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| NPRR Number | [1282](https://www.ercot.com/mktrules/issues/NPRR1282) | NPRR Title | Ancillary Service Duration under Real-Time Co-Optimization |
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| Date | May 13, 2025 |
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| Submitter’s Information |
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| Market Segment | Not applicable |

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| Comments |

The IMM appreciates the opportunity to comment on Nodal Protocol Revision Request (NPRR) 1282, which, among other changes, would set the duration requirements for ERCOT Contingency Reserve Service (ECRS) and Non-Spinning Reserve (Non-Spin) at one and four hours, respectively. Regarding the duration requirement for ECRS, this NPRR represents a step in the right direction by adjusting the duration requirement down from two hours to one. However, we maintain that the duration requirement for Non-Spin should be set no more than one hour as well.

We frame this commentary to first address the market events ERCOT referenced to justify the 4-hour duration, second to describe how a 4-hour duration requirement for Non-Spin will result in market incentives that run counter to reliability, and finally to summarize a set of operational and market design improvements that would more effectively manage the risks this duration requirement is meant to address.

**Duration of Non-Spin Deployments is a Misleading Metric**

For both dates ERCOT referenced as evidence of the need for a 4-hour duration requirement for Non-Spin, they use the length of time over which Non-Spin was deployed to make their case. Drawing that conclusion from this metric is flawed because the relationship between system conditions and Non-Spin deployments is heavily influenced by the volume of Non-Spin procured in the Ancillary Service Plan. The more Non-Spin is procured, the more likely it is to be deployed for the same system conditions, which can be seen in the increased frequency of Non-Spin deployments since the Non-Spin plan was increased in summer 2021. If the Non-Spin plan were more appropriately sized, these deployments may not have lasted so long. This dynamic was particularly evident on March 2, 2025, where the minimum Physical Responsive Capability (PRC) and Real-Time On-Line Reserve Capacity (RTOLCAP) were 6,792 MW and 8,470 MW, respectively, and where there was no shortage pricing produced by the Operating Reserve Demand Curve (ORDC).

The shortage conditions on May 13, 2022, constitute a more reasonable concern. PRC dipped slightly below 3,000 MW for a brief period and remained around 3,000 MW for almost three hours due to a sequence of Forced Outages of seven different large Resources on that day. A stochastic risk methodology, like the one we presented in our 2024 Ancillary Service Study, would incorporate the probability of Forced Outages and procure appropriate reserve volumes to address the types of short-term reliability events that Non-Spin is designed to cover. Thus, rather than imposing excessive duration requirements on the entirety of the Non-Spin plan, this concern could be addressed by the implementation of a stochastic risk methodology for the Ancillary Service Plan.

**Market Incentives of 4-Hour Requirement Run Counter to Reliability**

Longer duration requirements for Energy Storage Resources (ESRs) to carry operating reserves will distort their incentives during scarcity conditions. Requiring four hours of State of Charge (SOC) for ESRs to provide Non-Spin effectively reduces the extent to which ESRs can provide Non-Spin and increases the likelihood of shortage pricing for energy and Ancillary Services. Higher energy prices, in turn, incentivize ESRs to shift from providing reserves to delivering energy earlier in a reliability event because of the opportunity cost of holding reserves relative to the value of selling energy. For instance, if energy prices are peaking, a four-hour reserve obligation implies an opportunity cost quadruple the energy price for the ESR. Conversely, the higher reserve prices will incentivize thermal power plants to provide reserves rather than energy, because their cost for providing reserves is lower than their cost of producing energy. This outcome is misaligned with system reliability, as it would be preferable for gas turbines to be dispatched for energy before duration-limited Resources. Ideally, duration-limited ESRs should be prioritized for reserve provision, while thermal units should be dispatched for energy.

Our position is that the duration requirement for Non-Spin should be set at no more than one hour, both for qualifying the capacity of Non-Spin that an ESR can provide and for constraining Ancillary Service awards in Real-Time Co-optimization (RTC) Security-Constrained Economic Dispatch (SCED). Consider a multi-hour reliability event where system conditions are tight, prices are elevated, and all of the Ancillary Services except for Non-Spin are being fully procured. This requirement would allow, for example, a fully charged 100 MW/100MWh ESR to carry 100 MW of Non-Spin and preserve SOC until later in the multi-hour event, thus maximizing total revenue by providing operating reserves and then energy. If, instead, the duration requirement was set at four hours for both qualification and in RTC-SCED, this same Resource would only be able to sell 25 MW of Non-Spin or could sell 100 MW of energy. Under that condition, the ESR has a strong incentive not to miss out on the opportunity to sell energy at elevated prices, as it can only monetize a quarter of its capacity to sell Non-Spin. Thus, the longer duration requirement, rather than incentivizing ESRs to preserve their SOC, incentivizes them to sell energy rather than carry operating reserves.

