

**The Reliability and Markets (R&M) Committee  
is expected to consider  
R&M Committee Agenda Item 6.1:**

***PUCT Remand of NPRR1186, Improvements  
Prior to the RTC+B Project for Better ESR  
State of Charge Awareness, Accounting and  
Monitoring***

**at its meeting on February 26, 2024.**

**The Board of Directors is expected to hear  
the R&M Committee's recommendation on  
this matter as part of the  
R&M Committee Report  
at the Board meeting  
on February 27, 2024.**

**Attached are the Board and Committee  
materials in relation to these agenda items.**



**Item 6.1: PUCT Remand of  
NPRR1186, *Improvements Prior to  
the RTC+B Project for Better ESR  
State of Charge Awareness,  
Accounting and Monitoring***

*Dan Woodfin*

Vice President, System Operations

Reliability and Markets Committee Meeting

ERCOT Public

February 26, 2024

# Board Request

- At its January 18, 2024 Open Meeting, the Public Utility Commission of Texas (PUCT) voted to remand Nodal Protocol Revision Request (NPRR) 1186, *Improvements Prior to the RTC+B Project for Better ESR State of Charge Awareness, Accounting and Monitoring*, to the ERCOT Board of Directors (Board).
- The PUCT's order includes “suggested modifications” that remove proposed language in Section 8.1 establishing State of Charge (SOC) compliance requirements for Energy Storage Resources (ESRs) providing Ancillary Services.
- Consistent with the PUCT's order, ERCOT has submitted comments on NPRR 1186 to remove the revisions to Protocols Section 8.1.

## **ERCOT requests that the Board:**

1. Recommend approval of NPRR 1186 as amended by the February 12, 2024 ERCOT comments; and
2. Direct ERCOT Staff to withdraw NPRR 1209, *Board Priority – State Of Charge Ancillary Service Failed Quantity Allocations under NPRR1149*.

## NPRR 1186 History

- ERCOT submitted NPRR 1186 in **June 2023** to provide awareness, accounting, and monitoring of State of Charge (SOC) for Energy Storage Resources (ESRs) until the RTC+B project is implemented.
- In **August 2023**, the Board remanded NPRR 1186 to TAC to address the limited scarcity deployment issue discussed with the Board.
- In **October 2023**, the Board recommended approval of the revised NPRR 1186 as recommended in the September 26, 2023 TAC report and directed ERCOT to file one or more Board Priority NPRR(s) to “strengthen the compliance and financial penalties to mitigate the reliability risk” from the revised NPRR 1186.
- ERCOT subsequently submitted NPRR 1209, *Board Priority – State Of Charge Ancillary Service Failed Quantity Allocations under NPRR1149*. NPRR 1209 is currently tabled at the Protocol Revision Subcommittee.



## PUCT Remand of NPRR 1186

- On January 18, 2024, the PUCT ordered that NPRR 1186 be remanded to the Board with the following suggested modifications:  
“The proposed amendment to add paragraph (4) to ERCOT Nodal Protocols Section 8.1, QSE and Resource Performance Monitoring, should be removed in its entirety, including gray box language and subparagraphs (a) and (b).”
- The suggested modifications remove language that would have required each Qualified Scheduling Entity (QSE) that relies on an ESR to provide Ancillary Services to ensure that the ESR maintains sufficient SOC to fulfill each Ancillary Service it provides. The modifications also remove language that required ERCOT to report certain defined instances of non-compliance to the ERCOT Reliability Monitor.

## Remaining Provisions of NPRR 1186

- On February 12, 2024, ERCOT submitted comments to reflect the PUCT's suggested modifications.
- As modified, NPRR 1186 retains the following important improvements:
  - Provides a mechanism for Security-Constrained Economic Dispatch (SCED) to account for an ESR's SOC and Ancillary Service obligation and to preserve a sufficient level of SOC when dispatching ESRs.
  - Provides a mechanism for Reliability Unit Commitment (RUC) to account for an ESR's SOC when evaluating the need for incremental unit commitments.

## ESR SOC Reporting

- During the PUCT’s discussion of NPPRR 1186 at the January 18, 2024 Open Meeting, Commissioners expressed interest in having ERCOT regularly report the sufficiency of SOC for ESRs that have been designated to carry an Ancillary Service responsibility.
  - ERCOT supports this transparency, especially for situations like September 6, 2023 EEA event, when several ESRs carrying Ancillary Services responsibilities were observed to have run out of energy.
- ERCOT is developing a methodology to track ESR SOC insufficiency with the aim of providing reports to the PUCT and the R&M Committee beginning in Q2 2024. The methodology is likely to be based in part on the SOC compliance and failure-to-provide concepts proposed in NPPRR 1186 and NPPRR 1209.
- ERCOT also plans to work with stakeholders to evaluate whether any additional tracking and reporting may be useful.

## NPRR 1209

- ERCOT submitted NPRR 1209, *Board Priority – State Of Charge Ancillary Service Failed Quantity Allocations under NPRR 1149*, per the Board’s direction at its October 2023 meeting.
- NPRR 1209 proposes to extend the automated assessment of failure-to-provide charges introduced by NPRR 1149, *Implementation of Systematic Ancillary Service Failed Quantity Charges*, to include consideration of ESR Real-Time SOC data.
- Because NPRR 1209 relies on the same premise the Commission rejected in its consideration of NPRR 1186—*i.e.*, that a QSE designating an ESR to carry some part of its Ancillary Service responsibility for a given hour is obligated to ensure the ESR has sufficient SOC to provide that responsibility through the remainder of the hour—ERCOT Staff recommends that NPRR 1209 be withdrawn.



# Compliance Framework Under Revised NPPRR 1186 and Without NPPRR 1209

- ERCOT submitted NPPRR 1209 pursuant to the Board’s directive to submit one or more Board Priority NPPRR(s) to “strengthen the compliance and financial penalties to mitigate the reliability risk” from the revised NPPRR 1186.
- Without the SOC compliance requirements in NPPRR 1186 and the failure-to-provide framework in NPPRR 1209, ERCOT will evaluate ESRs under the compliance and failure-to-provide framework that applies to Generation Resources.
- Under this framework, only the available MW will be considered, regardless of how long that level of MW output could be sustained if called upon; SOC will not be evaluated.

## ERCOT Request

Consistent with the PUCT's order remanding NPRR 1186, ERCOT has submitted comments to the NPRR to remove the proposed language in paragraph (4) of Protocol Section 8.1.

ERCOT Staff requests that the Board:

1. Recommend approval of NPRR 1186 as amended by the February 12, 2024 ERCOT comments; and
2. Direct ERCOT Staff to withdraw NPRR 1209, *Board Priority – State Of Charge Ancillary Service Failed Quantity Allocations under NPRR1149*.



**Date:** February 20, 2024  
**To:** Board of Directors  
**From:** Bob Flexon, Reliability and Markets (R&M) Committee Chair  
**Subject:** PUCT Remand of NPRR1186, Improvements Prior to the RTC+B Project for Better ESR State of Charge Awareness, Accounting and Monitoring

**Issue for the ERCOT Board of Directors**

**ERCOT Board of Directors Meeting Date:** February 27, 2024

**Item No.:** 11.2

**Issue:**

Whether the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) should (1) recommend approval of NPRR1186, *Improvements Prior to the RTC+B Project for Better ESR State of Charge Awareness, Accounting, and Monitoring*, as amended by the 2/12/24 ERCOT comments (**Attachment A**), and (2) direct ERCOT staff to withdraw NPRR1209, *Board Priority – State Of Charge Ancillary Service Failed Quantity Allocations under NPRR1149*.

**Background/History:**

On June 22, 2023, ERCOT Staff submitted NPRR1186. The NPRR proposed requirements to improve ERCOT’s awareness, accounting, and monitoring of the State of Charge (SOC) of Energy Storage Resources (ESR) during completion of the Real-Time Co-optimization and Single-Model Energy Storage Resource project (RTC+B). **Attachment B**, *ERCOT Impact Analysis Report*, estimates the cost to implement the proposed system changes between \$500k and \$700k and a project duration of 7 to 10 months with 75% ERCOT labor and 25% vendor labor.

On August 22, 2023, the Technical Advisory Committee (TAC) voted, with three opposing votes, to recommend approval of NPRR1186. During TAC discussion, opponents expressed concerns with Ancillary Service duration limits within NPRR1186 and performance enforcement. On August 31, 2023, the Board voted unanimously to remand NPRR1186 to TAC. The Board instructed TAC to address a limited deployment issue and present an updated recommendation to the Board. On September 19, 2023, ERCOT submitted comments to amend NPRR1186. On September 26, 2023, following discussion that included potential need for additional revision requests related to performance or compliance, TAC voted, with one opposing vote, to recommend approval of NPRR1186 as amended by the 9/19/23 ERCOT comments.

On October 17, 2023, the Board voted unanimously to recommend approval of NPRR1186 as recommended by TAC and directed ERCOT to file one or more Board Priority Revision Requests to strengthen compliance and financial penalties to mitigate the reliability risk from NPRR1186. On November 8, 2023, ERCOT staff submitted NPRR1209. As submitted, NPRR1209 would clawback Ancillary Services revenues for

the Qualified Scheduling Entity (QSE) associated with an ESR that carries an Ancillary Service Resource Responsibility and provides insufficient SOC.

The Public Utility Commission of Texas (PUCT, Commission) considered NPRR1186 at its November 30, 2023 Open Meeting. At that meeting, two Commissioners expressed concerns with the proposed SOC compliance requirements in Protocol Section 8.1, QSE and Resource Performance Monitoring, and deferred acting on NPRR1186 to allow further information from ERCOT and stakeholders. The Commission next considered NPRR1186 at its January 18, 2024 Open Meeting. After significant discussion related to ERCOT’s reliability needs, ESR development, and the potential discriminatory impact of NPRR1186, the Commission voted to remand NPRR1186 to the Board with “suggested modifications” to remove the SOC compliance requirements from the NPRR. Specifically, the Commission’s order filed in Project No. 54445 states that “the proposed amendment to add paragraph (4) to Protocol Section 8.1 should be removed in its entirety, including gray box language and subparagraphs (a) and (b).” The suggested modifications remove language that would have required each QSE that relies on an ESR to provide Ancillary Services to ensure that the Resource maintains sufficient SOC to fulfill each Ancillary Service it provides. The suggested modifications also remove language that required ERCOT to report certain defined instances of non-compliance to the ERCOT Reliability Monitor.

As discussed in the 2/12/24 ERCOT Comments, because the revisions to NPRR1186 described in the Commission’s order seem straightforward, ERCOT recommends that the Board adopt the revisions without formally requesting additional input from TAC or other stakeholder bodies. The 2/12/24 ERCOT comments also include minor clarifications to paragraphs (3) and (9) of Protocol Section 6.5.7.2, Resource Limit Calculator, to ensure alignment with revisions ERCOT made last September to the language concerning the High Ancillary Services Limit (HASL) calculation. While the Commission did not formally take a vote regarding NPRR1209, and while the Commission’s order does not directly address NPRR1209, ERCOT agrees it would be inconsistent to revise the Protocols to assess failure-to-provide charges against a QSE based on an ESR’s insufficient SOC when the Commission has explicitly rejected the inclusion of a SOC compliance requirement in the Protocols. For this reason, ERCOT recommends that it be directed to withdraw NPRR1209 which is currently pending at the Protocol Revision Subcommittee. ERCOT requests Board direction in this case because the Board previously directed ERCOT to pursue NPRR1209 as a Board Priority Revision Request.

**Key Factors Influencing Issue:**

1. On January 18, 2024, the Commission issued an order in Project No. 54445 (Order) remanding to the Board NPRR1186.
2. The Order “suggested modifications” to NPRR1186, specifically “the proposed amendment to add paragraph (4) to ERCOT Protocol Section 8.1, QSE and

Resource Performance Monitoring, should be removed in its entirety, including gray box language and subparagraphs (a) and (b).”

3. The suggested modifications in the Commission’s Order remove from NPRR1186 language that would have required each QSE that relies on an ESR to provide Ancillary Services to ensure that the ESR maintains sufficient SOC to fulfill each Ancillary Service it provides, and the modifications also remove language that required ERCOT to report certain defined instances of non-compliance to the ERCOT Reliability Monitor.
4. The 2/12/24 ERCOT comments recommend to remove from NPRR1186 the proposed amendment to add paragraph (4) to Protocol Section 8.1 in its entirety, including gray box language and subparagraphs (a) and (b), and also recommend minor clarifications in paragraphs (3) and (9) of Section 6.5.7.2.
5. It would be inconsistent for NPRR1209 to revise the Protocols to assess failure-to-provide charges against a QSE based on an ESR’s insufficient SOC when the Commission has explicitly rejected the inclusion of a SOC compliance requirement in the Protocols.

**Conclusion/Recommendation:**

ERCOT staff recommends, and the R&M Committee is expected to recommend, that the Board: (1) recommend approval of NPRR1186 as amended by the 2/12/24 ERCOT comments; and (2) direct ERCOT staff to withdraw NPRR1209.



**ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.**  
**BOARD OF DIRECTORS RESOLUTION**

WHEREAS, on January 18, 2024, the Public Utility Commission of Texas (PUCT, Commission) issued an order in Project No. 54445 (Order) remanding to the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) Nodal Protocol Revision Request (NPRR) 1186, *Improvements Prior to the RTC+B Project for Better ESR State of Charge Awareness, Accounting, and Monitoring*;

WHEREAS, the Commission's Order suggested modifications to NPRR1186, specifically "the proposed amendment to add paragraph (4) to ERCOT Protocol Section 8.1, QSE and Resource Performance Monitoring, should be removed in its entirety, including gray box language and subparagraphs (a) and (b)";

WHEREAS, the suggested modifications in the Commission's Order remove language from NPRR1186 that would have required each Qualified Scheduling Entity (QSE) that relies on an Energy Storage Resource (ESR) to provide Ancillary Services to ensure that the ESR maintains sufficient State of Charge (SOC) to fulfill each Ancillary Service it provides, and the modifications also remove language that required ERCOT to report certain defined instances of non-compliance to the ERCOT Reliability Monitor;

WHEREAS, the 2/12/24 ERCOT comments recommend to remove from NPRR1186 the proposed amendment to add paragraph (4) to ERCOT Protocol Section 8.1, QSE and Resource Performance Monitoring, in its entirety, including gray box language and subparagraphs (a) and (b), and recommend minor clarifications to paragraphs (3) and (9) of Protocol Section 6.5.7.2, Resource Limit Calculator, to ensure alignment with revisions ERCOT made last September to the language concerning the High Ancillary Services Limit (HASL) calculation; and

WHEREAS, it would be inconsistent for NPRR1209, *Board Priority – State Of Charge Ancillary Service Failed Quantity Allocations under NPRR1149*, to revise the Protocols to assess failure-to-provide charges against a QSE based on an ESR's insufficient SOC when the Commission has explicitly rejected the inclusion of a SOC compliance requirement in the Protocols;

THEREFORE, BE IT RESOLVED, that the Board hereby (1) recommends approval of NPRR1186 as amended by the 2/12/24 ERCOT comments, and (2) directs ERCOT staff to withdraw NPRR1209.



**CORPORATE SECRETARY'S CERTIFICATE**

I, Jonathan M. Levine, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its February 27, 2024 meeting, the Board passed a motion approving the above Resolution by \_\_\_\_\_.

IN WITNESS WHEREOF, I have hereunto set my hand this \_\_\_\_ day of February, 2024.

\_\_\_\_\_  
Jonathan M. Levine  
Assistant Corporate Secretary

# NPRR Comments

Attachment A

<b>NPRR Number</b>	<a href="#">1186</a>	<b>NPRR Title</b>	<b>Improvements Prior to the RTC+B Project for Better ESR State of Charge Awareness, Accounting, and Monitoring</b>
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<b>Date</b>	February 12, 2024
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<b>Submitter's Information</b>	
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<b>Market Segment</b>	Not applicable

## Comments

ERCOT submits these comments to incorporate revisions to Nodal Protocol Revision Request (NPRR) 1186 consistent with the Public Utility Commission of Texas's (PUC) January 18, 2024 order remanding NPRR1186 to the ERCOT Board of Directors (Board).<sup>1</sup> ERCOT proposes that the Board recommend approval of this NPRR as modified by these comments.

At its October 17, 2023 meeting, the Board voted to recommend approval of NPRR1186. Following this recommendation, ERCOT filed NPRR1186 with the PUC. The PUC considered NPRR1186 at its November 30, 2023 Open Meeting. At that meeting, two Commissioners expressed concerns with the proposed State of Charge (SOC) compliance requirements in Section 8.1, QSE and Resource Performance Monitoring, of NPRR1186 and therefore deferred acting on the NPRR to allow further information from ERCOT and stakeholders. The Commission next considered the NPRR at its January 18, 2024 Open Meeting. After significant discussion related to ERCOT's reliability need, Energy Storage Resource (ESR) development, and the potential discriminatory impact of the NPRR, the Commissioners voted to remand NPRR1186 to the Board with "suggested modifications" to remove the SOC compliance requirements from the NPRR. Specifically, the PUC's order states that "the proposed amendment to add paragraph (4) to ERCOT Nodal Protocols § 8.1, QSE and Resource Performance Monitoring, should be removed in its entirety, including gray box language and subparagraphs (a) and (b)."<sup>2</sup>

<sup>1</sup> See *CY 2023 Review of Rules Adopted by the Independent Organization*, Order Remanding ERCOT Nodal Protocol Revision Request 1186 (Jan. 18, 2024) ("Order"), available at [https://interchange.puc.texas.gov/Documents/54445\\_64\\_1360141.PDF](https://interchange.puc.texas.gov/Documents/54445_64_1360141.PDF).

<sup>2</sup> Order at 1.



Consistent with the PUCT's suggested modifications, ERCOT proposes that the Board remove the SOC compliance requirements previously reflected in paragraph (4) of Section 8.1 from the text of this NPRR, as reflected in the revisions below.

Because the revisions described in the PUCT's order seem straightforward, ERCOT recommends that the Board adopt these recommended revisions without formally requesting additional input from the Technical Advisory Committee (TAC) or other stakeholder bodies. The Board's authority to decide this question without soliciting stakeholder feedback is consistent with the governing statute, which contemplates a "remand with suggested modifications *to the independent organization's governing body*," PURA § 39.151(g-6), and the PUCT's order, which directs that NPRR1186 be "remanded *to the ERCOT Board*." If any stakeholders may disagree with ERCOT's proposed revisions for any reason, they may submit a comment to the NPRR, which may be considered by the Board.

ERCOT expects that the simple approach proposed in this case may not be appropriate in all cases of remand, as the specific action that may be required to comply with a PUCT remand directive may not always be as clear. For example, in some cases of remand, the PUCT's order may provide only general direction, leaving ERCOT some flexibility to decide how best to address the suggestion. In such instances, ERCOT expects that the Board may wish to request input from TAC and/or other stakeholder groups regarding the appropriate revisions to address the remanded Revision Request.

These comments also include minor clarifications to paragraphs (3) and (9) of Section 6.5.7.2, Resource Limit Calculator, to ensure alignment with revisions ERCOT made last September to the language concerning the High Ancillary Services Limit (HASL) calculation. The clarification revises the definition of two variables in those provisions that define the required SOC values used in the calculation of the High Ancillary Services Limit (HASL)—specifically, REQASSOC and REQHDRMASSOC—to remove references to "Ancillary Service duration requirements," consistent with the calculation of the SOC value referenced in paragraph (14) of Section 6.5.5.2, Operational Data Requirements. ERCOT's September 19, 2023 comments to NPRR1186 revised that paragraph to remove the reference to duration requirements for Ancillary Services. Because paragraph (14) of Section 6.5.5.2 is intended to describe the calculation of the SOC value used in Section 6.5.5.2, the two provisions need to be aligned to avoid potential confusion.

In addition to recommending approval of these proposed revisions to NPRR1186, ERCOT requests that the Board also provide direction regarding NPRR1209, *State Of Charge Ancillary Service Failed Quantity Allocations under NPRR1149*, which is an NPRR the Board directed ERCOT to submit as a Board Priority NPRR at its October 2023 meeting. As currently proposed, NPRR1209 would explicitly provide that an SOC insufficiency of any ESR carrying an Ancillary Service Resource Responsibility would be considered a "failed quantity" that would result in a claw-back of Ancillary Services revenues for the Qualified Scheduling Entity (QSE) associated with the ESR. At the January 18, 2024 Open Meeting, as part of the discussion of the SOC requirements in NPRR1186, the Commissioners expressed concerns that NPRR1209 would be inconsistent with the elimination of the SOC compliance requirement in paragraph (4) of Section 8.1 in

NPRR1186. While the Commissioners did not formally take a vote regarding NPRR1209, and while the PUCT’s order does not directly address NPRR1209, ERCOT agrees that it would be inconsistent to revise the Protocols to assess failure-to-provide charges against a QSE based on an ESR’s SOC insufficiency when the PUCT has explicitly rejected the inclusion of an SOC compliance requirement in the Protocols. For this reason, ERCOT recommends that it be directed to withdraw NPRR1209 which is currently pending at the Protocol Revision Subcommittee (PRS). ERCOT requests Board direction in this case solely because the Board previously directed ERCOT to pursue this NPRR as a Board Priority NPRR.

