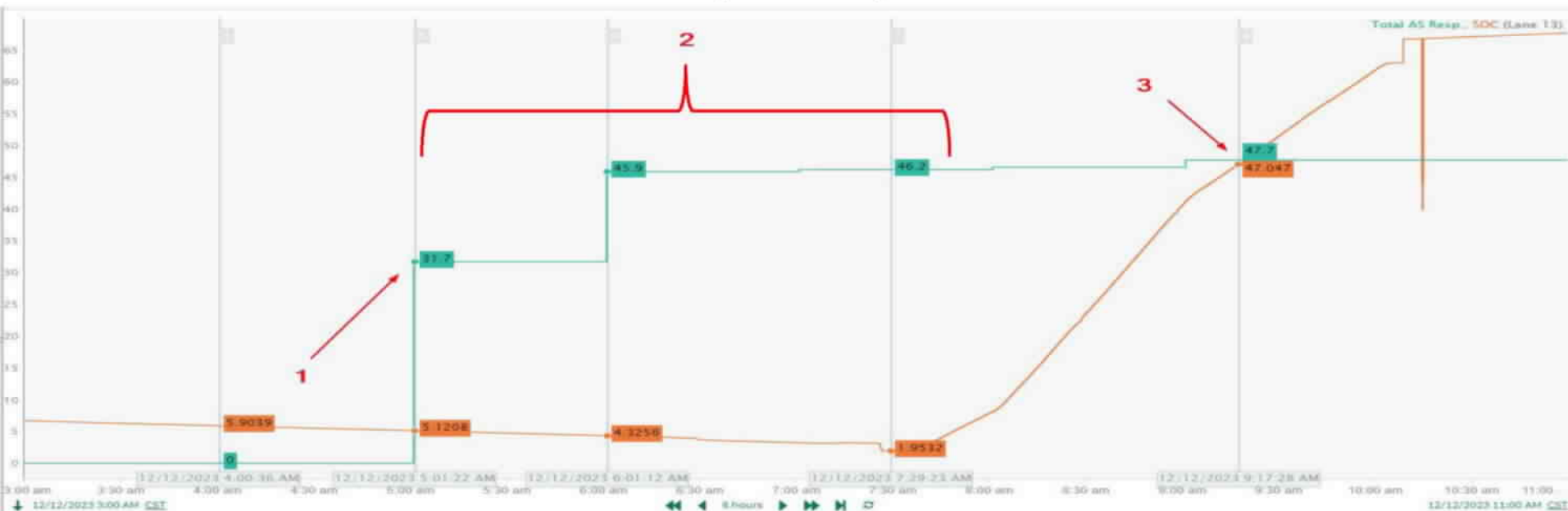
Appendix C Overview

- The following slides provide three examples of instances in which QSEs have allowed an ESR's SOC to fall to near-zero levels for multiple consecutive hours in which the QSE has assigned the ESR an AS Resource Responsibility.
- Many other similar examples exist.
- These examples suggest that QSEs are wagering that ERCOT will not deploy their ESRs for AS for any material duration for many of the hours that ESRs are carrying AS Resource Responsibilities.