We strongly support a one-hour duration for the reasons stated above. As a compromise until Dispatchable Reliability Reserve Service (DRRS) is implemented to address long-duration Load forecast uncertainty, we proposed at the January RTC plus Batteries Task Force (RTCBTF) that ERCOT decouple the duration requirement for qualifying Non-Spin capacity from the duration used in RTC-SCED. This distinction would avoid the worst market and reliability outcomes and allows SCED to aggregate Non-Spin awards across multiple ESRs. The ESR in the hypothetical scenario referenced in the previous paragraph would be qualified to carry 25 MW of Non-Spin and sell as much as 75 MW of energy. This decoupling would still encourage the ESR to sell energy earlier in a reliability event rather than preserving its full SOC, but at least it would be able to take advantage of elevated energy prices while preserving 25 MWh of SOC to provide Non-Spin.

**Recommended Operational and Market Design Improvements**

We have identified several operational and market design improvements that, if implemented, could more effectively manage the risks this duration requirement is meant to address:

1. **Implement DRRS**. We recognize the need for some longer-duration operating reserve capacity to manage uncertainty of supply and demand under extreme or volatile weather conditions. DRRS could more effectively serve this purpose rather than imposing a 4-hour duration requirement on the entirety of the Non-Spin plan.
2. **Implement a Multi-Interval Real-Time Market (RTM)**. Much of the operational challenge for managing ESR SOC can be attributed to the single-interval RTM, wherein SCED is incapable of expressly preserving ESR SOC for energy needs in a future interval. Rather, SOC is managed by each ESR operator through their submitted offers for energy and Ancillary Services. A Multi-Interval RTM would enable SCED to incorporate upcoming supply and demand conditions into its awards for energy and Ancillary Services and to preserve ESR SOC until it is most needed for energy.
3. **Incorporate the Probability of Forced Outages into the Ancillary Service Methodology.** In our contribution to the Ancillary Service Study, we demonstrated how a stochastic risk methodology that incorporates the probability of forced generator Outages could be used to set the Ancillary Service Plan for Non-Spin. Such a methodology would more comprehensively account for the operational risks that Non-Spin is procured to manage.
4. **Improve Short-Term Load Forecasting.** Much of the problem this duration requirement is meant to manage can be attributed to forecast error for load and for generation from Intermittent Renewable Resources (IRRs). The need for a longer-duration operating reserve is mostly a function of net Load forecast error that persists over several hours and continues to send inaccurate signals to thermal Resources as to whether conditions will be favorable for them to commit. The challenges associated with forecasting Demand and renewable generation have grown along with the increase in Demand from price-responsive Load and the massive increase in installed wind and solar capacity over the last decade. Given the magnitude of these changes, investments in improving the accuracy of these forecasts would likely be more effective than imposing longer duration requirements on Non-Spin.

In summary, we recommend that the duration requirement for Non-Spin be set at no more than one hour, both for qualification and in RTC-SCED. A reasonable compromise would be to decouple the duration requirement used for qualification and in RTC-SCED. Instead of imposing a four-hour duration requirement, we recommend that ERCOT focus on several other market design and operational improvements that would more effectively manage the risks this duration requirement is meant to address.

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| Revised Cover Page Language |

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| Nodal Protocol Sections Requiring Revision  | 2.2, Acronyms and Abbreviations5.5.2, Reliability Unit Commitment (RUC) Process8.1.1.2.1.1, Regulation Service Qualification8.1.1.2.1.2, Responsive Reserve Qualification8.1.1.2.1.3, Non-Spinning Reserve Qualification8.1.1.3.1, Regulation Service Capacity Monitoring Criteria8.1.1.3.2, Responsive Reserve Capacity Monitoring Criteria8.1.1.3.3, Non-Spinning Reserve Capacity Monitoring Criteria8.1.1.3.4, ERCOT Contingency Reserve Service Capacity Monitoring Criteria |
| Revision Description | This Nodal Protocol Revision Request (NPRR) makes changes to the duration requirements for the following Ancillary Services in preparation for Real-Time Co-optimization plus Batteries (RTC+B): * Updates duration requirements for Regulation Service and Responsive Reserve (RRS) to thirty minutes;
* Updates duration requirement for ERCOT Contingency Reserve Service (ECRS) to one hour; and
* Updates duration requirements for Non-Spinning Reserve (Non-Spin) to one hour.