**Revised Cover Page Language**

<b>Revision Description</b>	<p>This NPRR is the first of two NPRRs that ERCOT has prepared to improve the awareness, accounting, and monitoring of the State of Charge (SOC) for an ESR. This particular NPRR is for the interim period which is described as the time period before the RTC+B project goes live. The target go-live date for the RTC+B project is expected to be several years away and the language and changes in this first NPRR are aimed to strategically improve SOC awareness, accounting, and monitoring with minimal system changes so that the improvements can be in place while the RTC+B project is completed.</p> <p>This NPRR:</p> <ul style="list-style-type: none"> <li>• Adds definitions and telemetry requirements related to ESR SOC information that was specified in the fall of 2018. Most of the definitions added to the Protocols with this NPRR are simply a lift of language that was previously provided;</li> <li>• For Real-Time, High Ancillary Service Limit (HASL) calculations are modified to account for SOC required to support an ESR’s Ancillary Service Resource Responsibility;</li> <li>• Clarifies that Non-Frequency Responsive Capacity (NFRC) will be accounted for in the HASL calculation when Responsive Reserve (RRS) responsibility is non-zero;</li> <li>• Introduces the requirement for a Qualified Scheduling Entity (QSE) representing an ESR to telemeter a new quantity representing the next Operating Hour’s Ancillary Service Resource Responsibility for the ESR. This requirement of next Operating Hour’s Ancillary Service Resource Responsibility will be deprecated after RTC+B project goes live;</li> <li>• Introduces the requirement for a QSE representing an ESR to complete three new values in the Current Operating Plan (COP), including the Hour Beginning Planned SOC, Minimum State of</li> </ul>
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	<p>Charge (MinSOC), and Maximum State of Charge (MaxSOC). The COP information is needed in the interim period and will also be used once the RTC+B project goes live; <u>and</u></p> <ul style="list-style-type: none"> <li>• <del>Specifies that the Day Ahead Market (DAM) process should be changed and begin to respect the Ancillary Service award limits for ESRs based on Ancillary Service duration requirements;</del></li> <li>• Specifies how the Hour Beginning Planned SOC values provided by a QSE through COP submittals will be accounted for in Reliability Unit Commitment (RUC) studies; <u>and</u></li> <li>• <del>Specifies that a QSE is expected manage the SOC of an ESR to ensure that each ESR has sufficient energy to meet its Ancillary Service Resource Responsibilities.</del></li> </ul> <p>This NPRR does NOT specify that ERCOT manage the SOC for an ESR. It specifies existing and new information to be provided by the QSE so that ERCOT can better understand each ESR’s current energy capability and expected energy capability in future hours.</p> <p>Grey-boxed language related to DC-Coupled Resources was not revised with this NPRR.</p> <p>The purpose of the second NPRR (NPRR1204, Considerations of State of Charge with Real-Time Co-Optimization Implementation) is to implement similar improvements in the awareness, accounting and monitoring of the SOC for an ESR along with the other features of the RTC+B project and specifically the Single-Model ESR implementation. In most cases the work done to implement this NPRR will carry over to NPRR1204.</p>

**Revised Proposed Protocol Language**

**2.1 DEFINITIONS**

**State of Charge (SOC)**

The stored energy in MWh, of an ESR, that can be injected into the grid at the Point of Interconnection (POI) or Point of Common Coupling (POCC).

Hour Beginning Planned SOC

The planned State of Charge, in MWh, at the beginning of an hour, as communicated to ERCOT by the QSE for the Resource.

Minimum State of Charge (MinSOC)

The minimum amount of State of Charge, in MWh of an ESR.

Maximum State of Charge (MaxSOC)

The maximum amount of State of Charge, in MWh of an ESR.

**2.2 ACRONYMS AND ABBREVIATIONS**

<u>SOC</u>	<u>State of Charge</u>
<u>MinSOC</u>	<u>Minimum State of Charge</u>
<u>MaxSOC</u>	<u>Maximum State of Charge</u>
<u>MWhh</u>	<u>Megawatt Hour Hour</u>

**3.8.1 Split Generation Resources**

- (1) When a generation meter is split, as provided for in Section 10.3.2.1, Generation Resource Meter Splitting, two or more independent Generation Resources must be created in the ERCOT Network Operations Model according to Section 3.10.7.2, Modeling of Resources and Transmission Loads, to function in all respects as Split Generation Resources in ERCOT System operation. A Combined Cycle Train may not be registered in ERCOT as a Split Generation Resource. A Distribution Generation Resource (DGR) or Distribution Energy Storage Resource (DESR) may not be registered in ERCOT as a Split Generation Resource. An Energy Storage Resource (ESR) may not be registered in ERCOT as a Split Generation Resource.
- (2) Each Qualified Scheduling Entity (QSE) representing a Split Generation Resource shall collect and shall submit to ERCOT the Resource Parameters defined under Section 3.7, Resource Parameters, for the Split Generation Resource it represents. The parameters provided must be consistent with the parameters submitted by each other QSE that represents a Split Generation Resource from the same Generation Resource. The parameters submitted for each Split Generation Resource for limits and ramp rates must be according to the capability of the Split Generation Resource represented by the QSE. Startup and shutdown times, time to change status and number of starts must be identical for all the Split Generation Resources from the same Generation Resource submitted by each QSE. ERCOT shall review data submitted by each QSE representing Split Generation Resources for consistency and notify each QSE of any errors.

- (3) Each Split Generation Resource may be represented by a different QSE. The Resource Entities that own or control the Split Generation Resources from a single Generation Resource must designate a Master QSE. Each QSE representing a Split Generation Resource must comply in all respects to the requirements of a Generation Resource specified under these Protocols.
- (4) The Master QSE shall:
  - (a) Serve as the Single Point of Contact for the Generation Resource, as required by Section 3.1.4.1, Single Point of Contact;
  - (b) Provide real-time telemetry for the total Generation Resource, as specified in Section 6.5.5.2, Operational Data Requirements; and
  - (c) Receive Verbal Dispatch Instructions (VDIs) from ERCOT, as specified in Section 6.5.7.8, Dispatch Procedures.
- (5) Each QSE is responsible for representing its Split Generation Resource in its Current Operating Plan (COP). During the Reliability Unit Commitment (RUC) Study Periods, any conflict in the Resource Status of a Split Generation Resource in the COP is resolved according to the following:
  - (a) If a Split Generation Resource has a Resource Status of OUT for any hour in the COP, then any other QSEs' COP entries for their Split Generation Resources from the same Generation Resource are also considered unavailable for the hour;
  - (b) If the QSEs for all Split Generation Resources from the same Generation Resource have submitted a COP and at least one of the QSEs has an On-Line Resource Status in a given hour, then the status for all Split Generation Resources for the Generation Resource is considered to be On-Line for that hour, except if any of the QSEs has indicated in the COP a Resource Status of OUT.
- (6) Each QSE representing a Split Generation Resource shall update its individual Resource Status appropriately.
- (7) Each QSE representing a Split Generation Resource may independently submit Energy Offer Curves and Three-Part Supply Offers. ERCOT shall treat each Split Generation Resource offer as a separate offer, except that all Split Generation Resources in a single Generation Resource must be committed or decommitted together.

***[NPRR1007: Replace paragraph (7) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]***

- (7) Each QSE representing a Split Generation Resource may independently submit Energy Offer Curves, Ancillary Service Offers, and Three-Part Supply Offers. ERCOT shall treat each Split Generation Resource offer as a separate offer, except that all Split

Generation Resources in a single Generation Resource must be committed or decommitted together.

- (8) Each QSE submitting verifiable cost data to ERCOT shall coordinate among all owners of a single Generation Resource to provide individual Split Generation Resource data consistent with the total verifiable cost of the entire Generation Resource. ERCOT may compare the total verifiable costs with other similarly situated Generation Resources to determine the reasonability of the cost.

### 3.9.1 *Current Operating Plan (COP) Criteria*

- (1) Each QSE that represents a Resource must submit a COP to ERCOT that reflects expected operating conditions for each Resource for each hour in the next seven Operating Days.
- (2) Each QSE that represents a Resource shall update its COP reflecting changes in availability of any Resource as soon as reasonably practicable, but in no event later than 60 minutes after the event that caused the change. Each QSE shall timely update its COP unless in the reasonable judgment of the QSE, such compliance would create an undue threat to safety, undue risk of bodily harm, or undue damage to equipment. The QSE is excused from updating the COP only for so long as the undue threat to safety, undue risk of bodily harm, or undue damage to equipment exists. The time for updating the COP begins once the undue threat to safety, undue risk of bodily harm, or undue damage to equipment no longer exists.
- (3) The Resource capacity in a QSE's COP must be sufficient to supply the Ancillary Service Supply Responsibility of that QSE. Additionally, for a COP provided for an ESR, the QSE shall ensure that the Hour Beginning Planned State of Charge (SOC) for any two consecutive hours shall be feasible based on the ESR's maximum rate of charge or discharge.

***[NPRR1007, NPRR1014, and NPRR1029: Replace applicable portions of paragraph (3) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029:]***

- (3) Each QSE that represents a Resource shall update its COP to reflect the ability of the Resource to provide each Ancillary Service by product and sub-type.
- (4) Load Resource COP values may be adjusted to reflect Distribution Losses in accordance with Section 8.1.1.2, General Capacity Testing Requirements.
- (5) A COP must include the following for each Resource represented by the QSE:
- (a) The name of the Resource;

- (b) The expected Resource Status:
  - (i) Select one of the following for Generation Resources synchronized to the ERCOT System that best describes the Resource’s status. Unless otherwise provided below, these Resource Statuses are to be used for COP and/or Real-Time telemetry purposes, as appropriate.
    - (A) ONRUC – On-Line and the hour is a RUC-Committed Hour;
    - (B) ONREG – On-Line Resource with Energy Offer Curve providing Regulation Service;

***[NPRR1007, NPRR1014, and NPRR1029: Delete item (B) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029; and renumber accordingly.]***

- (C) ON – On-Line Resource with Energy Offer Curve;
- (D) ONDSR – On-Line Dynamically Scheduled Resource (DSR);

***[NPRR1000: Delete item (D) above upon system implementation and renumber accordingly.]***

- (E) ONOS – On-Line Resource with Output Schedule;
- (F) ONOSREG – On-Line Resource with Output Schedule providing Regulation Service;

***[NPRR1007, NPRR1014, and NPRR1029: Delete item (F) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029; and renumber accordingly.]***

- (G) ONDSRREG – On-Line DSR providing Regulation Service;

***[NPRR1000, NPRR1007, NPRR1014, and NPRR1029: Delete item (G) above upon system implementation for NPRR1000, NPRR1014, or NPRR1029; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; and renumber accordingly.]***

- (H) FRRSUP – Available for Dispatch of Fast Responding Regulation Service (FRRS). This Resource Status is only to be used for Real-Time telemetry purposes;

***[NPRR1007, NPRR1014, and NPRR1029: Delete item (H) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 and NPRR1029; and renumber accordingly.]***

- (I) ONTEST – On-Line blocked from Security-Constrained Economic Dispatch (SCED) for operations testing (while ONTEST, a Generation Resource may be shown on Outage in the Outage Scheduler);
- (J) ONEMR – On-Line EMR (available for commitment or dispatch only for ERCOT-declared Emergency Conditions; the QSE may appropriately set LSL and High Sustained Limit (HSL) to reflect operating limits);
- (K) ONRR – On-Line as a synchronous condenser providing Responsive Reserve (RRS) but unavailable for Dispatch by SCED and available for commitment by RUC;

***[NPRR1007, NPRR1014, and NPRR1029: Delete item (K) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029; and renumber accordingly.]***

- (L) ONECRS – On-Line as a synchronous condenser providing ERCOT Contingency Response Service (ECRS) but unavailable for Dispatch by SCED and available for commitment by RUC;

***[NPRR1007, NPRR1014, and NPRR1029: Delete item (L) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029; and renumber accordingly.]***

- (M) ONOPTOUT – On-Line and the hour is a RUC Buy-Back Hour;
- (N) SHUTDOWN – The Resource is On-Line and in a shutdown sequence, and has no Ancillary Service Obligations other than Off-Line Non-Spinning Reserve (Non-Spin) which the Resource will provide following the shutdown. This Resource Status is only to be used for Real-Time telemetry purposes;

***[NPRR1007, NPRR1014, and NPRR1029: Replace paragraph (N) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029:]***



- (N) SHUTDOWN – The Resource is On-Line and in a shutdown sequence, and is not eligible for an Ancillary Service award. This Resource Status is only to be used for Real-Time telemetry purposes;

- (O) STARTUP – The Resource is On-Line and in a start-up sequence and has no Ancillary Service Obligations. This Resource Status is only to be used for Real-Time telemetry purposes;

***[NPRR1007, NPRR1014, and NPRR1029: Replace paragraph (O) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029:]***

- (O) STARTUP – The Resource is On-Line and in a start-up sequence and is not eligible for an Ancillary Service award, unless coming On-Line in response to a manual deployment of ERCOT Contingency Reserve Service (ECRS) or Non-Spinning Reserve (Non-Spin). This Resource Status is only to be used for Real-Time telemetry purposes;

- (P) OFFQS – Off-Line but available for SCED deployment. Only qualified Quick Start Generation Resources (QSGRs) may utilize this status;

***[NPRR1007, NPRR1014, and NPRR1029: Replace paragraph (P) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029:]***

- (P) OFFQS – Off-Line but available for SCED deployment and to provide ECRS and Non-Spin, if qualified and capable. Only qualified Quick Start Generation Resources (QSGRs) may utilize this status;

- (Q) ONFFRRRS – Available for Dispatch of RRS when providing Fast Frequency Response (FFR) from Generation Resources. This Resource Status is only to be used for Real-Time telemetry purposes. A Resource with this Resource Status may also be providing Ancillary Services other than FFR; and

***[NPRR1007, NPRR1014, and NPRR1029: Delete item (Q) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029; and renumber accordingly.]***

***[NPRR1007, NPRR1014, and NPRR1029: Insert item (K) below upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029:]***

(K) ONSC – Resource is On-Line operating as a synchronous condenser and available to provide Responsive Reserve (RRS) and ECRS, if qualified and capable, and for commitment by RUC, but is unavailable for Dispatch by SCED. For SCED, Resource Base Points will be set equal to the telemetered net real power of the Resource available at the time of the SCED execution; and

(R) ONHOLD – Resource is On-Line but temporarily unavailable for Dispatch by SCED or for participating in Ancillary Services. This Resource Status is only to be used for Real-Time telemetry purposes. For SCED, Resource Base Points will be set equal to the telemetered net real power of the Resource available at the time of the SCED execution.

***[NPRR1007, NPRR1014, and NPRR1029: Replace item (R) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029:]***

(R) ONHOLD – Resource is On-Line but temporarily unavailable for Dispatch by SCED or Ancillary Service awards. This Resource Status is only to be used for Real-Time telemetry purposes. For SCED, Resource Base Points will be set equal to the telemetered net real power of the Resource available at the time of the SCED execution.

- (ii) Select one of the following for Off-Line Generation Resources not synchronized to the ERCOT System that best describes the Resource’s status. These Resource Statuses are to be used for COP and/or Real-Time telemetry purposes, as appropriate.
  - (A) OUT – Off-Line and unavailable, or not connected to the ERCOT System and operating in a Private Microgrid Island (PMI);
  - (B) OFFNS – Off-Line but reserved for Non-Spin;

***[NPRR1007, NPRR1014, and NPRR1029: Delete item (B) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029; and renumber accordingly.]***

- (C) OFF – Off-Line but available for commitment in the Day-Ahead Market (DAM) and RUC;

***[NPRR1007, NPRR1014, and NPRR1029: Replace item (C) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029:]***

- (B) OFF – Off-Line but available for commitment in the Day-Ahead Market (DAM), RUC, and providing Non-Spin, if qualified and capable;

- (D) EMR – Available for commitment as a Resource contracted by ERCOT under Section 3.14.1, Reliability Must Run, or under paragraph (4) of Section 6.5.1.1, ERCOT Control Area Authority, or available for commitment only for ERCOT-declared Emergency Condition events; the QSE may appropriately set LSL and HSL to reflect operating limits;
- (E) EMRSWGR – Switchable Generation Resource (SWGR) operating in a non-ERCOT Control Area, or in the case of a Combined Cycle Train with one or more SWGRs, a configuration in which one or more of the physical units in that configuration are operating in a non-ERCOT Control Area.

(iii) Select one of the following for Load Resources. Unless otherwise provided below, these Resource Statuses are to be used for COP and/or Real-Time telemetry purposes.

- (A) ONRGL – Available for Dispatch of Regulation Service by Load Frequency Control (LFC) and, for any remaining Dispatchable capacity, by SCED with a Real-Time Market (RTM) Energy Bid;
- (B) FRRSUP – Available for Dispatch of FRRS by LFC and not Dispatchable by SCED. This Resource Status is only to be used for Real-Time telemetry purposes;
- (C) FRRSDN - Available for Dispatch of FRRS by LFC and not Dispatchable by SCED. This Resource Status is only to be used for Real-Time telemetry purposes;

- (D) ONCLR – Available for Dispatch as a Controllable Load Resource by SCED with an RTM Energy Bid;
- (E) ONRL – Available for Dispatch of RRS or Non-Spin, excluding Controllable Load Resources. A Load Resource, excluding Controllable Load Resources, may not provide ECRS with this Resource Status;

***[NPRR1007, NPRR1014, and NPRR1029: Delete items (A)-(E) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029; and renumber accordingly.]***

- (F) ONECL – Available for Dispatch of ECRS or available for Dispatch of ECRS and RRS simultaneously, excluding Controllable Load Resources;

***[NPRR1007, NPRR1014, and NPRR1029: Delete item (F) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029; and renumber accordingly.]***

- (G) OUTL – Not available;
- (H) ONFFRRRSL – Available for Dispatch of RRS when providing FFR, excluding Controllable Load Resources. This Resource Status is only to be used for Real-Time telemetry purposes;

***[NPRR1007, NPRR1014, and NPRR1029: Delete item (H) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029.]***

***[NPRR1007, NPRR1014, NPRR1029: Insert item (B) below upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029:]***

- (B) ONL – On-Line and available for Dispatch by SCED or providing Ancillary Services.

***[NPRR1014 or NPRR1029: Insert applicable portions of paragraph (iv) below upon system implementation:]***

- (iv) Select one of the following for Energy Storage Resources (ESRs). Unless otherwise provided below, these Resource Statuses are to be used for COP and Real-Time telemetry purposes:
  - (A) ON – On-Line Resource with Energy Bid/Offer Curve;
  - (B) ONOS – On-Line Resource with Output Schedule;
  - (C) ONTEST – On-Line blocked from SCED for operations testing (while ONTEST, an Energy Storage Resource (ESR) may be shown on Outage in the Outage Scheduler);
  - (D) ONEMR – On-Line EMR (available for commitment or dispatch only for ERCOT-declared Emergency Conditions; the QSE may appropriately set LSL and High Sustained Limit (HSL) to reflect operating limits);
  - (E) ONHOLD – Resource is On-Line but temporarily unavailable for Dispatch by SCED or Ancillary Service awards. ESRs shall not be discharging into or charging from the grid. This Resource Status is only to be used for Real-Time telemetry purposes; and
  - (F) OUT – Off-Line and unavailable, or not connected to the ERCOT System and operating in a Private Microgrid Island (PMI);

- (c) The HSL;
  - (i) For Load Resources other than Controllable Load Resources, the HSL should equal the expected power consumption;

***[NPRR1014 and NPRR1029: Insert applicable portions of paragraph (ii) below upon system implementation:]***

- (ii) For ESRs, the HSL may be negative;

- (d) The LSL;
  - (i) For Load Resources other than Controllable Load Resources, the LSL should equal the expected Low Power Consumption (LPC);

***[NPRR1014 and NPRR1029: Insert applicable portions of paragraph (ii) below upon system implementation:]***

- (ii) For ESRs, the LSL may be positive;

- (e) The High Emergency Limit (HEL);
- (f) The Low Emergency Limit (LEL); and
- (g) Ancillary Service Resource Responsibility capacity in MW for:

***[NPRR1007, NPRR1014, and NPRR1029: Replace applicable portions of item (g) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029:]***

- (g) Ancillary Service capability in MW for each product and sub-type.