Example 1 of QSE Maintaining Insufficient ESR SOC for Consecutive Hours

+/-50 MW ESR carrying 31.7-47.7 MW on 12/12/23

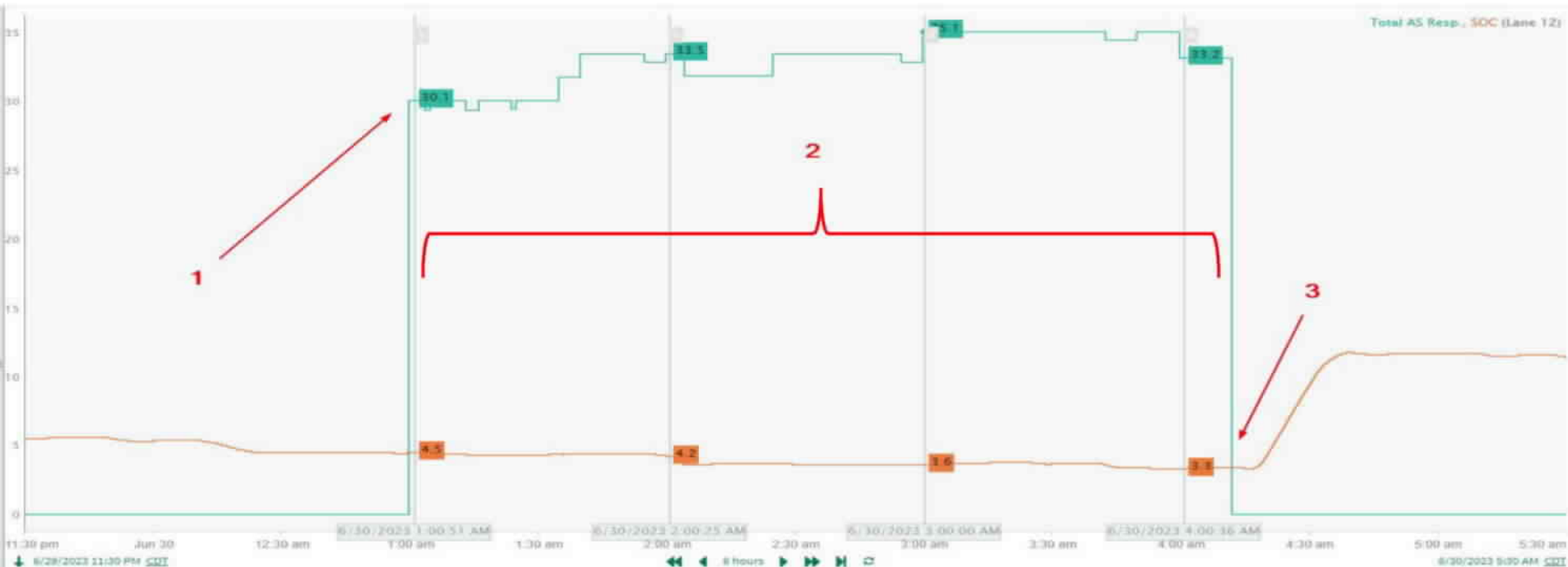
1. ~5:00am: ESR is already at low SOC and gains 31.7 MW of AS Responsibility; ESR opts not to charge to prepare for Responsibility.
2. ~5:00am to 7:30am: ESR opts not to charge and remains at low SOC while gaining additional AS Responsibility and does not charge to replenish SOC until ~7:30am.
3. ~9:15am: SOC exceeds AS Responsibility.



Example 2 of QSE Maintaining Insufficient SOC on ESR for Consecutive Hours

+/-50 ESR carrying 30.1 to 35.1 MW of AS for consecutive hours on 6/30/23

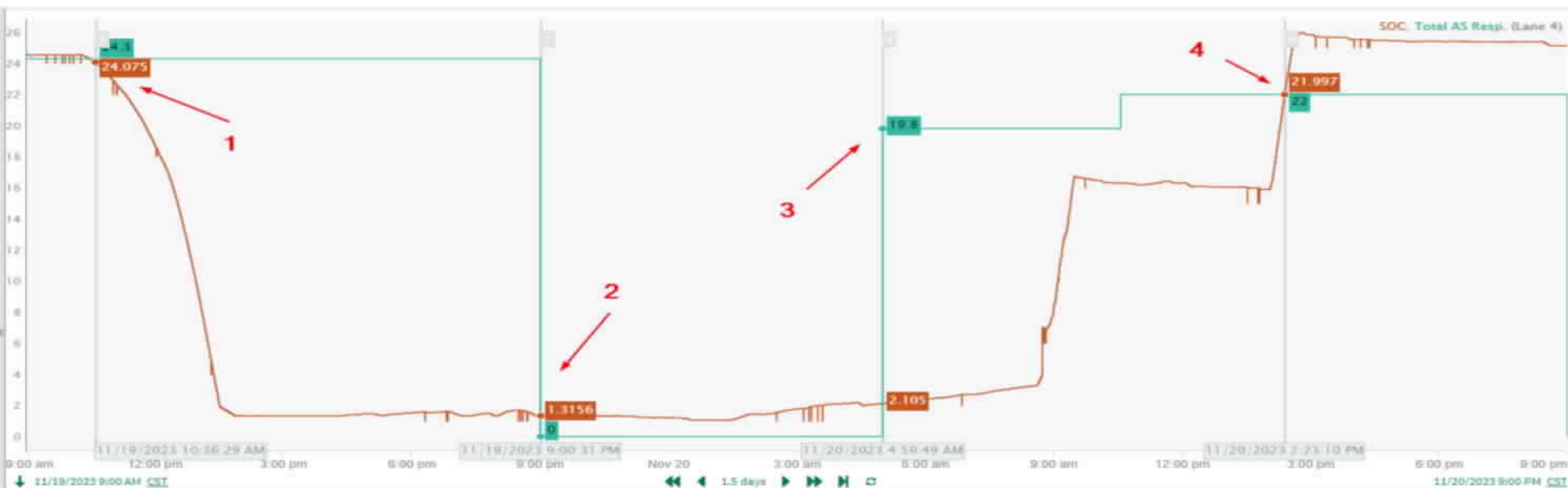
1. ~1:00am: ESR is already at low SOC and gains 30.1 MW of AS Responsibility; ESR opts not to charge to prepare for Responsibility.
2. ~1:00am to ~4:15am: ESR opts to remain idle at minimal SOC and does not charge to replenish SOC until ~4:15am.
3. ~4:15am: All AS responsibility is dropped.