This NPRR also updates the requirement for Reliability Unit Commitment (RUC) studies to use a one-hour duration for all Ancillary Service types, excluding Fast Frequency Response (FFR).ERCOT invites review of this NPRR from the RTC+B Task Force (RTCBTF). The changes proposed in this NPRR have no system impacts because these Ancillary Service durations are being incorporated as parameters in the current RTC+B business requirements. |
| Justification of Reason for Revision and Market Impacts | In preparation for the new market paradigm to be implemented with RTC+B, ERCOT revisited the analysis that was conducted under NPRR1096, Require Sustained Two-Hour Capability for ECRS and Four-Hour Capability for Non-Spin, and conducted additional analysis to determine appropriate duration requirements for Ancillary Services. ERCOT shared the results of its analysis and its recommendations with the RTCBTF at its [March 25, 2025](https://www.ercot.com/calendar/03252025-RTCBTF-Meeting) and [April 22, 2025](https://www.ercot.com/calendar/04222025-RTCBTF-Meeting) meetings. Following is a summary of ERCOT’s analysis and recommendations:* Non-Spin duration should be changed to one hour, as a longer duration requirement, rather than incentivizing ESRs to preserve their SOC, incentivizes them to sell energy rather than carry operating reserves. Additionally, the duration requirement for Non-Spin should be revisited upon implementation of Dispatchable Reliability Reserve Service (DRRS).
* ECRS duration should be changed to one hour: Based on the length of historical ECRS risk-relevant deployments, sustained under-forecast error in 30-minute ahead net load, and the need for a margin to account for increases in forecast errors that can be expected with growth in solar Resources, changing from a two-hour duration requirement to a one-hour duration requirement for ECRS is sufficient. However, this duration recommendation may need to be revisited if there are concerns with frequency event recovery and violations of North American Electric Reliability Corporation’s (NERC’s) BAL-002 criteria.
* Regulation Service and RRS duration should be changed to 30 minutes: Based on ERCOT’s analysis, changing the duration requirement for Regulation Service and RRS from 15 minutes to 30 minutes is necessary to reduce the risk of ERCOT violating ERCOT’s BAL-001 obligation in the event that Security-Constrained Economic Dispatch (SCED) is not available due to unplanned events.
* Reliability Unit Commitment (RUC) studies should use a one-hour duration for all Ancillary Service types, excluding Fast Frequency Response (FFR) which should continue to require a 15-minute duration. A one-hour duration for RUC studies is appropriate to both respect an Energy Storage Resource’s (ESR’s) minimum and maximum State of Charge (SOC) values from the Current Operating Plan (COP) and as a deployment duration for use with deployment factors.
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| Revised Proposed Protocol Language |

**2.2 ACRONYMS AND ABBREVIATIONS**

**HBSOC** Hour Beginning Planned State of Charge

***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 Energy Storage Resources (ESRs), the Hour Beginning Planned State of Charge (HBSOC) 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 Minimum State of Charge (MinSOC) and Maximum State of Charge (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.

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| ***[NPRR1239: Replace paragraph (3) above with the following upon system implementation:]***(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 ERCOT website. 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 ERCOT website 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 100% 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. Also, 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:

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| **Parameter** | **Unit** | **Current Value\*** |
| 1HRLESSCOSTSCALING | 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 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 the first Operating Day in the Opt Out Snapshot of the first Operating Day.

(15) 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.

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| ***[NPRR1239: Replace paragraph (15) above with the following upon system implementation:]***(15) ERCOT shall, as soon as practicable, post to the ERCOT website 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. |

(16) 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.

(17) 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.