- (i) Regulation Up (Reg-Up);
- (ii) Regulation Down (Reg-Down);
- (iii) RRS;
- (iv) ECRS; and
- (v) Non-Spin.

(h) For ESRs:

- (i) Minimum State of Charge (MinSOC);
- (ii) Maximum State of Charge (MaxSOC); and
- (iii) Hour Beginning Planned SOC.

***[NPRR1007, NPRR1014, and NPRR1029: Delete items (i)-(v) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029.]***

- (6) For Combined Cycle Generation Resources, the above items are required for each operating configuration. In each hour only one Combined Cycle Generation Resource in a Combined Cycle Train may be assigned one of the On-Line Resource Status codes described above.
  - (a) During a RUC study period, if a QSE’s COP reports multiple Combined Cycle Generation Resources in a Combined Cycle Train to be On-Line for any hour, then until the QSE corrects its COP, the On-Line Combined Cycle Generation Resource with the largest HSL is considered to be On-Line and all other Combined Cycle Generation Resources in the Combined Cycle Train are considered to be Off-Line. Furthermore, until the QSE corrects its COP, the Off-

Line Combined Cycle Generation Resources as designated through the application of this process are ineligible for RUC commitment or de-commitment Dispatch Instructions.

- (b) For any hour in which QSE-submitted COP entries are used to determine the initial state of a Combined Cycle Generation Resource for a DAM or Day-Ahead Reliability Unit Commitment (DRUC) study and the COP shows multiple Combined Cycle Generation Resources in a Combined Cycle Train to be in an On-line Resource Status, then until the QSE corrects its COP, the On-Line Combined Cycle Generation Resource that has been On-Line for the longest time from the last recorded start by ERCOT systems, regardless of the reason for the start, combined with the COP Resource Status for the remaining hours of the current Operating Day, is considered to be On-Line at the start of the DRUC study period and all other COP-designated Combined Cycle Generation Resources in the Combined Cycle Train are considered to be Off-Line.
- (c) ERCOT systems shall allow only one Combined Cycle Generation Resource in a Combined Cycle Train to offer Off-Line Non-Spin in the DAM or Supplemental Ancillary Services Market (SASM).

***[NPRR1007, NPRR1014, and NPRR1029: Replace paragraph (c) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014 or NPRR1029:]***

- (c) ERCOT systems shall allow only one Combined Cycle Generation Resource in a Combined Cycle Train to offer Off-Line Non-Spin in the DAM or SCED.
  - (i) If there are multiple Non-Spin offers from different Combined Cycle Generation Resources in a Combined Cycle Train, then prior to execution of the DAM, ERCOT shall select the Non-Spin offer from the Combined Cycle Generation Resource with the highest HSL for consideration in the DAM and ignore the other offers.
  - (ii) Combined Cycle Generation Resources offering Off-Line Non-Spin must be able to transition from the shutdown state to the offered Combined Cycle Generation Resource On-Line state and be capable of ramping to the full amount of the Non-Spin offered.
- (d) The DAM and RUC shall honor the registered hot, intermediate or cold Startup Costs for each Combined Cycle Generation Resource registered in a Combined Cycle Train when determining the transition costs for a Combined Cycle Generation Resource. In the DAM and RUC, the Startup Cost for a Combined Cycle Generation Resource shall be determined by the positive transition cost from the On-Line Combined Cycle Generation Resource within the Combine Cycle Train or from a shutdown condition, whichever ERCOT determines to be appropriate.

- (7) ERCOT may accept COPs only from QSEs.
- (8) For the first 168 hours of the COP, ERCOT will update the HSL values for Wind-powered Generation Resources (WGRs) with the most recently updated Short-Term Wind Power Forecast (STWPF), and the HSL values for PhotoVoltaic Generation Resources (PVGRs) with the most recently updated Short-Term PhotoVoltaic Power Forecast (STPPF). ERCOT will notify the QSE via an Extensible Markup Language (XML) message each time COP HSL values are updated with the forecast values. A QSE representing a WGR may override the STWPF HSL value but must submit an HSL value that is less than or equal to the amount for that Resource from the most recent STWPF provided by ERCOT; a QSE representing a PVGR may override the STPPF HSL value but must submit an HSL value that is less than or equal to the amount for that Resource from the most recent STPPF provided by ERCOT.

***[NPRR1029: Replace paragraph (8) above with the following upon system implementation:]***

- (8) For the first 168 hours of the COP, ERCOT will update the HSL values for Wind-powered Generation Resources (WGRs) with the most recently updated Short-Term Wind Power Forecast (STWPF), and the HSL values for PhotoVoltaic Generation Resources (PVGRs) with the most recently updated Short-Term PhotoVoltaic Power Forecast (STPPF). A QSE representing a DC-Coupled Resource shall provide the capacity value of the Energy Storage System (ESS) that is included in the HSL of the DC-Coupled Resource, and ERCOT will update the DC-Coupled Resource's HSL with the sum of the forecasts of the intermittent renewable generation component and the QSE-submitted value for the ESS component. ERCOT will notify the QSE via an Extensible Markup Language (XML) message each time COP HSL values are updated with the forecast values. A QSE representing a WGR may override the STWPF HSL value but must submit an HSL value that is less than or equal to the amount for that Resource from the most recent STWPF provided by ERCOT; a QSE representing a PVGR may override the STPPF HSL value but must submit an HSL value that is less than or equal to the amount for that Resource from the most recent STPPF provided by ERCOT. A QSE representing a DC-Coupled Resource may override the COP HSL value with a value that is lower than the ERCOT-populated value, and may override with a value that is higher than the ERCOT-populated value if the ESS component of the DC-Coupled Resource can support the higher value.
- (9) A QSE representing a Generation Resource that is not actively providing Ancillary Services or is providing Off-Line Non-Spin that the Resource will provide following the shutdown, may only use a Resource Status of SHUTDOWN to indicate to ERCOT through telemetry that the Resource is operating in a shutdown sequence or a Resource Status of ONTEST to indicate in the COP and through telemetry that the Generation Resource is performing a test of its operations either manually dispatched by the QSE or by ERCOT as part of the test. A QSE representing a Generation Resource that is not actively providing Ancillary Services may only use a Resource Status of STARTUP to



indicate to ERCOT through telemetry that the Resource is operating in a start-up sequence requiring manual control and is not available for Dispatch.

- (10) If a QSE has not submitted a valid COP for any Generation Resource for any hour in the DAM or RUC Study Period, then the Generation Resource is considered to have a Resource Status as OUT thus not available for DAM awards or RUC commitments for those hours.
- (11) If a COP is not available for any Resource for any hour from the current hour to the start of the DAM period or RUC study, then the Resource Status for those hours are considered equal to the last known Resource Status from a previous hour’s COP or from telemetry as appropriate for that Resource.
- (12) A QSE representing a Resource may only use the Resource Status code of EMR for a Resource whose operation would have impacts that cannot be monetized and reflected through the Resource’s Energy Offer Curve or recovered through the RUC make-whole process or if the Resource has been contracted by ERCOT under Section 3.14.1 or under paragraph (4) of Section 6.5.1.1. If ERCOT chooses to commit an Off-Line unit with EMR Resource Status that has been contracted by ERCOT under Section 3.14.1 or under paragraph (4) of Section 6.5.1.1, the QSE shall change its Resource Status to ONRUC. Otherwise, the QSE shall change its Resource Status to ONEMR.
- (13) A QSE representing a Resource may use the Resource Status code of ONEMR for a Resource that is:
  - (a) On-Line, but for equipment problems it must be held at its current output level until repair and/or replacement of equipment can be accomplished; or
  - (b) A hydro unit.
- (14) A QSE operating a Resource with a Resource Status code of ONEMR may set the HSL and LSL of the unit to be equal to ensure that SCED does not send Base Points that would move the unit.
- (15) A QSE representing a Resource may use the Resource Status code of EMRSWGR only for an SWGR.

***[NPRR1026: Insert paragraph (16) below upon system implementation:]***

- (16) A QSE representing a Self-Limiting Facility must ensure that the sum of the COP HSL/LSL and the sum of the telemetered HSL/LSL submitted for each Resource within the Self-Limiting Facility do not exceed either the limit on MW Injection or the limit on the MW Withdrawal established for the Self-Limiting Facility.

***[NPRR1029: Insert paragraph (16) below upon system implementation:]***

(16) A QSE representing a DC-Coupled Resource shall not submit an HSL that exceeds the inverter rating or the sum of the nameplate ratings of the generation component(s) of the Resource.

(17) A QSE representing an ESR shall ensure that COP values for a given hour follow the following rules:

(a) MinSOC is greater than or equal to the nameplate minimum MWh operating SOC limit;

(b) MaxSOC is less than or equal to the nameplate maximum MWh operating SOC limit; and

(c) Hour Beginning Planned SOC is a value between the corresponding COP values of MinSOC and MaxSOC.

#### **4.5.1 DAM Clearing Process**

- (1) At 1000 in the Day-Ahead, ERCOT shall start the Day-Ahead Market (DAM) clearing process. If the processing of DAM bids and offers after 0900 is significantly delayed or impacted by a failure of ERCOT software or systems that directly impacts the DAM, ERCOT shall post a Notice as soon as practicable on the ERCOT website, in accordance with paragraph (1) of Section 4.1.2, Day-Ahead Process and Timing Deviations, extending the start time of the execution of the DAM clearing process by an amount of time at least as long as the duration of the processing delay plus ten minutes. In no event shall the extension exceed more than one hour from when the processing delay is resolved.
- (2) ERCOT shall complete a Day-Ahead Simultaneous Feasibility Test (SFT). This test uses the Day-Ahead Updated Network Model topology and evaluates all Congestion Revenue Rights (CRRs) for feasibility to determine hourly oversold quantities.
- (3) The purpose of the DAM is to economically and simultaneously clear offers and bids described in Section 4.4, Inputs into DAM and Other Trades.
- (4) The DAM uses a multi-hour mixed integer programming algorithm to maximize bid-based revenues minus the offer-based costs over the Operating Day, subject to security and other constraints, and ERCOT Ancillary Service procurement requirements.
  - (a) The bid-based revenues include revenues from DAM Energy Bids and Point-to-Point (PTP) Obligation bids.

- (b) The offer-based costs include costs from the Startup Offer, Minimum Energy Offer, and Energy Offer Curve of any Resource that submitted a Three-Part Supply Offer, DAM Energy-Only Offers and Ancillary Service Offers.
- (c) Security constraints specified to prevent DAM solutions that would overload the elements of the ERCOT Transmission Grid include the following:
  - (i) Transmission constraints – transfer limits on energy flows through the ERCOT Transmission Grid, e.g., thermal or stability limits. These limits must be satisfied by the intact network and for certain specified contingencies. These constraints may represent:
    - (A) Thermal constraints – protect Transmission Facilities against thermal overload.
    - (B) Generic constraints – protect the ERCOT Transmission Grid against transient instability, dynamic stability or voltage collapse.
    - (C) Power flow constraints – the energy balance at required Electrical Buses in the ERCOT Transmission Grid must be maintained.
  - (ii) Resource constraints – the physical and security limits on Resources that submit Three-Part Supply Offers:
    - (A) Resource output constraints – the Low Sustained Limit (LSL) and High Sustained Limit (HSL) of each Resource; and
    - (B) Resource operational constraints – includes minimum run time, minimum down time, ~~and~~ and configuration constraints, ~~and Ancillary Service award limits for Energy Storage Resources (ESRs), based on Ancillary Service duration requirements.~~
  - (iii) Other constraints –
    - (A) Linked offers – the DAM may not select any one part of that Resource capacity to provide more than one Ancillary Service or to provide both energy and an Ancillary Service in the same Operating Hour. The DAM may, however, select part of that Resource capacity to provide one Ancillary Service and another part of that capacity to provide a different Ancillary Service or energy in the same Operating Hour, provided that linked Energy and Off-Line Non-Spinning Reserve (Non-Spin) Ancillary Service Offers are not awarded in the same Operating Hour.
    - (B) The sum of the awarded Ancillary Service capacities for each Resource must be within the Resource limits specified in the Current Operating Plan (COP) and Section 3.18, Resource Limits

in Providing Ancillary Service, and the Resource Parameters as described in Section 3.7, Resource Parameters.

- (C) Block Ancillary Service Offers for a Load Resource – blocks will not be cleared unless the entire quantity block can be awarded. Because block Ancillary Service Offers cannot set the Market Clearing Price for Capacity (MCPC), a block Ancillary Service Offer may clear below the Ancillary Service Offer price for that block.
  - (D) Block DAM Energy Bids, DAM Energy-Only Offers, and PTP Obligation bids – blocks will not be cleared unless the entire time and/or quantity block can be awarded. Because quantity block bids and offers cannot set the Settlement Point Price, a quantity block bid or offer may clear in a manner inconsistent with the bid or offer price for that block.
  - (E) Combined Cycle Generation Resources – The DAM may commit a Combined Cycle Generation Resource in a time period that includes the last hour of the Operating Day only if that Combined Cycle Generation Resource can transition to a shutdown condition in the DAM Operating Day.
- (d) Ancillary Service needs for each Ancillary Service include the needs specified in the Ancillary Service Plan that are not part of the Self-Arranged Ancillary Service Quantity and that must be met from available DAM Ancillary Service Offers while co-optimizing with DAM Energy Offers. ERCOT may not buy more of one Ancillary Service in place of the quantity of a different service. See Section 4.5.2, Ancillary Service Insufficiency, for what happens if insufficient Ancillary Service Offers are received in the DAM.

***[NPRR1008 and NPRR1014: Replace applicable portions of paragraph (4) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1008; or upon system implementation for NPRR1014:]***

- (4) The DAM uses a multi-hour mixed integer programming algorithm to maximize bid-based revenues, including revenues based on Ancillary Service Demand Curves (ASDCs), minus the offer-based costs over the Operating Day, subject to security and other constraints.
  - (a) The bid-based revenues include revenues from ASDCs, DAM Energy Bids, bid portions of Energy Bid/Offer Curves, and Point-to-Point (PTP) Obligation bids.
  - (b) The offer-based costs include costs from the Startup Offer, Minimum Energy Offer, and Energy Offer Curve of any Resource that submitted a Three-Part

Supply Offer, DAM Energy-Only Offers, offer portions of Energy Bid/Offer Curves, Ancillary Service Only Offers, and Ancillary Service Offers.

- (c) Security constraints specified to prevent DAM solutions that would overload the elements of the ERCOT Transmission Grid include the following:
- (i) Transmission constraints – transfer limits on energy flows through the ERCOT Transmission Grid, e.g., thermal or stability limits. These limits must be satisfied by the intact network and for certain specified contingencies. These constraints may represent:
    - (A) Thermal constraints – protect Transmission Facilities against thermal overload.
    - (B) Generic constraints – protect the ERCOT Transmission Grid against transient instability, dynamic stability or voltage collapse.
    - (C) Power flow constraints – the energy balance at required Electrical Buses in the ERCOT Transmission Grid must be maintained.
  - (ii) Resource constraints – the physical and security limits on Resources that submit Three-Part Supply Offers or Energy Bid/Offer Curves:
    - (A) Resource output constraints – the Low Sustained Limit (LSL) and High Sustained Limit (HSL) of each Resource; and
    - (B) Resource operational constraints – includes minimum run time, minimum down time, and configuration constraints.
  - (iii) Other constraints –
    - (A) Linked offers – the DAM may not select any one part of that Resource capacity to provide more than one Ancillary Service or to provide both energy and an Ancillary Service in the same Operating Hour. The DAM may, however, select part of that Resource capacity to provide one Ancillary Service and another part of that capacity to provide a different Ancillary Service or energy in the same Operating Hour, provided that linked Energy and Off-Line Non-Spinning Reserve (Non-Spin) Resource-Specific Ancillary Service Offers are not awarded in the same Operating Hour.
    - (B) The sum of the awarded Resource-Specific Ancillary Service Offer capacities for each Resource must be within the Resource limits specified in the Current Operating Plan (COP) and

Section 3.18, Resource Limits in Providing Ancillary Service, and the Resource Parameters as described in Section 3.7, Resource Parameters.

- (C) Block Resource-Specific Ancillary Service Offers for a Load Resource – blocks will not be cleared unless the entire quantity block can be awarded. Because block Resource-Specific Ancillary Service Offers cannot set the Market Clearing Price for Capacity (MCPC), a block Ancillary Service Offer may clear below the Ancillary Service Offer price for that block.
  - (D) Block DAM Energy Bids, DAM Energy-Only Offers, and PTP Obligation bids – blocks will not be cleared unless the entire time and/or quantity block can be awarded. Because quantity block bids and offers cannot set the Settlement Point Price, a quantity block bid or offer may clear in a manner inconsistent with the bid or offer price for that block.
  - (E) Combined Cycle Generation Resources – The DAM may commit a Combined Cycle Generation Resource in a time period that includes the last hour of the Operating Day only if that Combined Cycle Generation Resource can transition to a shutdown condition in the DAM Operating Day.
  - (F) Energy Storage Resources (ESRs) – The energy cleared for an ESR may be negative, indicating purchase of energy, or positive, indicating sale of energy.
- (d) Ancillary Service needs will be reflected in ASDCs for each Ancillary Service. Self-Arranged Ancillary Service Quantities will first be used to meet the ASDCs, and the remaining Ancillary Service needs are met from Ancillary Service Offers, as long as the costs do not exceed the ASDC value. ERCOT may not buy more of one Ancillary Service in place of the quantity of a different service.
- (5) ERCOT shall determine the appropriate Load distribution factors to allocate offers, bids, and source and sink of CRRs at a Load Zone across the energized power flow buses that are modeled with Load in that Load Zone. The non-Private Use Network Load distribution factors are based on historical State Estimator hourly distribution using a proxy day methodology representing anticipated weather conditions. The Private Use Network Load distribution factors are based on an estimated Load value considering historical net consumption at all Private Use Networks. If ERCOT decides, in its sole discretion, to change the Load distribution factors for reasons such as anticipated weather events or holidays, ERCOT shall select a State Estimator hourly distribution from a proxy day reasonably reflecting the anticipated Load in the Operating Day. ERCOT may also modify the Load distribution factors to account for predicted differences in network

topology between the proxy day and Operating Day. ERCOT shall develop a methodology, subject to Technical Advisory Committee (TAC) approval, to describe the modification of the proxy day bus-load distribution for this purpose.

***[NPRR1004: Replace paragraph (5) above with the following upon system implementation:]***

- (5) ERCOT shall determine the appropriate Load distribution factors to allocate offers, bids, and source and sink of PTP Obligations at a Load Zone across the energized power flow buses that are modeled with Load in that Load Zone. ERCOT shall derive DAM Load distribution factors with the set of Load distribution factors constructed in accordance with the ERCOT Load distribution factor methodology specified in paragraph (c) of Section 3.12, Load Forecasting. In the event the Load distribution factors are not available, the Load distribution factors for the most recent preceding Operating Day will be used.
- (6) ERCOT shall allocate offers, bids, and source and sink of CRRs at a Hub using the distribution factors specified in the definition of that Hub in Section 3.5.2, Hub Definitions.
- (7) A Resource that has a Three-Part Supply Offer cleared in the DAM may be eligible for Make-Whole Payment of the Startup Offer and Minimum Energy Offer submitted by the Qualified Scheduling Entity (QSE) representing the Resource under Section 4.6, DAM Settlement.
- (8) The DAM Settlement is based on hourly MW awards and on Day-Ahead hourly Settlement Point Prices. All PTP Options settled in the DAM are settled based on the Day-Ahead Settlement Point Prices (DASPPs). ERCOT shall assign a Locational Marginal Price (LMP) to de-energized Electrical Buses for use in the calculation of the DASPPs by using heuristic rules applied in the following order:
  - (a) Use an appropriate LMP predetermined by ERCOT as applicable to a specific Electrical Bus; or if not so specified
  - (b) Use the following rules in order:
    - (i) Use average LMP for Electrical Buses within the same station having the same voltage level as the de-energized Electrical Bus, if any exist.
    - (ii) Use average LMP for all Electrical Buses within the same station, if any exist.
    - (iii) Use System Lambda.
- (9) The Day-Ahead MCPC for each hour for each Ancillary Service is the Shadow Price for that Ancillary Service for the hour as determined by the DAM algorithm.