Example 3 of QSE Maintaining Insufficient SOC on ESR for Consecutive Hours

+/- 50 MW ESR carrying 19.8-24.3 MW from 11/19/23 to 11/20/23

1. ~10:30am: SOC falls below the amount of ESR's AS Responsibility; ESR opts to remain idle and does not charge to replenish SOC for several hours.
2. ~9:00pm to 5:00am: ESR has no AS responsibility.
3. ~5:00am: ESR gains 19.8 MW but SOC still below AS Responsibility.
4. ~2:30pm: SOC exceeds AS Responsibility.



Appendix D

QSE and Sub-QSE Relationships with Resources

- AS compliance responsibilities are evaluated at the QSE level because QSEs are the entities that submit offers to provide AS and because the Protocols allow QSEs flexibility to move AS Responsibilities between Resources in each QSE's portfolio (see Scenario 1 on next slide).
- ERCOT allows QSEs to register multiple "Sub-QSEs" under the same legal entity. Each Sub-QSE is treated as a QSE for all purposes under the Protocols. Sub-QSE registration is simply a workaround that allows a single entity to have multiple QSE registrations (with separate settlement statements and invoices) without having to create a separate legal entity for each registration. A QSE is not required to create Sub-QSEs.
- If a Sub-QSE represents multiple Resources, it may move AS Responsibilities between those Resources, just like a traditional QSE (see Scenario 2 on next slide). Entities that choose to create a separate sub-QSE (or traditional QSE) for each Resource may be impairing their ability to move AS Responsibilities among Resources (see Scenario 3 on next slide). Few entities create separate QSEs for each Resource.

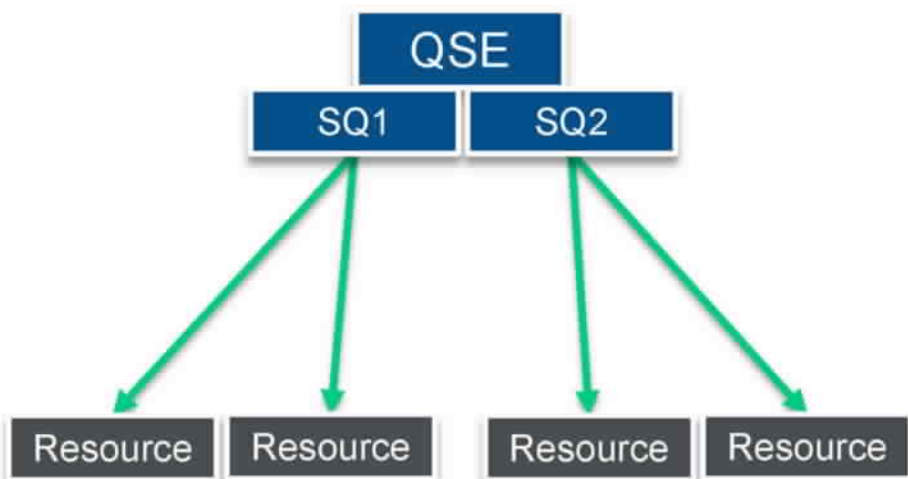
Key Takeaway: Sub-QSEs are regarded as QSEs under the Protocols. Entities that create one Sub-QSE for each Resource may be limiting their ability to move AS Responsibilities among Resources.