- (10) Day-Ahead MCPCs shall not exceed the System-Wide Offer Cap (SWCAP). Ancillary Service Offers higher than corresponding Ancillary Service penalty factors, as defined in Appendix 2, Day-Ahead Market Optimization Control Parameters, of the Other Binding Document titled “Methodology for Setting Maximum Shadow Prices for Network and Power Balance Constraints,” will not be awarded.

***[NPRR1080: Delete paragraph (10) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1008; or upon system implementation for NPRR1014; and renumber accordingly.]***

- (11) If the Day-Ahead MCPC cannot be calculated by ERCOT, the Day-Ahead MCPC for the particular Ancillary Service is equal to the Day-Ahead MCPC for that Ancillary Service in the same Settlement Interval of the preceding Operating Day.

***[NPRR1008 and NPR1014: Delete paragraph (11) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1008; or upon system implementation for NPRR1014; and renumber accordingly.]***

- (12) If the DASPPs cannot be calculated by ERCOT, all CRRs shall be settled based on Real-Time prices. Settlements for all CRRs shall be reflected on the Real-Time Settlement Statement.
- (13) Constraints can exist between the generator’s Resource Connectivity Node and the Resource Node, in which case the awarded quantity of energy may be inconsistent with the clearing price when the constraint between the Resource Connectivity Node and the Resource Node is binding.

***[NPRR1014: Replace paragraph (13) above with the following upon system implementation:]***

- (13) Constraints can exist between a Resource’s Resource Connectivity Node and its Resource Node, in which case the awarded quantity of energy may be inconsistent with the clearing price when the constraint between the Resource Connectivity Node and the Resource Node is binding.
- (14) PTP Obligation bids shall not be awarded where the DAM clearing price for the PTP Obligation is greater than the PTP Obligation bid price plus \$0.01/MW per hour.



### 5.5.2 Reliability Unit Commitment (RUC) Process

- (1) The RUC process recommends commitment of Generation Resources, to match ERCOT's forecasted Load including Direct Current Tie (DC Tie) Schedules, subject to all transmission constraints and Resource performance characteristics. The RUC process takes into account Resources already committed in the Current Operating Plans (COPs), Resources already committed in previous RUCs, Off-Line Available Resources having a start-up time of one hour or less, and Resource capacity already committed to provide Ancillary Service. The formulation of the RUC objective function must employ penalty factors on violations of security constraints. The objective of the RUC process is to minimize costs based on the Resource costs described in paragraphs (5) through (9) below. For all hours of the RUC Study Period within the RUC process, Quick Start Generation Resources (QSGRs) with a COP Resource Status of OFFQS shall be considered as On-Line with Low Sustained Limit (LSL) at zero MW. QSGRs with a Resource Status of OFFQS shall only be committed by ERCOT through a RUC instruction in instances when a reliability issue would not otherwise be managed through Dispatch Instructions from Security-Constrained Economic Dispatch (SCED). For On-Line ESRs, the Hour Beginning Planned State of Charge (SOC) values provided in the COP for a given hour are discounted to ensure sufficient SOC is preserved to meet Ancillary Service Resource Responsibilities, as reflected in the COP. Any remaining SOC on the ESR will be considered available for energy dispatch by RUC while respecting the MinSOC and MaxSOC values provided in the COP.
- (2) The RUC process can recommend Resource decommitment. ERCOT may only decommit a Resource to resolve transmission constraints that are otherwise unresolvable. Qualifying Facilities (QFs) may be decommitted only after all other types of Resources have been assessed for decommitment. In addition, the HRUC process provides decision support to ERCOT regarding a Resource decommitment requested by a Qualified Scheduling Entity (QSE).
- (3) ERCOT shall review the RUC-recommended Resource commitments and the list of Off-Line Available Resources having a start-up time of one hour or less to assess feasibility and shall make any changes that it considers necessary, in its sole discretion. During the RUC process, ERCOT may also review and commit, through a RUC instruction, Combined Cycle Generation Resources that are currently planned to be On-Line but are capable of transitioning to a configuration with additional capacity. ERCOT may deselect Resources recommended in DRUC and in all HRUC processes if in ERCOT's sole discretion there is enough time to commit those Resources in the future HRUC processes, taking into account the Resources' start-up times, to meet ERCOT System reliability. After each RUC run, ERCOT shall post the amount of capacity deselected per hour in the RUC Study Period to the MIS Secure Area. A Generation Resource shown as On-Line and available for SCED dispatch for an hour in its COP prior to a DRUC or HRUC process execution, according to Section 5.3, ERCOT Security Sequence Responsibilities, will be considered self-committed for that hour. For purpose of Settlement, snapshot data will be used as specified in paragraph (2) of Section 5.3. ERCOT shall issue RUC instructions to each QSE specifying its Resources that have been committed as a result of the RUC process. ERCOT shall, within one day after

making any changes to the RUC-recommended commitments, post to the MIS Secure Area any changes that ERCOT made to the RUC-recommended commitments with an explanation of the changes.

- (4) A QSE shall notify the ERCOT Operator of any physical limitation that impacts its Resource's ability to start that is not reflected in the Resource's COP or the Resource's startup time, minimum On-Line time, or minimum Off-Line time. The following shall apply:
  - (a) If a Resource receives a RUC Dispatch Instruction that it cannot meet due to a physical limitation described in paragraph (4) above, the QSE representing the Resource shall notify the ERCOT Operator of the inability to fully comply with the instruction and shall comply with the instruction to the best of the Resource's ability. If the QSE has provided the ERCOT Operator notice of that limitation at least seven days prior to the Operating Day in which the instruction occurs, the QSE shall be excused from complying with the portion of the RUC Dispatch Instruction that it could not meet due to the identified limitation.
  - (b) If a QSE provides notice pursuant to paragraph (a) above of a physical limitation that will delay the RUC-committed Resource's ability to reach its LSL in accordance with a RUC Dispatch Instruction, ERCOT shall extend the RUC Dispatch Instruction so that the Resource's minimum run time is respected. However, if the Resource will not be available in time to address the issue for which it received the RUC instruction, ERCOT may instead cancel the RUC Dispatch Instruction.
- (5) A QSE shall be excused from complying with any portion of a RUC Dispatch Instruction that it could not meet due to a physical limitation that was reflected, at the time of the RUC Dispatch Instruction, in the Resource's COP, startup time, minimum On-Line time, or minimum Off-Line time.
- (6) To determine the projected energy output level of each Resource and to project potential congestion patterns for each hour of the RUC, ERCOT shall calculate proxy Energy Offer Curves based on the Mitigated Offer Caps (MOCs) for the type of Resource as specified in Section 4.4.9.4, Mitigated Offer Cap and Mitigated Offer Floor, for use in the RUC. Proxy Energy Offer Curves are calculated by multiplying the MOC by a constant selected by ERCOT from time to time that is no more than 0.10% and applying the cost for all Generation Resource output between High Sustained Limit (HSL) and LSL. The intent of this process is to minimize the effect of the proxy Energy Offer Curves on optimization.
- (7) ERCOT shall use the RUC process to evaluate the need to commit Resources for which a QSE has submitted Three-Part Supply Offers and other available Off-Line Resources in addition to Resources that are planned to be On-Line during the RUC Study Period. All of the above commitment information must be as specified in the QSE's COP. For available Off-Line Resources with a cold start time of one hour or less that have not been removed from special consideration under paragraph (9) below pursuant to paragraph (4)

of Section 8.1.2, Current Operating Plan (COP) Performance Requirements, the Startup Offers and Minimum-Energy Offer from a Resource’s Three-Part Supply Offer shall not be used in the RUC process.

- (8) ERCOT shall create Three-Part Supply Offers for all Resources that did not submit a Three-Part Supply Offer, but are specified as available but Off-Line, excluding Resources with a Resource Status of EMR, in a QSE’s COP. For such Resources, excluding available Off-Line Resources with a cold start time of one hour or less that have not been removed from special consideration under paragraph (9) below pursuant to paragraph (4) of Section 8.1.2, ERCOT shall use in the RUC process 150% of any approved verifiable Startup Cost and verifiable minimum-energy cost or if verifiable costs have not been approved, the applicable Resource Category Generic Startup Offer Cost and the applicable Resource Category Generic Minimum-Energy Offer Cost as described specified in Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, registered with ERCOT. However for Settlement purposes, ERCOT shall use any approved verifiable Startup Costs and verifiable minimum-energy cost for such Resources, or if verifiable costs have not been approved, the applicable Resource Category Generic Startup Offer Cost and Generic Minimum-Energy Offer Cost.
- (9) For all available Off-Line Resources having a cold start time of one hour or less and not removed from special consideration pursuant to paragraph (4) of Section 8.1.2, ERCOT shall scale any approved verifiable Startup Cost and verifiable minimum-energy cost or if verifiable costs have not been approved, the applicable Resource Category Generic Startup Offer Cost and the applicable Resource Category Generic Minimum-Energy Offer Cost as specified in Section 4.4.9.2.3 for use in the RUC process.

The above parameter is defined as follows:

Parameter	Unit	Current Value*
IHRLESSCOSTSCALING	Percentage	Maximum value of 100%
* The current value for the parameter(s) referenced in this table above will be recommended by the Technical Advisory Committee (TAC) and approved by the ERCOT Board. ERCOT shall update parameter value(s) on the first day of the month following ERCOT Board approval unless otherwise directed by the ERCOT Board. ERCOT shall provide a Market Notice prior to implementation of a revised parameter value.		

- (10) The RUC process must treat all Resource capacity providing Ancillary Service as unavailable for the RUC Study Period, unless that treatment leads to infeasibility (i.e., that capacity is needed to resolve some local transmission problem that cannot be resolved by any other means). If an ERCOT Operator decides that the Ancillary Service capacity allocated to that Resource is infeasible based on ERCOT System conditions, then, ERCOT shall inform each affected QSE of the amount of its Resource capacity that does not qualify to provide Ancillary Service, and the projected hours for which this is the case. In that event, the affected QSE may, under Section 6.4.9.1.2, Replacement of Infeasible Ancillary Service Due to Transmission Constraints, either:
  - (a) Substitute capacity from Resources represented by that QSE;

- (b) Substitute capacity from other QSEs using Ancillary Service Trades; or
  - (c) Ask ERCOT to replace the capacity.
- (11) Factors included in the RUC process are:
- (a) ERCOT System-wide hourly Load forecast allocated appropriately over Load buses;
  - (b) Transmission constraints – Transfer limits on energy flows through the electricity network;
    - (i) Thermal constraints – protect transmission facilities against thermal overload;
    - (ii) Generic constraints – protect the transmission system against transient instability, dynamic instability or voltage collapse;
  - (c) Planned transmission topology;
  - (d) Energy sufficiency constraints;
  - (e) Inputs from the COP, as appropriate;
  - (f) Inputs from Resource Parameters, including a list of Off-Line Available Resources having a start-up time of one hour or less, as appropriate;
  - (g) Each Generation Resource’s Minimum-Energy Offer and Startup Offer, from its Three-Part Supply Offer;
  - (h) Any Generation Resource that is Off-Line and available but does not have a Three-Part Supply Offer;
  - (i) Forced Outage information; and
  - (j) Inputs from the eight-day look ahead planning tool, which may potentially keep a unit On-Line (or start a unit for the next day) so that a unit minimum duration between starts does not limit the availability of the unit (for security reasons).
- (12) The HRUC process and the DRUC process are as follows:
- (a) The HRUC process uses current Resource Status for the initial condition for the first hour of the RUC Study Period. All HRUC processes use the projected status of transmission breakers and switches starting with current status and updated for each remaining hour in the study as indicated in the COP for Resources and in the Outage Scheduler for transmission elements.
  - (b) The DRUC process uses the Day-Ahead forecast of total ERCOT Load including DC Tie Schedules for each hour of the Operating Day. The HRUC process uses

the current hourly forecast of total ERCOT Load including DC Tie Schedules for each hour in the RUC Study Period.

- (c) The DRUC process uses the Day-Ahead weather forecast for each hour of the Operating Day. The HRUC process uses the weather forecast information for each hour of the balance of the RUC Study Period.
- (13) A QSE that has one or more of its Resources RUC-committed to provide Ancillary Services must increase its Ancillary Service Supply Responsibility by the total amount of RUC-committed Ancillary Service quantities. The QSE may only use a RUC-committed Resource to meet its Ancillary Service Supply Responsibility during that Resource's RUC-Committed Interval if the Resource has been committed by the RUC process to provide Ancillary Service, or the Resource is a Combined Cycle Generation Resource that was RUC-committed to transition from one On-Line configuration to a different configuration with additional capacity. For cases in which the commitment was to provide Ancillary Service, the QSE shall indicate the exact amount and type of Ancillary Service for which it was committed as the Resource's Ancillary Service Resource Responsibility and Ancillary Services Schedule for the RUC-Committed Intervals for both telemetry and COP information provided to ERCOT. Upon deployment of the Ancillary Services, the QSE shall adjust its Ancillary Services Schedule to reflect the amounts requested in the deployment.
- (14) A QSE with a Resource that is not a Reliability Must-Run (RMR) Unit or has not received an Outage Schedule Adjustment (OSA) that has been committed in a RUC process or by a RUC Verbal Dispatch Instruction (VDI) may opt out of the RUC Settlement (or "buy back" the commitment) by setting the telemetered Resource Status of the RUC-committed Resource to ONOPTOUT for the first SCED run that the Resource is On-Line and available for SCED dispatch during the first hour of a contiguous block of RUC-Committed Hours. All the configurations of the same Combined Cycle Train shall be treated as the same Resource for the purpose of creating the block of RUC-Committed Hours. A RUC-committed Combined Cycle Generation Resource may opt out of the RUC Settlement by setting the telemetered Resource Status to ONOPTOUT for any On-Line configuration of the same Combined Cycle Train for the first SCED run that the Combined Cycle Train is On-Line and available for SCED Dispatch during the first hour of a contiguous block of RUC-Committed Hours. A Combined Cycle Generation Resource that is RUC-committed from one On-Line configuration in order to transition to a different configuration with additional capacity may opt out of the RUC Settlement following the same rule for RUC-committed Combined Cycle Generation Resources described above. A QSE that opts out of RUC Settlement forfeits RUC Settlement for the affected Resource for a given block of RUC Buy-Back Hours. A QSE that opts out of RUC Settlement treatment must make the Resource available to SCED for all RUC Buy-Back Hours. All hours in a contiguous block of RUC-Committed Hours that includes the RUC Buy-Back Hour shall be considered RUC Buy-Back Hours. However, if a contiguous block of RUC-Committed Hours spans more than one Operating Day, each contiguous block of RUC-Committed Hours within each Operating Day shall be treated as an independent block for purposes of opting out, and a QSE that wishes to opt out of RUC Settlement for the RUC-Committed Hours in the next Operating Day must set its

telemetered Resource Status to ONOPTOUT for the first SCED run the next Operating Day.

- (15) If a QSE-committed Resource experiences a Forced Outage or Startup Loading Failure in an hour for which another Resource under the control of the same QSE is committed by a RUC instruction, the QSE may opt out of RUC Settlement for the RUC-committed Resource in accordance with paragraph (14) above, or if the Forced Outage or Startup Loading Failure occurs after the beginning of the first RUC-Committed Interval, the QSE may opt out of RUC Settlement by submitting a dispute pursuant to Section 9.14, Settlement and Billing Dispute Process, requesting a correction of the RUC Settlement treatment for the RUC-committed Resource.
- (16) ERCOT shall, as soon as practicable, post to the MIS Secure Area a report identifying those hours that were considered RUC Buy-Back Hours, along with the name of each RUC-committed Resource whose QSE opted out of RUC Settlement.
- (17) A Resource that has a Three-Part Supply Offer cleared in the Day-Ahead Market (DAM) and subsequently receives a RUC commitment for the Operating Hour for which it was awarded will be treated as if the telemetered Resource Status was ONOPTOUT for purposes of Section 6.5.7.3, Security Constrained Economic Dispatch, and Section 6.5.7.3.1, Determination of Real-Time On-Line Reliability Deployment Price Adder.

***[NPRR1009, NPRR1032, and NPRR1092: Replace applicable portions of Section 5.5.2 above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1009; or upon system implementation for NPRR1032 or NPRR1092:]***

#### **5.5.2 Reliability Unit Commitment (RUC) Process**

- (1) The RUC process recommends commitment of Generation Resources, to match ERCOT's forecasted Load including Direct Current Tie (DC Tie) Schedules and RUC Ancillary Service Demand Curves (ASDCs), subject to all transmission constraints and Resource performance characteristics. The RUC process takes into account Resources already committed in the Current Operating Plans (COPs), Resources already committed in previous RUCs, and Off-Line Available Resources having a start-up time of one hour or less. The formulation of the RUC objective function must employ penalty factors on violations of security constraints. The objective of the RUC process is to minimize costs based on the Resource costs described in paragraphs (9) through (13) below.
- (2) ERCOT shall create an ASDC for each Ancillary Service for use in RUC. ERCOT shall post the ASDCs to the ERCOT website as soon as practicable after any change to the ASDCs.
- (3) For all hours of the RUC Study Period within the RUC process, Quick Start Generation Resources (QSGRs) with a COP Resource Status of OFFQS shall be considered as On-

Line with Low Sustained Limit (LSL) at zero MW. QSGRs with a Resource Status of OFFQS shall only be committed by ERCOT through a RUC instruction in instances when a reliability issue would not otherwise be managed through Dispatch Instructions from Security-Constrained Economic Dispatch (SCED).

- (4) In addition to On-Line qualified Resources, the RUC engine shall consider a COP Resource status of OFFQS for QSGRs that are qualified for ERCOT Contingency Reserve Service (ECRS), as being eligible to provide ECRS constrained by the Ancillary Service capability in the COP.
- (5) In addition to On-Line qualified Resources, the RUC engine shall consider a COP Resource Status of OFFQS for QSGRs that are qualified for Non-Spinning Reserve (Non-Spin), as being eligible to provide Non-Spin constrained by the Ancillary Service Capability in the COP. The RUC engine shall also consider a COP Resource Status of OFF (Off-Line but available for commitment in the DAM and RUC) for a Resource that is qualified for Non-Spin, as being eligible to provide Non-Spin constrained by the Ancillary Service capability in the COP.
- (6) The RUC process can recommend Resource decommitment. ERCOT may only decommit a Resource to resolve transmission constraints that are otherwise unresolvable. Qualifying Facilities (QFs) may be decommitted only after all other types of Resources have been assessed for decommitment. In addition, the HRUC process provides decision support to ERCOT regarding a Resource decommitment requested by a Qualified Scheduling Entity (QSE).
- (7) ERCOT shall review the RUC-recommended Resource commitments and the list of Off-Line Available Resources having a start-up time of one hour or less to assess feasibility and shall make any changes that it considers necessary, in its sole discretion. During the RUC process, ERCOT may also review and commit, through a RUC instruction, Combined Cycle Generation Resources that are currently planned to be On-Line but are capable of transitioning to a configuration with additional capacity. ERCOT may deselect Resources recommended in DRUC and in all HRUC processes if in ERCOT's sole discretion there is enough time to commit those Resources in the future HRUC processes, taking into account the Resources' start-up times, to meet ERCOT System reliability. After each RUC run, ERCOT shall post the amount of capacity deselected per hour in the RUC Study Period to the MIS Secure Area. A Generation Resource shown as On-Line and available for SCED dispatch for an hour in its COP prior to a DRUC or HRUC process execution, according to Section 5.3, ERCOT Security Sequence Responsibilities, will be considered self-committed for that hour. For purpose of Settlement, snapshot data will be used as specified in paragraph (2) of Section 5.3.
- (8) ERCOT shall issue RUC instructions to each QSE specifying its Resources that have been committed as a result of the RUC process. ERCOT shall, within one day after making any changes to the RUC-recommended commitments, post to the MIS Secure

Area any changes that ERCOT made to the RUC-recommended commitments with an explanation of the changes.