Examples of QSE and Sub-QSE Relationships to Resources

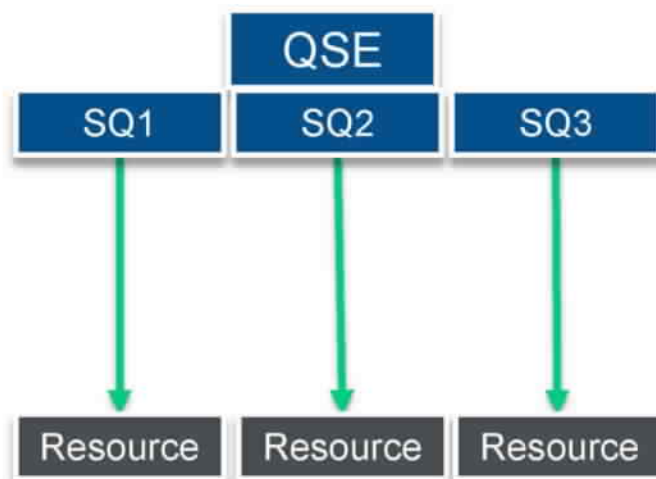
Scenario 1



Scenario 2



Scenario 3



Appendix E

Protocols Section 6.4.9.1.3

6.4.9.1.3 *Replacement of Ancillary Service Due to Failure to Provide*

(1) ERCOT may procure Ancillary Services to replace those of a QSE that has failed on its Ancillary Services Supply Responsibility through a SASM, as described below in Section 6.4.9.2, Supplemental Ancillary Services Market. A QSE is considered to have failed on its Ancillary Services Supply Responsibility when ERCOT determines, in its sole discretion, that some or all of the QSE's Resource-specific Ancillary Service capacity will not be available in Real-Time. This Section does not apply to a failure to provide caused by events described in Section 6.4.9.1.2, Replacement of Infeasible Ancillary Service Due to Transmission Constraints.

(2) Within a time frame acceptable to ERCOT, each affected QSE may either substitute capacity to meet its Ancillary Services Supply Responsibility or inform ERCOT that the Ancillary Services capacity needs to be replaced. If a QSE elects to substitute capacity, ERCOT shall determine the feasibility of the substitution. If the substitution is deemed infeasible by ERCOT or the QSE informs ERCOT that the Ancillary Services capacity needs to be replaced, then ERCOT shall procure, if in its sole discretion it finds that the service is still needed, the Ancillary Services capacity required under Section 6.4.9.2.

(3) ERCOT shall charge each QSE that has failed according to paragraph (1) on its Ancillary Service Supply Responsibility for a particular Ancillary Service for a specific hour.

(4) A Load Resource that is not a Controllable Load Resource shall not simultaneously provide RRS and Non-Spin on the same Load Resource in Real-Time. ERCOT may, in its sole discretion, evaluate whether the simultaneous provision of RRS and Non-Spin results in the QSE failing on its RRS or Non-Spin Ancillary Service Supply Responsibility.

Protocols Section 8.1.1.3

8.1.1.3 Ancillary Service Capacity Compliance Criteria

- (1) ERCOT shall provide each QSE representing Resources a capacity summary containing as a minimum the same general information required in Section 6.5.7.5, Ancillary Services Capacity Monitor, except specific to only the QSE. The summary shall be updated with calculations every ten seconds by ERCOT and then provided to the QSE every five minutes using the MIS Certified Area.
- (2) ERCOT shall continuously measure the overall performance of each QSE in providing each Ancillary Service by comparing the sum of each of the QSE's Resources' telemetered Ancillary Services Resource Responsibility with the QSE's total Ancillary Service responsibility. If the comparison indicates the QSE is not providing sufficient capacity to meet its Ancillary Services responsibility, ERCOT shall notify the QSE via the MIS Certified Area.
- (3) The QSE, within ten minutes of receiving the insufficient capacity notification from ERCOT, the QSE must:
 - (a) If due to a telemetry issue, correct the telemetered Ancillary Services Resource Responsibility to provide sufficient capacity; or
 - (b) Must provide both appropriate justification for not satisfying their Ancillary Service Obligation and a plan to correct the shortfall that is acceptable with the ERCOT operator. ERCOT shall report non-compliance of Ancillary Service capacity requirements to the Reliability Monitor for review.
- (4) A QSE for an ESR that is, was, or will be unable to meet its Ancillary Service Resource Responsibility due to a charging restriction during an EEA Level 3 event shall inform ERCOT of this inability no later than one hour after the end of the EEA Level 3 event. Upon providing such notification, the QSE shall be deemed to have complied with its Ancillary Service Supply Responsibility for a time period following the EEA Level 3 event that is equal to the duration of the suspended charging period during the EEA Level 3 event. However, nothing in this paragraph exempts the QSE from any charge under Section 6.7.3, Charges for Ancillary Service Capacity Replaced Due to Failure to Provide, or any other Settlement consequence due to the Ancillary Service insufficiency.