- (9) ERCOT shall use the RUC process to evaluate the need to commit Resources for which a QSE has submitted Three-Part Supply Offers and other available Off-Line Resources in addition to Resources that are planned to be On-Line during the RUC Study Period. All of the above commitment information must be as specified in the QSE's COP. For available Off-Line Resources with a cold start time of one hour or less that have not been removed from special consideration under paragraph (15) below pursuant to paragraph (4) of Section 8.1.2, Current Operating Plan (COP) Performance Requirements, the Startup Offers and Minimum-Energy Offer from a Resource's Three-Part Supply Offer shall not be used in the RUC process.
- (10) ERCOT shall create Three-Part Supply Offers for all Resources that did not submit a Three-Part Supply Offer, but are specified as available but Off-Line, excluding Resources with a Resource Status of EMR, in a QSE's COP. For such Resources, excluding available Off-Line Resources with a cold start time of one hour or less that have not been removed from special consideration under paragraph (13) below pursuant to paragraph (4) of Section 8.1.2, ERCOT shall use in the RUC process 150% of any approved verifiable Startup Cost and verifiable minimum-energy cost or if verifiable costs have not been approved, the applicable Resource Category Generic Startup Offer Cost and the applicable Resource Category Generic Minimum-Energy Offer Cost as described specified in Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, registered with ERCOT. However for Settlement purposes, ERCOT shall use any approved verifiable Startup Costs and verifiable minimum-energy cost for such Resources, or if verifiable costs have not been approved, the applicable Resource Category Generic Startup Offer Cost and Generic Minimum-Energy Offer Cost.
- (11) A QSE shall notify the ERCOT Operator of any physical limitation that impacts its Resource's ability to start that is not reflected in the Resource's COP or the Resource's startup time, minimum On-Line time, or minimum Off-Line time. The following shall apply:
  - (a) If a Resource receives a RUC Dispatch Instruction that it cannot meet due to a physical limitation described in paragraph (4) above, the QSE representing the Resource shall notify the ERCOT Operator of the inability to fully comply with the instruction and shall comply with the instruction to the best of the Resource's ability. If the QSE has provided the ERCOT Operator notice of that limitation at least seven days prior to the Operating Day in which the instruction occurs, the QSE shall be excused from complying with the portion of the RUC Dispatch Instruction that it could not meet due to the identified limitation.
  - (b) If a QSE provides notice pursuant to paragraph (a) above of a physical limitation that will delay the RUC-committed Resource's ability to reach its LSL in accordance with a RUC Dispatch Instruction, ERCOT shall extend the RUC Dispatch Instruction so that the Resource's minimum run time is respected. However, if the Resource will not be available in time to address the issue for



which it received the RUC instruction, ERCOT may instead cancel the RUC Dispatch Instruction.

- (12) A QSE shall be excused from complying with any portion of a RUC Dispatch Instruction that it could not meet due to a physical limitation that was reflected, at the time of the RUC Dispatch Instruction, in the Resource’s COP, startup time, minimum On-Line time, or minimum Off-Line time.
- (13) To determine the projected energy output level of each Resource and to project potential congestion patterns for each hour of the RUC, ERCOT shall calculate proxy Energy Offer Curves based on the Mitigated Offer Caps (MOCs) for the type of Resource as specified in Section 4.4.9.4, Mitigated Offer Cap and Mitigated Offer Floor, for use in the RUC. Proxy Energy Offer Curves are calculated by multiplying the MOC by a constant selected by ERCOT from time to time that is no more than 0.10% and applying the cost for all Generation Resource output between High Sustained Limit (HSL) and LSL. The intent of this process is to minimize the effect of the proxy Energy Offer Curves on optimization.
- (14) ERCOT shall calculate proxy Ancillary Service Offer Curves for use in RUC based on validated Ancillary Service Offers as specified in Section 4.4.7.2, Ancillary Service Offers. For all Resources that do not have a valid Ancillary Service Offer but are qualified to provide an Ancillary Service, ERCOT shall create an Ancillary Service Offer Curve for use in RUC as described in Section 6.5.7.3, Security Constrained Economic Dispatch. Proxy Ancillary Service Offer Curves for use in RUC are calculated by multiplying the Ancillary Service Offer by a constant selected by ERCOT from time to time that is no more than 0.1%, and are extended between the HSL and LSL. Notwithstanding the presence or absence of a proxy Ancillary Service Offer, Ancillary Service provision in RUC shall be limited by the Resource’s Ancillary Service capabilities as reflected in the COP.
- (15) For all available Off-Line Resources having a cold start time of one hour or less and not removed from special consideration pursuant to paragraph (4) of Section 8.1.2, ERCOT shall scale any approved verifiable Startup Cost and verifiable minimum-energy cost or if verifiable costs have not been approved, the applicable Resource Category Generic Startup Offer Cost and the applicable Resource Category Generic Minimum-Energy Offer Cost as specified in Section 4.4.9.2.3 for use in the RUC process.

The above parameter is defined as follows:

Parameter	Unit	Current Value*
IHRLESSCOSTSCALING	Percentage	Maximum value of 100%

\* The current value for the parameter(s) referenced in this table above will be recommended by the Technical Advisory Committee (TAC) and approved by the ERCOT Board. ERCOT shall update parameter value(s) on the first day of the month following ERCOT Board approval unless otherwise directed by the ERCOT Board. ERCOT shall provide a Market Notice prior to implementation of a revised parameter value.

- (16) Factors included in the RUC process are:
- (a) ERCOT System-wide hourly Load forecast allocated appropriately over Load buses;
  - (b) ERCOT's Ancillary Service Plans in the form of ASDCs;
  - (c) Transmission constraints – Transfer limits on energy flows through the electricity network;
    - (i) Thermal constraints – protect transmission facilities against thermal overload;
    - (ii) Generic constraints – protect the transmission system against transient instability, dynamic instability or voltage collapse;
  - (d) Planned transmission topology;
  - (e) Energy sufficiency constraints;
  - (f) Inputs from the COP, as appropriate;
  - (g) Inputs from Resource Parameters, including a list of Off-Line Available Resources having a start-up time of one hour or less, as appropriate;
  - (h) Each Generation Resource's Minimum-Energy Offer and Startup Offer, from its Three-Part Supply Offer;
  - (i) Any Generation Resource that is Off-Line and available but does not have a Three-Part Supply Offer;
  - (j) Forced Outage information; and
  - (k) Inputs from the eight-day look ahead planning tool, which may potentially keep a unit On-Line (or start a unit for the next day) so that a unit minimum duration between starts does not limit the availability of the unit (for security reasons).
- (17) The HRUC process and the DRUC process are as follows:
- (a) The HRUC process uses current Resource Status for the initial condition for the first hour of the RUC Study Period. All HRUC processes use the projected status of transmission breakers and switches starting with current status and updated for each remaining hour in the study as indicated in the COP for Resources and in the Outage Scheduler for transmission elements.
  - (b) The DRUC process uses the current hourly forecast of total ERCOT Load including DC Tie Schedules up to the physical rating of the DC Tie for each

hour of the Operating Day. The HRUC process uses the current hourly forecast of total ERCOT Load including DC Tie Schedules up to the physical rating of the DC Tie for each hour in the RUC Study Period.

- (c) The DRUC process uses the Day-Ahead weather forecast for each hour of the Operating Day. The HRUC process uses the weather forecast information for each hour of the balance of the RUC Study Period.
- (18) A QSE with a Resource that is not a Reliability Must-Run (RMR) Unit or has not received an Outage Schedule Adjustment (OSA) that has been committed in a DRUC or HRUC process may opt out of the RUC Settlement (or “buy back” the commitment) by setting the COP status of the RUC-committed Resource to ONOPTOUT for the first hour of a contiguous block of RUC-Committed Hours in the Opt Out Snapshot. All the configurations of the same Combined Cycle Train shall be treated as the same Resource for the purpose of creating the block of RUC-Committed Hours. A RUC-committed Combined Cycle Generation Resource may opt out of the RUC Settlement by setting the COP status of any Combined Cycle Generation Resource within the same Combined Cycle Train as the RUC-committed Resource to ONOPTOUT for the first hour of a contiguous block of RUC-Committed Hours in the Opt Out Snapshot. A Combined Cycle Generation Resource that is RUC-committed from one On-Line configuration in order to transition to a different configuration with additional capacity may opt out of the RUC Settlement following the same rule for RUC-committed Combined Cycle Generation Resources described above. A QSE that opts out of RUC Settlement forfeits RUC Settlement for the affected Resource for a given block of RUC Buy-Back Hours. A QSE that opts out of RUC Settlement treatment must make the Resource available to SCED for all RUC Buy-Back Hours. All hours in a contiguous block of RUC-Committed Hours that includes the RUC Buy-Back Hour shall be considered RUC Buy-Back Hours. If a contiguous block of RUC-Committed Hours spans more than one Operating Day and a QSE wishes to opt out of RUC Settlement for the RUC-Committed Hours in the second or subsequent Operating Day, the QSE must set its COP status to ONOPTOUT for the first hour of that the first Operating Day in the Opt Out Snapshot of the first Operating Day.
- (19) ERCOT shall, as soon as practicable, post to the MIS Secure Area a report identifying those hours that were considered RUC Buy-Back Hours, along with the name of each RUC-committed Resource whose QSE opted out of RUC Settlement.
- (20) A Resource that has a Three-Part Supply Offer cleared in the Day-Ahead Market (DAM) and subsequently receives a RUC commitment for the Operating Hour for which it was awarded will be treated as if the Resource Status was ONOPTOUT for purposes of Section 6.5.7.3 and Section 6.5.7.3.1, Determination of Real-Time Reliability Deployment Price Adders.
- (21) A Resource that has self-committed for an Operating Hour after the RUC Snapshot was taken but before the RUC commitment has been communicated through an XML message for that RUC process and that Operating Hour is included in a block of RUC-committed hours for that RUC process will be treated as if the Resource Status was

ONOPTOUT for purposes of Section 6.5.7.3, Section 6.5.7.3.1, Operating Reserve Demand Curve (ORDC) calculations, and RUC Settlement for the entire block of RUC-committed hours. A QSE that has a Resource that meets these conditions must make the Resource available to SCED for the entire block of RUC-committed hours. ERCOT will send the QSE a notification stating the Operating Day and block of hours for which this occurred.

**6.3.2 Activities for Real-Time Operations**

- (1) Activities for Real-Time operations begin at the end of the Adjustment Period and conclude at the close of the Operating Hour.
- (2) The following table summarizes the timeline for the Operating Period and the activities of QSEs and ERCOT during Real-Time operations where “T” represents any instant within the Operating Hour. The table is intended to be only a general guide and not controlling language, and any conflict between this table and another section of the Protocols is controlled by the other section:

Operating Period	QSE Activities	ERCOT Activities
During the first hour of the Operating Period		Execute the Hour-Ahead Sequence, including HRUC, beginning with the second hour of the Operating Period  Review the list of Off-Line Available Resources with a start-up time of one hour or less  Review and communicate HRUC commitments and Direct Current Tie (DC Tie) Schedule curtailments  Snapshot the Scheduled Power Consumption for Controllable Load Resources
Before the start of each SCED run	Update Output Schedules for DSRs	Validate Output Schedules for DSRs  Execute Real-Time Sequence
SCED run		Execute SCED and pricing run to determine impact of reliability deployments on energy prices
During the Operating Hour	Telemeter the Ancillary Service Resource Responsibility for each Resource  <a href="#">Telemeter next Operating Hour Ancillary Service Resource Responsibility for an ESR.</a>  Acknowledge receipt of Dispatch Instructions	Communicate all binding Base Points, Dispatch Instructions, and the sum of each type of available reserves, including total Real-Time reserve amount for On-Line reserves, total Real-Time reserve amount for Off-Line reserves, Real-Time Reserve Price Adders for On-Line Reserves, and Real-Time Reserve Price Adders for Off-Line Reserves and LMPs for energy and Ancillary Services, and for the pricing run as

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Operating Period	QSE Activities	ERCOT Activities
	<p>Comply with Dispatch Instruction</p> <p>Review Resource Status to assure current state of the Resources is properly telemetered</p> <p>Update COP with actual Resource Status and limits and Ancillary Service Schedules</p> <p>Communicate Resource Forced Outages to ERCOT</p> <p>Communicate to ERCOT Resource changes to Ancillary Service Resource Responsibility via telemetry in the time window beginning 30 seconds prior to the five-minute clock interval and ending ten seconds prior to that five-minute clock interval</p>	<p>described in Section 6.5.7.3.1, Determination of Real-Time On-Line Reliability Deployment Price Adder, the total Reliability Unit Commitment (RUC)/Reliability Must-Run (RMR) MW relaxed, total Load Resource MW deployed that is added to the Demand, total Emergency Response Service (ERS) MW deployed that is added to the Demand, total emergency DC Tie MW that is added to or subtracted from the Demand, total Block Load Transfer (BLT) MW that is added to or subtracted from the Demand, total Low Ancillary Service Limit (LASL), total High Ancillary Service Limit (HASL), Real-Time On-Line Reliability Deployment Price Adder using Inter-Control Center Communications Protocol (ICCP) or Verbal Dispatch Instructions (VDIs)</p> <p>Monitor Resource Status and identify discrepancies between COP and telemetered Resource Status</p> <p>Restart Real-Time Sequence on major change of Resource or Transmission Element Status</p> <p>Monitor ERCOT total system capacity providing Ancillary Services</p> <p><a href="#"><u>Monitor ESR State of Change (SOC) information to ensure Ancillary Service Resource Responsibilities can be met</u></a></p> <p>Validate COP information</p> <p>Monitor ERCOT control performance</p> <p>Distribute by ICCP, and post on the ERCOT website, System Lambda and the LMPs for each Resource Node, Load Zone and Hub, and the sum of each type of available reserves, including total Real-Time reserve amount for On-Line reserves, total Real-Time reserve amount for Off-Line reserves, Real-Time Reserve Price Adders for On-Line Reserves and Real-Time Reserve Price Adders for Off-Line Reserves, and for the pricing run as described in Section 6.5.7.3.1 the total RUC/RMR MW relaxed, total Load Resource MW deployed that is added to the Demand, total ERS MW deployed that is</p>

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Operating Period	QSE Activities	ERCOT Activities
		<p>added to the Demand, total emergency DC Tie MW that is added to or subtracted from the Demand, total BLT MW that is added to or subtracted from the Demand, total On-Line LASL, total On-Line HASL, Real-Time On-Line Reliability Deployment Price Adder created for each SCED process. These prices shall be posted immediately subsequent to deployment of Base Points from SCED with the time stamp the prices are effective</p> <p>Post on the ERCOT website the nodal prices for Settlement Only Distribution Generators (SODGs) and Settlement Only Transmission Generator (SOTGs). These prices shall include all Real-Time Reserve Price Adders for On-Line Reserves and Real-Time On-Line Reliability Deployment Price Adders created for each SCED process. These prices shall be posted immediately subsequent to deployment of Base Points from SCED with the time stamp the prices are effective</p> <p>Post LMPs for each Electrical Bus on the ERCOT website. These prices shall be posted immediately subsequent to deployment of Base Points from each binding SCED with the time stamp the prices are effective</p> <p>Post on the ERCOT website the projected non-binding LMPs created by each SCED process for each Resource Node, the projected total Real-Time reserve amount for On-Line reserves and Off-Line reserves, the projected Real-Time On-Line Reserve Price Adders and Real-Time Off-Line Reserve Price Adders, and for the projected non-binding pricing runs as described in Section 6.5.7.3.1 the total RUC/RMR MW relaxed, total Load Resource MW deployed that is added to Demand, total emergency DC Tie MW that is added to or subtracted from the Demand, total BLT MW that is added to or subtracted from the Demand, total ERS MW deployed that are deployed that is added to the Demand, total LASL, total HASL, Real-Time On-Line Reliability Deployment Price Adder and the projected Hub LMPs and Load Zone LMPs. These projected prices shall be posted at a</p>

Operating Period	QSE Activities	ERCOT Activities
		<p>frequency of every five minutes from SCED for at least 15 minutes in the future with the time stamp of the SCED process that produced the projections</p> <p>Post on the MIS Certified Area the projected non-binding Base Points for each Resource created by each SCED process. These projected non-binding Base Points shall be posted at a frequency of every five minutes from SCED for at least 15 minutes in the future with the time stamp of the SCED process that produced the projections</p> <p>Post each hour on the ERCOT website binding SCED Shadow Prices and active binding transmission constraints by Transmission Element name (contingency /overloaded element pairs)</p> <p>Post on the ERCOT website the Settlement Point Prices for each Settlement Point and the Real-Time price for each SODG and SOTG immediately following the end of each Settlement Interval</p> <p>Post the Real-Time On-Line Reliability Deployment Price, Real-Time Reserve Price for On-Line Reserves and the Real-Time Reserve Price for Off-Line Reserves immediately following the end of each Settlement Interval</p> <p>Post parameters as required by Section 6.4.9, Ancillary Services Capacity During the Adjustment Period and in Real-Time, on the ERCOT website</p>

***[NPRR829, NPRR904, NPRR995, NPRR1000, NPRR1006, NPRR1010, NPRR1058, NPRR1077, and NPRR1149: Replace applicable portions of paragraph (2) above with the following upon system implementation for NPRR829, NPRR904, NPRR995, NPRR1000, NPRR1006, NPRR1058, NPRR1077, or NPRR1149; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010:]***

- (2) The following table summarizes the timeline for the Operating Period and the activities of QSEs and ERCOT during Real-Time operations where “T” represents any instant within the Operating Hour. The table is intended to be only a general guide and not controlling

language, and any conflict between this table and another section of the Protocols is controlled by the other section:

Operating Period	QSE Activities	ERCOT Activities
During the first hour of the Operating Period		<p>Execute the Hour-Ahead Sequence, including HRUC, beginning with the second hour of the Operating Period</p> <p>Review the list of Off-Line Available Resources with a start-up time of one hour or less</p> <p>Review and communicate HRUC commitments and Direct Current Tie (DC Tie) Schedule curtailments</p> <p>Snapshot the Scheduled Power Consumption for Controllable Load Resources</p>
SCED run		Execute SCED and pricing run to determine impact of reliability deployments on energy and Ancillary Service prices
During the Operating Hour	<p>Acknowledge receipt of Dispatch Instructions</p> <p>Comply with Dispatch Instruction</p> <p>Review Resource Status to assure current state of the Resources is properly telemetered</p> <p>Update COP and telemetry with actual Resource Status and limits and Ancillary Service capabilities</p> <p>Submit and update Ancillary Service Offers</p> <p>Communicate Resource Forced Outages to ERCOT</p> <p>Submit and update Energy Offer Curves and/or RTM Energy Bids</p>	<p>Communicate all binding Base Points, Updated Desired Set Points (UDSPs), Ancillary Service awards, Dispatch Instructions, LMPs for energy, Real-Time MCPCs for Ancillary Services, and for the pricing run as described in Section 6.5.7.3.1, Determination of Real-Time Reliability Deployment Price Adders, the total Reliability Unit Commitment (RUC)/Reliability Must-Run (RMR) MW relaxed, total Load Resource MW deployed that is added to the Demand, total Transmission and/or Distribution Service Provider (TDSP) standard offer Load management MW deployed that is added to the Demand, total Emergency Response Service (ERS) MW deployed that is added to the Demand, total ERCOT-directed DC Tie MW that is added to or subtracted from the Demand, total Block Load Transfer (BLT) MW that is added to or subtracted from the Demand Real-Time Reliability Deployment Price Adder for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service using Inter-Control Center Communications Protocol (ICCP) or Verbal Dispatch Instructions (VDIs). In communicating Ancillary Service awards, the awards shall be broken out by Ancillary Service sub-type, where applicable</p>



		<p>Monitor Resource Status and identify discrepancies between COP and telemetered Resource Status</p> <p>Restart Real-Time Sequence on major change of Resource or Transmission Element Status</p> <p>Monitor ERCOT total system capacity providing Ancillary Services</p> <p>Validate COP information</p> <p>Validate Ancillary Service Trades</p> <p>Monitor ERCOT control performance</p> <p>Distribute by ICCP, and post on the ERCOT website, System Lambda and the LMPs for each Resource Node, Load Zone and Hub, and Real-Time MCPCs for each Ancillary Service, and for the pricing run as described in Section 6.5.7.3.1 the total RUC/RMR MW relaxed, total Load Resource MW deployed that is added to the Demand, total ERS MW deployed that is added to the Demand, total TDSP standard offer Load management MW deployed that is added to the Demand, total ERCOT-directed DC Tie MW that is added to or subtracted from the Demand, total BLT MW that is added to or subtracted from the Demand, Real-Time Reliability Deployment Price Adder for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service created for each SCED process. These prices shall be posted immediately subsequent to deployment of Base Points and Ancillary Service awards from SCED with the time stamp the prices are effective</p> <p>Post on the ERCOT website the nodal prices for Settlement Only Distribution Generators (SODGs), Settlement Only Distribution Energy Storage Systems (SODESSs), Settlement Only Transmission Generators (SOTGs), and Settlement Only Transmission Energy Storage Systems (SOTESSs). These prices shall include Real-Time Reliability Deployment Price Adders for Energy created for each SCED process. These prices shall be posted immediately subsequent to deployment of Base Points</p>
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		<p>from SCED with the time stamp the prices are effective</p> <p>Post LMPs for each Electrical Bus on the ERCOT website. These prices shall be posted immediately subsequent to deployment of Base Points from each binding SCED with the time stamp the prices are effective</p> <p>Post every 15 minutes on the ERCOT website the aggregate net injection from Settlement Only Generators (SOGs) and Settlement Only Energy Storage Systems (SOESSs)</p> <p>Post on the ERCOT website the projected non-binding LMPs for each Resource Node and Real-Time MCPCs for each Ancillary Service created by each SCED process and for the projected non-binding pricing runs as described in Section 6.5.7.3.1 the total RUC/RMR MW relaxed, total Load Resource MW deployed that is added to Demand, total TDSP standard offer Load management MW deployed that is added to the Demand, total ERCOT-directed DC Tie MW that is added to or subtracted from the Demand, total BLT MW that is added to or subtracted from the Demand, total ERS MW deployed that are deployed that is added to the Demand, Real-Time Reliability Deployment Price Adder for Energy, Real-Time On-Line Reliability Deployment Price Adders for Ancillary Service, and the projected Hub LMPs and Load Zone LMPs. These projected prices shall be posted at a frequency of every five minutes from SCED for at least 15 minutes in the future with the time stamp of the SCED process that produced the projections</p> <p>Post on the MIS Certified Area the projected non-binding Base Points and Ancillary Service awards for each Resource created by each SCED process. These projected non-binding Base Points shall be posted at a frequency of every five minutes from SCED for at least 15 minutes in the future with the time stamp of the SCED process that produced the projections. In posting Ancillary Service awards, the awards shall</p>
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		<p>be broken out by Ancillary Service sub-type, where applicable</p> <p>Post each hour on the ERCOT website binding SCED Shadow Prices and active binding transmission constraints by Transmission Element name (contingency /overloaded element pairs)</p> <p>Post on the ERCOT website, the Settlement Point Prices for each Settlement Point and the Real-Time price for each SODG, SODESS, SOTG, and SOTESS immediately following the end of each Settlement Interval</p> <p>By Settlement Interval, post the 15-minute Real-Time Reliability Deployment Price for Energy, and the 15-minute Real-Time Reliability Deployment Price for Ancillary Service for each of the Ancillary Services</p>
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- (3) At the beginning of each hour, ERCOT shall post on the ERCOT website the following information:
  - (a) Changes in ERCOT System conditions that could affect the security and dynamic transmission limits of the ERCOT System, including:
    - (i) Changes or expected changes, in the status of Transmission Facilities as recorded in the Outage Scheduler for the remaining hours of the current Operating Day and all hours of the next Operating Day; and
    - (ii) Any conditions such as adverse weather conditions as determined from the ERCOT-designated weather service;
  - (b) Updated system-wide Mid-Term Load Forecasts (MTLFs) for all forecast models available to ERCOT Operations, as well as an indicator for which forecast was in use by ERCOT at the time of publication;
  - (c) The quantities of RMR Services deployed by ERCOT for each previous hour of the current Operating Day; and
  - (d) Total ERCOT System Demand, from Real-Time operations, integrated over each Settlement Interval.
- (4) No later than 0600, ERCOT shall post on the ERCOT website the actual system Load by Weather Zone, the actual system Load by Forecast Zone, and the actual system Load by Study Area for each hour of the previous Operating Day.

- (5) ERCOT shall provide notification to the market and post on the ERCOT website Electrical Bus Load distribution factors and other information necessary to forecast Electrical Bus Loads. This report will be published when updates to the Load distribution factors are made. Private Use Network net Load will be redacted from this posting.

***[NPRR1010: Insert paragraphs (6) and (7) below upon system implementation of the Real-Time Co-Optimization (RTC) project:]***

- (6) After every SCED run, ERCOT shall post to the ERCOT website the total capability of Resources available to provide the following Ancillary Service combinations, based on the Resource telemetry from the QSE and capped by the limits of the Resource, for the most recent SCED execution:
  - (a) Capacity to provide Reg-Up, irrespective of whether it is capable of providing any other Ancillary Service;
  - (b) Capacity to provide RRS, irrespective of whether it is capable of providing any other Ancillary Service;
  - (c) Capacity to provide ECRS, irrespective of whether it is capable of providing any other Ancillary Service;
  - (d) Capacity to provide Non-Spin, irrespective of whether it is capable of providing any other Ancillary Service;
  - (e) Capacity to provide Reg-Up, RRS, or both, irrespective of whether it is capable of providing ECRS or Non-Spin;
  - (f) Capacity to provide Reg-Up, RRS, ECRS, or any combination, irrespective of whether it is capable of providing Non-Spin;
  - (g) Capacity to provide Reg-Up, RRS, ECRS, Non-Spin, or any combination; and
  - (h) Capacity to provide Reg-Down.
- (7) Each week, ERCOT shall post on the ERCOT website the historical SCED-interval data described in paragraph (6) above.

**6.4.9.2.2 *SASM Clearing Process***

- (1) SASM procurement requirements are:
  - (a) ERCOT shall procure the additional quantity required of each Ancillary Service, less the quantity self-arranged, if applicable. ERCOT may not buy more of one Ancillary Service in place of the quantity of a different service.

- (b) ERCOT shall select Ancillary Service Offers submitted by QSEs, such that:
- (i) For each Ancillary Service being procured, other than Reg-Down, ERCOT shall select offers that minimize the overall offer-based cost of these Ancillary Services. For each of these Ancillary Services, if selection of the Resource offer exceeds ERCOT's required Ancillary Service quantity, then ERCOT shall select a portion of the Resource offer to meet the Ancillary Service quantity required. For Load Resources offering a block of capacity, ERCOT shall ignore the offer unless the entire block can be accepted.
  - (ii) For Reg-Down, ERCOT shall procure required quantities by selecting capacity in ascending order starting from the lowest-priced offer. ERCOT shall continue this selection process until the required quantity of Reg-Down is obtained. If selection of the Resource offer exceeds ERCOT's required Ancillary Service quantity, then ERCOT shall select a portion of the Resource offer to meet the Ancillary Service quantity required. For Load Resources offering a block of capacity, ERCOT shall ignore the offer unless the entire block can be accepted.
  - (iii) For each Ancillary Service Offer from an Off-Line Resource considered in a SASM, the offer will be awarded only if it can meet the start-up time of the Resource based on the current and the historical operational state of the Resource. If the start-up time cannot be met for the first hour of a block offer, then the whole block offer shall not be considered.
  - ~~(iv) For On-Line ESRs, the duration requirements for Ancillary Services will be respected.~~
- (c) If a QSE has submitted offers of the same Resource capacity for more than one Ancillary Service (sometimes called linked offers), ERCOT may not select any one part of that Resource capacity to provide more than one Ancillary Service in the same Operating Hour. ERCOT may, however, select part of that Resource capacity to provide one Ancillary Service and another part of that capacity to provide a different Ancillary Service in the same Operating Hour.
- (d) The SASM MCPC for each hour for each service is the Shadow Price for the corresponding Ancillary Service constraint for the hour as determined by the SASM algorithm.
- (e) SASM MCPCs for any Ancillary Service shall not exceed the SWCAP. Ancillary Service Offers higher than corresponding Ancillary Service penalty factors, as defined in Appendix 2, Day-Ahead Market Optimization Control Parameters, of the Other Binding Document titled "Methodology for Setting Maximum Shadow Prices for Network and Power Balance Constraints," will not be awarded.

*[NPRR1010: Delete Section 6.4.9.2.2 above upon system implementation of the Real-Time Co-Optimization (RTC) project.]*

### 6.5.5.2 Operational Data Requirements

- (1) ERCOT shall use Operating Period data to monitor and control the reliability of the ERCOT Transmission Grid and shall use it in network analysis software to predict the short-term reliability of the ERCOT Transmission Grid. Each TSP, at its own expense, may obtain that Operating Period data from ERCOT or directly from QSEs.
- (2) A QSE representing a Generation Resource connected to Transmission Facilities or distribution facilities shall provide the following Real-Time telemetry data to ERCOT for each Generation Resource. ERCOT shall make that data available, in accordance with ERCOT Protocols, NERC Reliability Standards, and Governmental Authority requirements, to requesting TSPs and DSPs operating within ERCOT. Such data must be provided to the requesting TSP or DSP at the requesting TSP's or DSP's expense, including:
  - (a) Net real power (in MW) as measured by installed power metering or as calculated in accordance with the Operating Guides based on metered gross real power and conversion constants determined by the Resource Entity and provided to ERCOT through the Resource Registration process. Net real power represents the actual generation of a Resource for all real power dispatch purposes, including use in Security-Constrained Economic Dispatch (SCED), determination of the High Ancillary Service Limit (HASL), High Dispatch Limit (HDL), Low Dispatch Limit (LDL) and Low Ancillary Service Limit (LASL), and is consistent with telemetered HSL, LSL and Non-Frequency Responsive Capacity (NFRC);
  - (b) Gross real power (in MW) as measured by installed power metering or as calculated in accordance with the Operating Guides based on metered real power, which may include Supervisory Control and Data Acquisition (SCADA) metering, and conversions constants determined by the Resource Entity and provided to ERCOT through the Resource Registration process;
  - (c) Gross Reactive Power (in Megavolt-Amperes reactive (MVar));
  - (d) Net Reactive Power (in MVar);
  - (e) Power to standby transformers serving plant auxiliary Load;
  - (f) Status of switching devices in the plant switchyard not monitored by the TSP or DSP affecting flows on the ERCOT Transmission Grid;
  - (g) Any data mutually agreed to by ERCOT and the QSE to adequately manage system reliability;

- (h) Generation Resource breaker and switch status;
- (i) HSL (Combined Cycle Generation Resources) shall:
  - (i) Submit the HSL of the current operating configuration; and
  - (ii) When providing ECRS, update the HSL as needed, to be consistent with Resource performance limitations of ECRS provision;
- (j) NFRC currently available (unloaded) and included in the HSL of the Combined Cycle Generation Resource’s current configuration;
- (k) High Emergency Limit (HEL), under Section 6.5.9.2, Failure of the SCED Process;
- (l) Low Emergency Limit (LEL), under Section 6.5.9.2;
- (m) LSL;
- (n) Configuration identification for Combined Cycle Generation Resources;
- (o) Ancillary Service Schedule for each quantity of ECRS and Non-Spin which is equal to the Ancillary Service Resource Responsibility minus the amount of Ancillary Service deployment;
  - (i) For On-line Non-Spin, Ancillary Service Schedule shall be set to zero;
  - (ii) For Off-Line Non-Spin and for On-Line Non-Spin using Off-Line power augmentation technology the Ancillary Service Schedule shall equal the Non-Spin obligation and then shall be set to zero within 20 minutes following Non-Spin deployment;
- (p) Ancillary Service Resource Responsibility for each quantity of Regulation Up Service (Reg-Up), Regulation Down Service (Reg-Down), RRS, ECRS, and Non-Spin. The sum of Ancillary Service Resource Responsibility for all Resources in a QSE is equal to the Ancillary Service Supply Responsibility for that QSE;
- (q) Reg-Up and Reg-Down participation factors represent how a QSE is planning to deploy the Ancillary Service energy on a percentage basis to specific qualified Resource(s). The Reg-Up and Reg-Down participation factors for a Resource providing Fast Responding Regulation Up Service (FRRS-Up) or Fast Responding Regulation Down Service (FRRS-Down) shall be zero; ~~and~~
- (r) The designated Master QSE of a Generation Resource that has been split to function as two or more Split Generation Resources shall provide Real-Time telemetry for items (a), (b), (c), (d), (e), (g), and (h) above, PSS and AVR status for the total Generation Resource in addition to the Split Generation Resource the Master QSE represents; ~~and~~ and

- (s) For an ESR, the next Operating Hour's Ancillary Service Resource Responsibility for each quantity of Reg-Up, Reg-Down, ECRS, RRS and Non-Spin.

***[NPRR1010, NPRR1014, and NPRR1029: Replace applicable portions of paragraph (2) above with the following upon system implementation for NPRR1014 or NPRR1029; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010:]***

- (2) A QSE representing a Generation Resource connected to Transmission Facilities or distribution facilities shall provide the following Real-Time telemetry data to ERCOT for each Generation Resource. ERCOT shall make that data available, in accordance with ERCOT Protocols, NERC Reliability Standards, and Governmental Authority requirements, to requesting TSPs and DSPs operating within ERCOT. Such data must be provided to the requesting TSP or DSP at the requesting TSP's or DSP's expense, including:
- (a) Net real power (in MW) as measured by installed power metering or as calculated in accordance with the Operating Guides based on metered gross real power and conversion constants determined by the Resource Entity and provided to ERCOT through the Resource Registration process. Net real power represents the actual generation of a Resource for all real power dispatch purposes, including use in Security-Constrained Economic Dispatch (SCED), High Dispatch Limit (HDL), and Low Dispatch Limit (LDL), and is consistent with telemetered HSL, LSL, and Frequency Responsive Capacity (FRC);
  - (b) Gross real power (in MW) as measured by installed power metering or as calculated in accordance with the Operating Guides based on metered real power, which may include Supervisory Control and Data Acquisition (SCADA) metering, and conversions constants determined by the Resource Entity and provided to ERCOT through the Resource Registration process;
  - (c) Gross Reactive Power (in Megavolt-Amperes reactive (MVAR));
  - (d) Net Reactive Power (in MVAR);
  - (e) Power to standby transformers serving plant auxiliary Load;
  - (f) Status of switching devices in the plant switchyard not monitored by the TSP or DSP affecting flows on the ERCOT Transmission Grid;
  - (g) Any data mutually agreed to by ERCOT and the QSE to adequately manage system reliability;
  - (h) Generation Resource breaker and switch status;
  - (i) HSL (Combined Cycle Generation Resources) shall:



- (i) Submit the HSL of the current operating configuration; and
- (ii) When providing ECRS, update the HSL as needed, to be consistent with Resource performance limitations of ECRS provision;
- (j) For Resources with capacity that is not capable of providing Primary Frequency Response (PFR), the current FRC of the Resource;
- (k) High Emergency Limit (HEL), under Section 6.5.9.2, Failure of the SCED Process;
- (l) Low Emergency Limit (LEL), under Section 6.5.9.2;
- (m) LSL;
- (n) Configuration identification for Combined Cycle Generation Resources;
- (o) For Resources with capacity that is not capable of providing PFR, the high and low limits in MW of the Resource’s capacity that is frequency responsive;
- (p) For RRS, including any sub-categories of RRS, the physical capability (in MW) of the Resource to provide RRS;
- (q) For Ancillary Services other than RRS, a blended Normal Ramp Rate (in MW/min) that reflects the physical capability of the Resource to provide that specific type of Ancillary Service;
- (r) Five-minute blended Normal Ramp Rates (up and down);
- (s) The designated Master QSE of a Generation Resource that has been split to function as two or more Split Generation Resources shall provide Real-Time telemetry for items (a), (b), (c), (d), (e), (g), and (h) above, PSS and AVR status for the total Generation Resource in addition to the Split Generation Resource the Master QSE represents; and
- (t) The telemetered MW of power augmentation capacity that is not On-Line for Resources that have power augmentation capacity included in HSL.

- (3) For each Intermittent Renewable Resource (IRR), the QSE shall set the HSL equal to the current net output capability of the facility. The net output capability should consider the net real power of the IRR generation equipment, IRR generation equipment availability, weather conditions, and whether the IRR net output is being affected by compliance with a SCED Dispatch Instruction.
- (4) For each Aggregate Generation Resource (AGR), the QSE shall telemeter the number of its generators online.

- (5) A QSE representing a Load Resource connected to Transmission Facilities or distribution facilities shall provide the following Real-Time data to ERCOT for each Load Resource and ERCOT shall make the data available, in accordance with ERCOT Protocols, NERC standards and policies, and Governmental Authority requirements, to the Load Resource's host TSP or DSP at the TSP's or DSP's expense. The Load Resource's net real power consumption, Low Power Consumption (LPC) and Maximum Power Consumption (MPC) shall be telemetered to ERCOT using a positive (+) sign convention:
- (a) Load Resource net real power consumption (in MW);
  - (b) Any data mutually agreed to by ERCOT and the QSE to adequately manage system reliability;
  - (c) Load Resource breaker status, if applicable;
  - (d) LPC (in MW);
  - (e) MPC (in MW);
  - (f) Ancillary Service Schedule (in MW) for each quantity of RRS, ECRS, and Non-Spin, which is equal to the Ancillary Service Resource Responsibility minus the amount of Ancillary Service deployment;
  - (g) Ancillary Service Resource Responsibility (in MW) for each quantity of Reg-Up and Reg-Down for Controllable Load Resources, and RRS, ECRS, and Non-Spin for all Load Resources;
  - (h) The status of the high-set under-frequency relay, if required for qualification. The under-frequency relay for a Load Resource providing Non-Spin shall be disabled and the status of that relay shall indicate it as disabled or unarmed;
  - (i) For a Controllable Load Resource providing Non-Spin, the Scheduled Power Consumption that represents zero Ancillary Service deployments;
  - (j) For a single-site Controllable Load Resource with registered maximum Demand response capacity of ten MW or greater, net Reactive Power (in MVar);
  - (k) Resource Status (Resource Status shall be ONRL if high-set under-frequency relay is active);
  - (l) Reg-Up and Reg-Down participation factor, which represents how a QSE is planning to deploy the Ancillary Service energy on a percentage basis to specific qualified Resource(s). The Reg-Up and Reg-Down participation factors for a Resource providing FRRS-Up or FRRS-Down shall be zero; ~~and~~
  - (m) For a Controllable Load Resource providing Non-Spin, the "Scheduled Power Consumption Plus Two Hours," representing the QSE's forecast of the

Controllable Load Resource's instantaneous power consumption for a point two hours in the future-; and

- (n) For an ESR, the next Operating Hour's Ancillary Service Resource Responsibility for each quantity of Reg-Up, Reg-Down, ECRS, RRS and Non-Spin.

***[NPRR1010, NPRR1029, and NPRR1131: Replace applicable portions of paragraph (5) above with the following upon system implementation for NPRR1029 or NPRR1131; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010:]***

- (5) A QSE representing a Load Resource connected to Transmission Facilities or distribution facilities shall provide the following Real-Time data to ERCOT for each Load Resource and ERCOT shall make the data available, in accordance with ERCOT Protocols, NERC standards and policies, and Governmental Authority requirements, to the Load Resource's host TSP or DSP at the TSP's or DSP's expense. The Load Resource's net real power consumption, Low Power Consumption (LPC) and Maximum Power Consumption (MPC) shall be telemetered to ERCOT using a positive (+) sign convention:
- (a) Load Resource net real power consumption (in MW);
  - (b) Any data mutually agreed to by ERCOT and the QSE to adequately manage system reliability;
  - (c) Load Resource breaker status, if applicable;
  - (d) LPC (in MW);
  - (e) MPC (in MW);
  - (f) The Load Resource's Ancillary Service self-provision (in MW) for RRS and/or ECRS provided via under-frequency relay;
  - (g) The status of the high-set under-frequency relay, if required for qualification. The under-frequency relay for a Load Resource providing Non-Spin shall be disabled and the status of that relay shall indicate it as disabled or unarmed;
  - (h) For a Controllable Load Resource providing Non-Spin, the Scheduled Power Consumption that represents zero Ancillary Service deployments;
  - (i) For a single-site Controllable Load Resource with registered maximum Demand response capacity of ten MW or greater, net Reactive Power (in MVar);

- (j) Resource Status;
- (k) For an Aggregate Load Resource (ALR) providing Non-Spin, the “Scheduled Power Consumption Plus Two Hours,” representing the QSE’s forecast of the Controllable Load Resource’s instantaneous power consumption for a point two hours in the future;
- (l) For RRS, including any sub-categories of RRS, the current physical capability (in MW) of the Resource to provide RRS;
- (m) For Ancillary Service products other than RRS, a blended Normal Ramp Rate (in MW/min) that reflects the current physical capability of the Resource’s ability to provide a particular Ancillary Service product; and
- (n) For a Controllable Load Resource, 5-minute blended Normal Ramp Rates (up and down).

***[NPRR1014 and NPRR1029: Insert applicable portions of paragraph (6) below upon system implementation and renumber accordingly:]***

- (6) A QSE representing an ESR connected to Transmission Facilities or distribution facilities shall provide the following Real-Time telemetry data to ERCOT for each ESR. ERCOT shall make that data available, in accordance with ERCOT Protocols, NERC Reliability Standards, and Governmental Authority requirements, to requesting TSPs and DSPs operating within ERCOT. Such data must be provided to the requesting TSP or DSP at the requesting TSP’s or DSP’s expense, including:
  - (a) Net real power consumption or output (in MW) as measured by installed power metering or as calculated in accordance with the Operating Guides based on metered gross real power and conversion constants determined by the Resource Entity and provided to ERCOT through the Resource Registration process. Net real power represents the actual generation or consumption of an ESR for all real power dispatch purposes, including use in Security-Constrained Economic Dispatch (SCED), in determination of High Dispatch Limit (HDL), and Low Dispatch Limit (LDL) and is consistent with telemetered HSL, LSL and Frequency Responsive Capacity (FRC);
  - (b) Gross real power consumption or output (in MW) as measured by installed power metering or as calculated in accordance with the Operating Guides based on metered real power, which may include Supervisory Control and Data Acquisition (SCADA) metering, and conversion constants determined by the Resource Entity and provided to ERCOT through the Resource Registration process;

- (c) Gross Reactive Power (in Megavolt-Amperes reactive (MVar));
- (d) Net Reactive Power (in MVar);
- (e) Power to standby transformers serving plant auxiliary Load;
- (f) Status of switching devices in the plant switchyard not monitored by the TSP or DSP affecting flows on the ERCOT Transmission Grid;
- (g) Any data mutually agreed to by ERCOT and the QSE to adequately manage system reliability;
- (h) ESR breaker and switch status;
- (i) HSL;
- (j) High Emergency Limit (HEL), under Section 6.5.9.2, Failure of the SCED Process;
- (k) Low Emergency Limit (LEL), under Section 6.5.9.2;
- (l) LSL;
- (m) For RRS, including any sub-category of RRS, the current physical capability (in MW) of the Resource to provide RRS;
- (n) For Ancillary Services other than RRS, a blended ramp rate (in MW/min) that reflects the current physical capability of the Resource to provide that specific type of Ancillary Service; and
- (o) Five-minute blended normal up and down ramp rates;

- (6) A QSE with Resources used in SCED shall provide communications equipment to receive ERCOT-telemetered control deployments.
- (7) A QSE providing any Regulation Service shall provide telemetry indicating the appropriate status of Resources providing Reg-Up or Reg-Down, including status indicating whether the Resource is temporarily blocked from receiving Reg-Up and/or Reg-Down deployments from the QSE. This temporary blocking will be indicated by the enabling of the Raise Block Status and/or Lower Block Status telemetry points.
  - (a) Raise Block Status and Lower Block Status are telemetry points used in transient unit conditions to communicate to ERCOT that a Resource’s ability to adjust its output has been unexpectedly impaired.

- (b) When one or both of the telemetry points are enabled for a Resource, ERCOT will cease using the regulation capacity assigned to that Resource for Ancillary Service deployment.
- (c) This hiatus of deployment will not excuse the Resource’s obligation to provide the Ancillary Services for which it has been committed.

***[NPRR1010, NPRR1014, and NPRR1029: Replace applicable portions of paragraph (c) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010; or upon system implementation for NPRR1014 or NPRR1029:]***

- (c) This hiatus of deployment will not excuse the Resource’s obligation to provide the Ancillary Services for which it has been awarded.

- (d) These telemetry points shall only be utilized during unforeseen transient unit conditions such as plant equipment failures. Raise Block Status and Lower Block Status shall only be enabled until the Resource operator has time to update the Resource limits and Ancillary Service telemetry to reflect the problem.

- (e) The Resource limits and Ancillary Service telemetry shall be updated as soon as practicable. Raise Block Status and Lower Block Status will then be disabled.

- (8) Real-Time data for reliability purposes must be accurate to within three percent. This telemetry may be provided from relaying accuracy instrumentation transformers.

- (9) Each QSE shall report the current configuration of combined-cycle Resources that it represents to ERCOT. The telemetered Resource Status for a Combined Cycle Generation Resource may only be assigned a Resource Status of OFFNS if no generation units within that Combined Cycle Generation Resource are On-Line.

***[NPRR1010, NPRR1014, and NPRR1029: Replace applicable portions of paragraph (9) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010; or upon system implementation for NPRR1014 or NPRR1029:]***

- (9) Each QSE shall report the current configuration of combined-cycle Resources that it represents to ERCOT. The telemetered Resource Status for a Combined Cycle Generation Resource may only be assigned a Resource Status of OFF if no generation units within that Combined Cycle Generation Resource are On-Line.

- (10) A QSE representing Combined Cycle Generation Resources shall provide ERCOT with the possible operating configurations for each power block with accompanying limits. Combined Cycle Train power augmentation methods may be included as part of one or

more of the registered Combined Cycle Generation Resource configurations. Power augmentation methods may include:

- (a) Combustion turbine inlet air cooling methods;
  - (b) Duct firing;
  - (c) Other ways of temporarily increasing the output of Combined Cycle Generation Resources; and
  - (d) For Qualifying Facilities (QFs), an LSL that represents the minimum energy available for Dispatch by SCED, in MW, from the Combined Cycle Generation Resource based on the minimum stable steam delivery to the thermal host plus a justifiable reliability margin that accounts for changes in ambient conditions.
- (11) A QSE representing Generation Resources other than Combined Cycle Generation Resources may telemeter an NFRC value for their Generation Resource only if the QSE or Resource Entity associated with that Generation Resource has first requested and obtained ERCOT’s approval of the Generation Resource’s NFRC quantity.

***[NPRR1010, NPRR1014, and NPRR1029: Replace applicable portions of paragraph (11) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010; or upon system implementation for NPRR1014 or NPRR1029:]***

(11) A QSE representing a Generation Resource other than a Combined Cycle Generation Resource may provide FRC telemetry for the Generation Resource only if the QSE or Resource Entity associated with that Generation Resource has first requested and obtained ERCOT’s approval.

- (12) A QSE representing an ESR shall provide the following Real-Time telemetry data to ERCOT for each ESR:
- (a) Maximum ~~Operating~~ State of Charge (MaxSOC), in MWh;
  - (b) Minimum ~~Operating~~ State of Charge (MinSOC), in MWh;
  - (c) State of Charge (SOC), in MWh;
  - (d) Maximum Operating Discharge Power Limit, in MW; and
  - (e) Maximum Operating Charge Power Limit, in MW.
- (13) The QSE shall ensure that the State of Charge (SOC) is greater than or equal to the Minimum State of Charge (MinSOC) and less than or equal to the Maximum State of Charge (MaxSOC).

(14) For each ESR, ERCOT shall include in the High Ancillary Service Limit (HASL) calculation the SOC that is available for an injection Base Point or the additional energy that the ESR can charge in the next SCED interval. For the purposes of paragraph (14), X equals 0.

(a) SOC available for an injection Base Point in the next SCED interval is the:

(i) Telemetered SOC;

(ii) Minus the sum of the individual SOC requirements for each up Ancillary Service (ERCOT Contingency Reserve Service (ECRS), Non-Spinning Reserve (Non-Spin), Responsive Reserve (RRS), or Regulation Up Service (Reg-Up)) the ESR is carrying at that time;

(A) The SOC requirement for each up Ancillary Service, excluding RRS from Fast Frequency Response (FFR) and Fast Responding Regulation Service (FRRS), is equal to the ESR's Ancillary Service Resource Responsibility multiplied by the remaining time in the Operating Hour, in hours, plus the product of the Ancillary Service Resource Responsibility and the difference between the duration of the Ancillary Service, in hours, and one hour. Prior to X minutes before the end of current Operating Hour, this requirement may increase to account for the up Ancillary Services that the ESR is required to provide in the next Operating Hour. The SOC requirement for an ESR providing RRS from FFR is equal to the ESR's Ancillary Service Resource Responsibility for FFR multiplied by 0.25 hours. If FFR is deployed, an SOC credit will be given such that:

(1) Until FFR is recalled, the SOC credit is equal to the ESR's Ancillary Service Resource Responsibility for FFR at the time of deployment multiplied by the lower of the elapsed time since the beginning of the deployment and 0.25 hours;

(2) For the 15 minutes following the recall of FFR, the SOC credit is equal to the lower of the SOC credit just prior to FFR recall and the ESR's Ancillary Service Resource Responsibility for FFR for the current hour multiplied by 0.25 hours;

(3) Beginning 15 minutes after FFR recall, the SOC credit is zero; and

(4) If another FFR event occurs within 15 minutes after a previous FFR event has been recalled, the SOC credit for the first event calculated in paragraph (2) above will be applied to the SOC credit for each additional FFR event.



(iii) Minus the telemetered MinSOC.

(b) The additional energy that the ESR can charge in the next SCED interval is the:

(i) Telemetered Maximum SOC (MaxSOC);

(ii) Minus the SOC margin required for the Regulation Down Service (Reg-Down) Ancillary Service Resource Responsibility the ESR is carrying at that time, which is calculated as the ESR's Reg-Down Ancillary Service Resource Responsibility multiplied by the remaining time in the Operating Hour, in hours. Prior to X minutes before the end of current Operating Hour, this SOC margin requirement may increase to account for the Regulation Down the ESR is planning to provide in the next Operating Hour;

(iii) Minus telemetered SOC.

(154) In accordance with ERCOT Protocols, NERC Reliability Standards, and Governmental Authority requirements, ERCOT shall make the data specified in paragraph (12) available to any requesting TSP or DSP at the requesting TSP's or DSP's expense.

***[NPRR1077: Insert paragraphs (1654)-(1876) below upon system implementation:]***

(1654) Except as provided in paragraph (15) below, a QSE representing a Settlement Only Generator (SOG) shall provide ERCOT the following Real-Time telemetry:

- (a) Net real power injection at the Point of Interconnection (POI) or Point of Common Coupling (POCC) for each site with one or more SOGs;
- (b) For any site with one or more ESSs that are registered as an SOG, net real power withdrawal at the POI or POCC;
- (c) For each inverter at the site, gross real power output measured at the generator terminals for all SOGs that are located behind that inverter, separately aggregated by fuel type;
- (d) For SOGs at the same site that are not located behind an inverter, gross real power output measured at the generator terminals for all SOGs, separately aggregated by fuel type;
- (e) For any site with one or more ESSs registered as an SOG, for each inverter, gross real power withdrawal by all such ESSs that are located behind that inverter, as measured at the generator terminals; and
- (f) Generator breaker status.

(~~1765~~) A QSE is not required to provide telemetry for a Settlement Only Distribution Generator (SODG) if:

- (a) The site that includes the SODG has not exported more than 10 MWh in any calendar year, exclusive of any energy exported during any Settlement Interval in which an ERCOT-declared Energy Emergency Alert (EEA) is in effect;
- (b) The QSE or Resource Entity for the SODG has submitted a written request to ERCOT seeking an exemption from the telemetry requirements under this paragraph; and
- (c) ERCOT has provided the QSE or Resource Entity written confirmation that the SODG is exempt from providing telemetry under this paragraph.

(~~1876~~) If ERCOT determines that a site that includes an SODG has exported more than 10 MWh in a given calendar year, it shall notify the SODG's QSE that the SODG is no longer eligible for the telemetry exemption. Within 90 days of receiving this notification, the QSE for the SODG shall comply with the telemetry requirements of paragraph (~~154~~) above.

*[NPRR885: Insert paragraph (~~1987~~) below upon system implementation:]*

(~~1987~~) A QSE representing a Must-Run Alternative (MRA) shall telemeter the MRA MW currently available (unloaded) and not included in the HSL.

*[NPRR1029: Insert paragraph (~~20198~~) below upon system implementation:]*

(~~20198~~) A QSE representing a DC-Coupled Resource shall provide the following Real-Time telemetry data in addition to that required for other ESRs:

- (a) Gross AC MW production of the intermittent renewable generation component of the DC-Coupled Resource, which includes the portion of the intermittent renewable generation used to charge the ESS and/or serve auxiliary Load on the DC side of the inverter; and
- (b) Gross AC MW capability of the intermittent renewable generation component of the DC-Coupled Resource, based on Real-Time conditions.

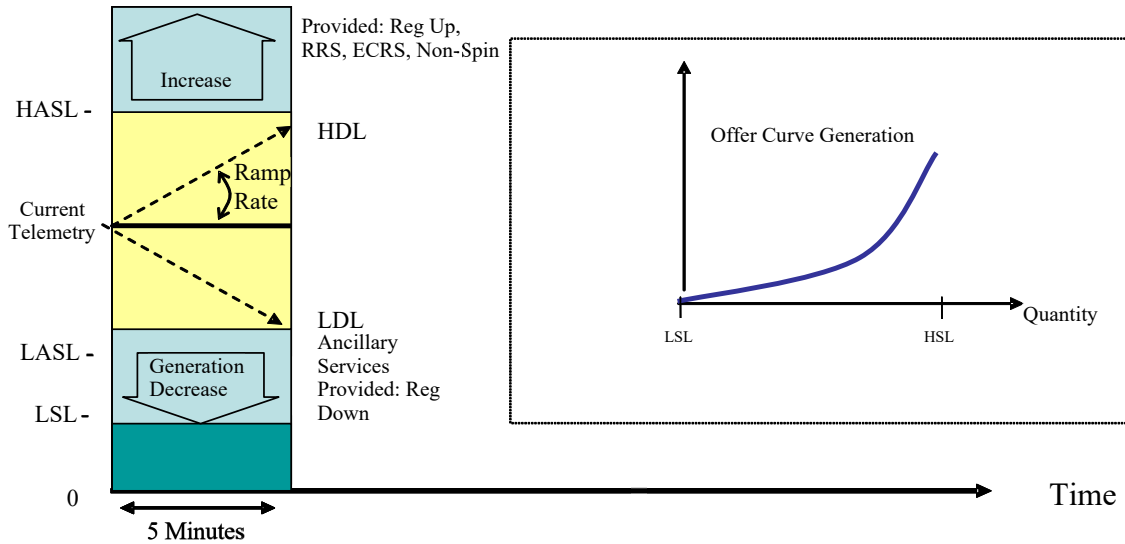
*[NPRR995: Insert paragraph (~~2019~~) below upon system implementation:]*

(2019) A QSE representing a Settlement Only Energy Storage System (SOESS) that elects to include the net generation and/or net withdrawals of the SOESS in the estimate of Real-Time Liability (RTL) shall provide ERCOT Real-Time telemetry of the net generation and/or net withdrawals of the SOESS.

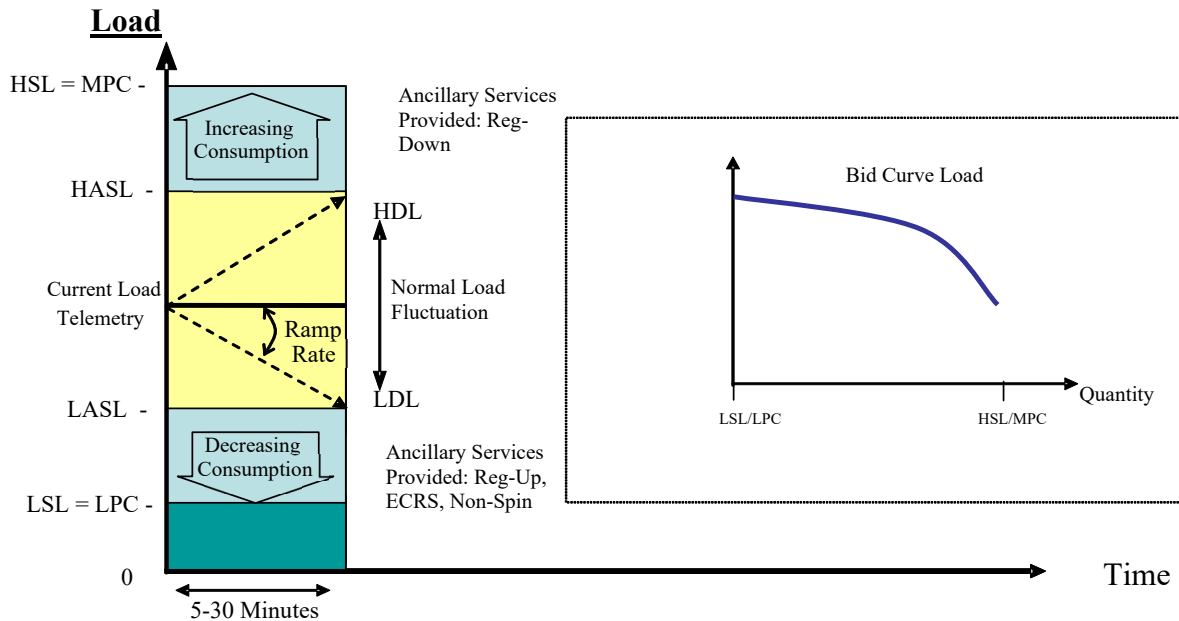
#### 6.5.7.2 Resource Limit Calculator

- (1) ERCOT shall calculate the HASL, LASL, SURAMP, SDRAMP, HDL and LDL within four seconds after a change of the Resource-specific attributes provided as part of the QSE's SCADA telemetry under Section 6.5.5.2, Operational Data Requirements. The formulas described below define which Resource-specific attributes must be used to calculate each Resource limit. The Resource limits are used as inputs into both the SCED process and the Ancillary Service Capacity Monitor as described in Section 6.5.7.6, Load Frequency Control. These Resource limits help ensure that the deployments produced by the SCED and Load Frequency Control (LFC) processes will respect the commitment of a Resource to provide Ancillary Services as well as individual Resource physical limitations.
- (2) The figures below illustrate how the Resource Limit Calculator determines the Resource limits for Generation and Load Resources:

Generation Resources:  
**Generation**



Load Resources:



(3) For Generation Resources, HASL is calculated as follows:

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$$\text{HASL} = \text{Max} (\text{LASL}, (\text{HSLTELEM} - (\text{ECRSTELEM} + \text{RRSTELEM} + \text{RUSTELEM} + \text{NSRSTELEM} + \text{NFRCTELEM})))$$

For a modeled Generation Resources that represents the injection component of an ESR, HASL is calculated as follows:

$$\text{HASL} = \text{Max} (\text{LASL}, \text{Min} ((\text{HSLTELEM} - (\text{RRSTELEM} + \text{RUSTELEM} + \text{ECRSTELEM} + \text{NSRSTELEM} + \text{NFRCTELEM})), \text{MaxBP}))$$

$$\text{MaxBP} = \frac{(\text{SOCTELEM} - \text{MINSOCTELEM} - \text{REQASSOC})}{\text{TSCED}}$$

Variable	Description
HASL	High Ancillary Service Limit.
HSLTELEM	High Sustained Limit provided via telemetry – per Section 6.5.5.2.
LASL	Low Ancillary Service Limit.
RRSTELEM	RRS Ancillary Service Schedule provided via telemetry.
RUSTELEM	Reg-Up Ancillary Service Resource Responsibility designation provided by telemetry.
NSRSTELEM	Non-Spin Ancillary Service Schedule provided via telemetry.
ECRSTELEM	ECRS Ancillary Service Schedule provided by telemetry.
NFRCTELEM	NFRC currently available (unloaded) and included in the HSL of the Generation Resource with non-zero <del>ECRS</del> RRS Ancillary Service Schedule telemetry.
<u>MaxBP</u>	<u>Calculated maximum SCED Base Point possible from available SOC after discounting for SOC required to support telemetered Ancillary Service Resource Responsibilities.</u>
<u>REQASSOC</u>	<u>Calculated required SOC needed to support Ancillary Service Supply Resource Responsibilities, as calculated in paragraph (14)(a)(ii)(A) of Section 6.5.5.2 taking into account Ancillary Services duration requirements.</u>
<u>SOCTELEM</u>	<u>Current SOC via telemetry.</u>
<u>MINSOCTELEM</u>	<u>MinSOC via telemetry.</u>
<u>TSCED</u>	<u>Nominal SCED interval duration = 1/12 hour.</u>

(4) For Generation Resources, LASL is calculated as follows:

$$\text{LASL} = \text{LSLTELEM} + \text{RDSTELEM}$$

Variable	Description
LASL	Low Ancillary Service Limit.
LSLTELEM	Low Sustained Limit provided via telemetry.
RDSTELEM	Reg-Down Ancillary Service Resource Responsibility designation provided by telemetry.

(5) For each Generation Resource, the SURAMP is calculated as follows:

$$\text{SURAMP} = \text{RAMPRATE} - (1 - \text{RDSDEPLP}) * (\text{RUSTELEM} / 7)$$

Variable	Description
SURAMP	SCED Up Ramp Rate.
RAMPRATE	Normal Ramp Rate up, as telemetered by the QSE, when ECRS is not deployed or when the subject Resource is not providing ECRS. Emergency Ramp Rate up, as telemetered by the QSE, for Resources deploying ECRS.
RUSTELEM	Reg-Up Ancillary Service Resource Responsibility designation provided by telemetry.
RDSDEPLP	Percentage of system-wide Reg-Down Ancillary Resource Responsibility deployed by LFC. This value shall not exceed 100% and controls the amount of ramp rate reserved for Regulation Service in Real-Time.

(6) For each Generation Resource, the SDRAMP is calculated as follows:

$$\text{SDRAMP} = \text{NORMRAMP} - (1 - \text{RUSDEPLP}) * (\text{RDSTELEM} / 7)$$

Variable	Description
SDRAMP	SCED Down Ramp Rate.
NORMRAMP	Normal Ramp Rate down, as telemetered by the QSE.
RDSTELEM	Reg-Down Ancillary Service Resource Responsibility designation by Resource provided via telemetry.
RUSDEPLP	Percentage of system-wide Reg-Up Ancillary Resource Responsibility deployed by LFC. This value shall not exceed 100% and controls the amount of ramp rate reserved for Regulation Service in Real-Time.

(7) For Generation Resources, HDL is calculated as follows:

(a) If the telemetered Resource Status is SHUTDOWN, then

$$\text{HDL} = \text{POWERTELEM} - (\text{SDRAMP} * 5)$$

(b) If the telemetered Resource Status is any status code specified in item (5)(b)(i) of Section 3.9.1, Current Operating Plan (COP) Criteria, other than SHUTDOWN, then

$$\text{HDL} = \text{Min} (\text{POWERTELEM} + (\text{SURAMP} * 5), \text{HASL})$$

Variable	Description
HDL	High Dispatch Limit.
POWERTELEM	Gross or net real power provided via telemetry.
SURAMP	SCED Up Ramp Rate.
SDRAMP	SCED Down Ramp Rate.
HASL	High Ancillary Service Limit – definition provided in Section 2, Definitions and Acronyms.

(8) For Generation Resources, LDL is calculated as follows:

(a) If the telemetered Resource Status is STARTUP, then

$$LDL = POWERTELEM + (SURAMP * 5)$$

(b) If the telemetered Resource Status is any status code specified in item (5)(b)(i) of Section 3.9.1 other than STARTUP, then

$$LDL = \text{Max} (POWERTELEM - (SDRAMP * 5), LASL)$$

Variable	Description
LDL	Low Dispatch Limit.
POWERTELEM	Gross or net real power provided via telemetry.
SDRAMP	SCED Down Ramp Rate.
LASL	Low Ancillary Service Limit – definition provided in Section 2.

(9) For Load Resources, HASL is calculated as follows:

$$HASL = \text{Max} (LPCTELEM, (MPCTELEM - RDSTELEM))$$

For a modeled Controllable Load Resources that represents the charging component of an ESR, HASL is -calculated as follows:

$$HASL = \text{Max} (LPCTELEM, \text{Min} ((MPCTELEM - RDSTELEM), \text{MaxBP}))$$

$$\text{MaxBP} = \frac{(MAXSOCTELEM - SOCTELEM - REQHDRMASSOC)}{TSCED}$$

Variable	Description
HASL	High Ancillary Service Limit.
LPCTELEM	Low Power Consumption provided via telemetry.
MPCTELEM	Maximum Power Consumption provided via telemetry.
RDSTELEM	Reg-Down Ancillary Service Resource Responsibility designation provided by telemetry.

<u>MaxBP</u>	Calculated <u>maximum SCED Base Point possible from available SOC headroom after discounting for SOC required to support telemetered Ancillary Service Resource Responsibilities.</u>
<u>REQHDRMASSOC</u>	Calculated <u>required SOC headroom needed to support Ancillary Service Resource Responsibilities, as calculated in paragraph (14)(b)(ii) of Section 6.5.5.2 taking into account Ancillary Service duration requirements.</u>
<u>SOCTELEM</u>	<u>Current SOC via telemetry.</u>
<u>MAXSOCTELEM</u>	<u>MaxSOC via telemetry.</u>
<u>TSCED</u>	<u>Nominal SCED interval duration = 1/12 hour.</u>

(10) For Load Resources, LASL is calculated as follows:

$$\text{LASL} = \text{Min (HASL, (LPCTELEM + (ECRSTELEM + RRSTELEM + RUSTELEM + NSRSTELEM)))}$$

Variable	Description
LASL	Low Ancillary Service Limit.
HASL	High Ancillary Service Limit.
LPCTELEM	Low Power Consumption provided via telemetry.
ECRSTELEM	ECRS Ancillary Service Schedule provided by telemetry.
RRSTELEM	RRS Ancillary Service Schedule provided by telemetry.
RUSTELEM	Reg-Up Ancillary Service Resource Responsibility designation provided by telemetry.
NSRSTELEM	Non-Spin Ancillary Service Schedule provided via telemetry.

(11) For each Controllable Load Resource, the SURAMP is calculated as follows:

$$\text{SURAMP} = \text{RAMPRATE} - (1 - \text{RDSDEPLP}) * (\text{RUSTELEM} / 7)$$

Variable	Description
SURAMP	SCED Up Ramp Rate.
RAMPRATE	Normal Ramp Rate up, as telemetered by the QSE, when ECRS is not deployed or when the subject Load Resource is not providing ECRS. Emergency Ramp Rate up, as telemetered by the QSE, for Load Resources deploying ECRS.
RUSTELEM	Reg-Up Ancillary Service Resource Responsibility designation provided by telemetry.
RDSDEPLP	Percentage of system-wide Reg-Down Ancillary Resource Responsibility deployed by LFC. This value shall not exceed 100% and controls the amount of ramp rate reserved for Regulation Service in Real-Time.

(12) For each Controllable Load Resource, the SDRAMP is calculated as follows:

$$\text{SDRAMP} = \text{NORMRAMP} - (1 - \text{RUSDEPLP}) * (\text{RDSTELEM} / 7)$$



Variable	Description
SDRAMP	SCED Down Ramp Rate.
NORMRAMP	Normal Ramp Rate down, as telemetered by the QSE.
RDSTELEM	Reg-Down Ancillary Service Resource Responsibility designation by Resource provided via telemetry.
RUSDEPLP	Percentage of system-wide Reg-Up Ancillary Resource Responsibility deployed by LFC. This value shall not exceed 100% and controls the amount of ramp rate reserved for Regulation Service in Real-Time.

(13) For Load Resources, HDL is calculated as follows:

$$\text{HDL} = \text{Min} (\text{POWERTELEM} + (\text{SDRAMP} * 5), \text{HASL})$$

Variable	Description
HDL	High Dispatch Limit.
POWERTELEM	Net real power flow provided via telemetry.
SDRAMP	SCED Down Ramp Rate.
HASL	High Ancillary Service Limit – definition provided in Section 2.

(14) For Load Resources, LDL is calculated as follows:

$$\text{LDL} = \text{Max} (\text{POWERTELEM} - (\text{SURAMP} * 5), \text{LASL})$$

Variable	Description
LDL	Low Dispatch Limit.
POWERTELEM	Net real power flow provided via telemetry.
SURAMP	SCED Up Ramp Rate.
LASL	Low Ancillary Service Limit – definition provided in Section 2.

***[NPRR879, NPRR1010, and NPRR1014: Replace applicable portions of Section 6.5.7.2 above with the following upon system implementation for NPRR879 or NPRR1014; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010:]***

**6.5.7.2 Resource Limit Calculator**

- (1) ERCOT shall calculate the HDL and LDL within four seconds after a change of the Resource-specific attributes provided as part of the QSE’s SCADA telemetry under Section 6.5.5.2, Operational Data Requirements. The formulas described below define which Resource-specific attributes must be used to calculate each Resource limit. The Resource limits are used as inputs into both the SCED process and the Ancillary Service Capacity Monitor as described in Section 6.5.7.6, Load Frequency Control. These Resource limits help ensure that the deployments produced by the SCED and

Load Frequency Control (LFC) processes will respect individual Resource physical limitations.

(2) For SCED-dispatchable Generation Resources, HDL is calculated as follows:

(a) If the telemetered Resource Status is SHUTDOWN, then

$$\text{HDL} = \text{POWERTELEM} - (\text{NORMRAMPDN} * 5)$$

(b) If the telemetered Resource Status is any status code specified in item (5)(b)(i) of Section 3.9.1, Current Operating Plan (COP) Criteria, other than SHUTDOWN, then

$$\text{HDL} = \text{Min} (\text{POWERTELEM} + (\text{NORMRAMPUP} * 5), \text{HSLTELEM})$$

Variable	Description
HDL	High Dispatch Limit.
POWERTELEM	Gross or net real power provided via telemetry.
NORMRAMPDN	5-minute blended Normal Ramp Rate down, as telemetered by the QSE.
NORMRAMPUP	5-minute blended Normal Ramp Rate up, as telemetered by the QSE.
HSLTELEM	For IRRs qualified to provide an Ancillary Service and telemetering a non-zero capability to provide that Ancillary Service, and all IRRs within an IRR Group where any IRR within the IRR Group is qualified to provide an Ancillary Service and telemetering a non-zero capability to provide that Ancillary Service, HSLTELEM shall be the five-minute intra-hour forecast for the Resource. For all other Resources, HSLTELEM shall be the Resource's HSL provided to ERCOT via telemetry, in accordance with Section 6.5.5.2.

(3) For SCED-dispatchable Generation Resources, LDL is calculated as follows:

(a) If the telemetered Resource Status is STARTUP, then

$$\text{LDL} = \text{POWERTELEM} + (\text{NORMRAMPUP} * 5)$$

(b) If the telemetered Resource Status is any status code specified in item (5)(b)(i) of Section 3.9.1 other than STARTUP, then

$$\text{LDL} = \text{Max} (\text{POWERTELEM} - (\text{NORMRAMPDN} * 5), \text{LSLTELEM})$$

Variable	Description
LDL	Low Dispatch Limit.
POWERTELEM	Gross or net real power provided via telemetry.
LSLTELEM	Low Sustained Limit (LSL) provided via telemetry.
NORMRAMPDN	5-minute blended Normal Ramp Rate down, as telemetered by the QSE.
NORMRAMPUP	5-minute blended Normal Ramp Rate up, as telemetered by the QSE.

(4) For ESRs, HDL is calculated as follows:

(a) If the telemetered Resource Status is ONHOLD, then

$$\mathbf{HDL = 0}$$

(b) If the telemetered Resource Status is ONTEST, then

$$\mathbf{HDL = \text{Max (Min (POWERTELEM, HSLTELEM), LSLTELEM)}$$

(c) If the telemetered Resource Status is any status code specified in item (5)(b)(iv) of Section 3.9.1, Current Operating Plan (COP) Criteria, other than OUT, EMR, EMRSWGR, ONHOLD, or ONTEST, then

$$\mathbf{HDL = \text{Min (POWERTELEM + (NORMRAMPUP * 5), HSLTELEM)}$$

Variable	Description
HDL	High Dispatch Limit.
POWERTELEM	Net real power provided via telemetry.
NORMRAMPUP	5-minute blended Normal Ramp Rate up, as telemetered by the QSE.
HSLTELEM	High Sustained Limit (HSL) provided via telemetry – per Section 6.5.5.2.

(5) For ESRs, LDL is calculated as follows:

(a) If the telemetered Resource Status is ONHOLD, then

$$\mathbf{LDL = 0}$$

(b) If the telemetered Resource Status is ONTEST, then

$$\mathbf{LDL = \text{Max (Min (POWERTELEM, HSLTELEM), LSLTELEM)}$$

(c) If the telemetered Resource Status is any status code specified in item (5)(b)(iv) of Section 3.9.1, Current Operating Plan (COP) Criteria, other than OUT, or EMR, or EMRSWGR, or ONHOLD, or ONTEST, then

$$\mathbf{LDL = \text{Max (POWERTELEM - (NORMRAMPDN * 5), LSLTELEM)}$$

Variable	Description
LDL	Low Dispatch Limit.
POWERTELEM	Net real power provided via telemetry.
LSLTELEM	Low Sustained Limit provided via telemetry.
NORMRAMPDN	5-minute blended Normal Ramp Rate down, as telemetered by the QSE.

(6) For SCED-dispatchable Load Resources, HDL is calculated as follows:

$$\text{HDL} = \text{Min} (\text{POWERTELEM} + (\text{NORMRAMPDN} * 5), \text{HSLTELEM})$$

Variable	Description
HDL	High Dispatch Limit.
POWERTELEM	Net real power flow provided via telemetry.
NORMRAMPDN	Normal Ramp Rate down, as telemetered by the QSE.
HSLTELEM	HSL provided via telemetry.

(7) For SCED-dispatchable Load Resources, LDL is calculated as follows:

$$\text{LDL} = \text{Max} (\text{POWERTELEM} - (\text{NORMRAMPUP} * 5), \text{LSLTELEM})$$

Variable	Description
LDL	Low Dispatch Limit.
POWERTELEM	Net real power flow provided via telemetry.
NORMRAMPUP	Normal Ramp Rate up, as telemetered by the QSE.
LSLTELEM	LSL provided via telemetry.

**8.1 QSE and Resource Performance Monitoring**

(1) ERCOT shall develop a Technical Advisory Committee (TAC)- and ERCOT Board-approved Qualified Scheduling Entity (QSE) and Resource monitoring program to be included in the Operating Guides. Nothing in this Section changes the process for amending the Operating Guides. The metrics developed by ERCOT and approved by TAC and the ERCOT Board must include the provisions of this Section.

(2) Each QSE and Resource shall meet performance measures as described in this Section and in the Operating Guides.

(3) ERCOT shall monitor and post the following categories of performance:

(a) Real-Time data, for QSEs:

(i) Telemetry performance

(b) Regulation control performance, for QSEs and as applicable, Resource-specific performance (see also Section 8.1.1, QSE Ancillary Service Performance Standards);

(c) Hydro responsive testing for Generation Resources;

(d) Supplying and validating data for generator models, as requested by ERCOT, for Generation Resources;

- (e) Outage scheduling and coordination, for QSEs and Resources;
- (f) Resource-specific Responsive Reserve (RRS) performance for QSEs and Resources;
- (g) Resource-specific Non-Spinning Reserve (Non-Spin) performance, for QSEs and Resources;
- (h) Resource-specific ERCOT Contingency Reserve Service (ECRS) performance for QSEs and Resources;
- (i) Outage reporting, by QSEs for Resources;
- (j) Current Operating Plan (COP) metrics, for QSEs; and
- (k) Day-Ahead Reliability Unit Commitment (DRUC) and Hourly Reliability Unit Commitment (HRUC) commitment performance by QSEs and Generation Resources.

~~(4) — A QSE shall manage the State of Charge (SOC) for each Energy Storage Resource (ESR) that it represents to ensure that the ESR is continuously capable of complying with its SOC requirements in (a) and (b) below Ancillary Service Resource Responsibility within the duration requirements for the Ancillary Service. ERCOT shall report any identified instances of non-compliance to the QSE Reliability Monitor for review where the integrated shortfall in comparison to the minimum required SOC over the course of an Operating Hour exceeds the greater of 2 MWhh or the lower of 8 MWhh or 20% of the integrated SOC requirement for the hour or the integrated excess in comparison to the maximum required SOC exceeds the greater of 2 MWhh or the lower of 8 MWhh or 20% of the integrated SOC requirement for the hour.~~

*[NPRR1186: Replace paragraph (4) above with the following upon Phase 2 system implementation but no earlier than three months after system Phase 1 implementation of NPRR1186:]*

~~(4) — A QSE shall manage the State of Charge (SOC) for each Energy Storage Resource (ESR) that it represents to ensure that the ESR is continuously capable of complying with its SOC requirements in (a) and (b) below. ERCOT shall report any identified instances of non-compliance to the Reliability Monitor for review where the integrated shortfall in comparison to the minimum required SOC over the course of an Operating Hour exceeds the greater of 2 MWhh or the lower of 8 MWhh or 20% of the integrated SOC requirement for the hour or the integrated excess in comparison to the maximum required SOC exceeds the greater of 2 MWhh or the lower of 8 MWhh or 20% of the integrated SOC requirement for the hour.~~

~~(a) — Telemetered SOC at any time within the hour must be greater than or equal to:~~

~~(i) — The Minimum SOC (MinSOC) that the ESR is telemetering;~~

(ii) — Plus the sum of the individual SOC required for each up Ancillary Service (ERCOT Contingency Reserve Service (ECRS), Non-Spinning Reserve (Non-Spin), Responsive Reserve (RRS), or Regulation Up Service (Reg-Up)) the ESR is carrying at that time;

(A) — The SOC requirement for each up Ancillary Service, excluding RRS from Fast Frequency Response (FFR) and Fast Responding Regulation Service (FRRS), is equal to the ESR's Ancillary Service Resource Responsibility multiplied by the remaining time in the Operating Hour, in hours, plus the product of the Ancillary Service Resource Responsibility and the difference between the duration of the Ancillary Service, in hours, and 1 hour. The SOC requirement for an ESR providing RRS from FFR is equal to the ESR's Ancillary Service Resource Responsibility for FFR multiplied by 0.25 hours. If FFR is deployed, an SOC credit will be given such that:

(1) — Until FFR is recalled, the SOC credit is equal to the ESR's Ancillary Service Resource Responsibility for FFR at the time of deployment multiplied by the lower of the elapsed time since the beginning of the deployment and 0.25 hours;

(2) — For the next 15 minutes following the recall of FFR, the SOC credit is equal to the lower of the SOC credit just prior to FFR recall and the ESR's Ancillary Service Resource Responsibility for FFR for the current hour multiplied by 0.25 hours;

(3) — Beginning 15 minutes after FFR recall, the SOC credit is zero; and

(4) — If another FFR event occurs within 15 minutes after a previous FFR event has been recalled, the SOC credit for the first event calculated in paragraph (2) above will be applied to the SOC credit for each additional FFR event.

(iii) — Plus the SOC reduction in the SCED interval due to the ESR's current injection Base Point;

(iv) — Minus an energy credit associated with the ESR's current withdrawal Base Point.

(b) — Telemetered SOC at any time within the hour must be less than or equal to:

(i) — The Maximum SOC (MaxSOC) the ESR is telemetering;

(ii) — Minus the SOC charging margin required for the Regulation Down Service (Reg-Down) Ancillary Service Resource Responsibility the ESR

is carrying at that time, which is calculated as the ESR's Regulation Down Resource Responsibility multiplied by the remaining time in the Operating Hour, in hours;

(iii) Minus the SOC the ESR will gain in the SCED interval due to the ESR's current withdrawal Base Point;

(iv) Plus an energy debit associated with the ESR's current injection Base Point.

# ERCOT Impact Analysis Report

**Attachment B**

<b>NPRR Number</b>	<a href="#"><u>1186</u></a>	<b>NPRR Title</b>	<b>Improvements Prior to the RTC+B Project for Better ESR State of Charge Awareness, Accounting, and Monitoring</b>
<b>Impact Analysis Date</b>	June 22, 2023		
<b>Estimated Cost/Budgetary Impact</b>	Between \$500k and \$700k		
<b>Estimated Time Requirements</b>	<p>The timeline for implementing this Nodal Protocol Revision Request (NPRR) is dependent upon Public Utility Commission of Texas (PUCT) prioritization and approval.</p> <p>Estimated project duration: 7 to 10 months</p>		
<b>ERCOT Staffing Impacts (across all areas)</b>	<p>Implementation Labor: 75% ERCOT; 25% Vendor</p> <p>Ongoing Requirements: No impacts to ERCOT staffing.</p>		
<b>ERCOT Computer System Impacts</b>	<p>The following ERCOT systems would be impacted:</p> <ul style="list-style-type: none"> <li>• Market Operation Systems 64%</li> <li>• Data Management &amp; Analytic Systems 17%</li> <li>• Energy Management Systems 15%</li> <li>• Integration Systems 2%</li> <li>• Grid Modeling Systems 1%</li> <li>• Grid Decision Support Systems 1%</li> </ul>		
<b>ERCOT Business Function Impacts</b>	ERCOT will update its business processes to implement this NPRR.		
<b>Grid Operations &amp; Practices Impacts</b>	No impacts to ERCOT grid operations and practices.		

<b>Evaluation of Interim Solutions or Alternatives for a More Efficient Implementation</b>
None offered.

<b>Comments</b>
None.