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| ***[NPRR1009, NPRR1032, NPRR1204, NPRR1239, and NPRR1245: 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, NPRR1204, and NPRR1245; or upon system implementation for NPRR1032 or NPRR1239:]******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. For On-Line Energy Storage Resources (ESRs), using RUC duration requirements for energy and Ancillary Services, RUC-projected dispatch for energy and Ancillary Service in one interval shall respect the ESR’s minimum and maximum State of Charge (SOC) values from the COP, while incorporating any adjustments under paragraph (19)(d) below. In addition, using the Ancillary Service Deployment Factors and their respective deployment duration requirements, the SOC required to support these dispatch levels for energy and Ancillary Services will match as closely as possible the difference between the adjusted COP values of the next interval’s Hour Beginning Planned SOC (HBSOC) and the current interval’s HBSOC. The formulation of the RUC objective function must employ penalty factors on violations of security constraints and violations of ESR COP HBSOC. The objective of the RUC process is to minimize costs based on the Resource costs described in paragraphs (11) through (15) below. ESR energy dispatch costs and Ancillary Service Offer costs are not included in the RUC objective function.(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) ERCOT shall post the following Ancillary Service Deployment Factor data on the ERCOT website:(a) Following each execution of RUC, ERCOT shall post the Ancillary Service Deployment Factors used by that RUC process for each hour in the RUC Study Period;(b) No later than 0600 in the Day-Ahead for each Operating Day, ERCOT shall post the Ancillary Service Deployments Factors that are projected to be used in the RUC process for that Operating Day; and(c) Following each month, ERCOT shall post the average, minimum, and maximum Ancillary Service Deployment Factors used in the RUC process by type of Ancillary Service and hour of the day for the month.(4) 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). (5) In addition to On-Line qualified Generation Resources and ESRs, 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.(6) In addition to On-Line qualified Generation Resources and ESRs, 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.(7) In addition to On-Line qualified Generation Resources and ESRs, the RUC engine shall consider a COP Resource Status of ONL for Load Resources that are qualified for Ancillary Services, as being eligible to provide Ancillary Services constrained by the Ancillary Service Capability in the COP. The RUC engine will not consider any Load Resources for dispatch of energy.(8) The RUC constraints in the RUC engine shall use 60 minutes as the duration for energy and Ancillary Services, excluding Responsive Reserve (RRS) provided using Fast Frequency Response, for which duration shall be 15 minutes. These same duration requirements will be used to enforce a constraint on each ESR’s dispatch for energy and Ancillary Services using Ancillary Service deployment factors for a given hour such that the calculated State of Charge (SOC) at the end of that hour is equal to the next hour’s COP value of HBSOC.(9) 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). (10) 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 ERCOT website. 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. (11) 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 ERCOT website any changes that ERCOT made to the RUC-recommended commitments with an explanation of the changes.(12) 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 (17) 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. (13) 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 (15) below pursuant to paragraph (4) of Section 8.1.2, ERCOT shall use in the RUC process 100% 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. Also, 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.(14) 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 (5) 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.(15) 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.(16) 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. For ESRs, energy dispatch costs are not considered in determining projected energy output levels.(17) 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. For ESRs, Ancillary Service Offer costs are not considered in determining projected Ancillary Service awards.(18) 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:

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| **Parameter** | **Unit** | **Current Value\*** |
| 1HRLESSCOSTSCALING | 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. |

(19) 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, including RUC duration requirements for energy and Ancillary Services;(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;(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); and(l) Ancillary Service Deployment Factors. (20) 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.(d) For the HRUC, DRUC, and Weekly Reliability Unit Commitment (WRUC) processes, a feasibility check on the COP submitted HBSOC will be performed. This check may adjust the HBSOC used in the RUC process. The feasibility check looks sequentially across all intervals in the RUC Study Period to validate whether a particular interval’s COP HBSOC is achievable from the previous interval. If it is not feasible, then RUC will adjust the HBSOC to the closest achievable value.(21) 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.(22) ERCOT shall, as soon as practicable, post to the ERCOT website 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.(23) 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.(24) 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, 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. |

**8.1.1.2.1.1 Regulation Service Qualification**

(1) A QSE control system must be capable of receiving Regulation Up Service (Reg-Up) and Regulation Down Service (Reg-Down) control signals from ERCOT’s Load Frequency Control (LFC) system, and of directing its Resources to respond to the control signals, in an upward and downward direction to balance Real-Time Demand and Resources. A QSE providing Reg-Up or Reg-Down shall provide communications equipment to receive telemetered control deployments of power from ERCOT.

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| ***[NPRR1011 and NPRR1014: Replace applicable portions of paragraph (1) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1011; or upon system implementation for NPRR1014:]***(1) A QSE control system must be capable of receiving Regulation Up Service (Reg-Up) and Regulation Down Service (Reg-Down) control signals from ERCOT’s Load Frequency Control (LFC) system, and of directing its Resources to respond to the control signals, in an upward and downward direction to balance Real-Time Demand and Resources. A QSE representing Resources qualified to provide Reg-Up or Reg-Down shall provide communications equipment to receive telemetered control deployments of power from ERCOT. |

(2) A QSE shall demonstrate to ERCOT that they have the ability to switch control to constant frequency operation as specified in the Operating Guides. ERCOT’s direction to the QSE to operate on constant frequency will be considered a Dispatch Instruction.

(3) A QSE providing Reg-Up or Reg-Down shall provide ERCOT with the data requirements of Section 6.5.5.2, Operational Data Requirements. Resources providing Reg-Up or Reg-Down must be capable of delivering the full amount of regulating capacity offered to ERCOT within five minutes.

(4) A Resource providing Fast Responding Regulation Service (FRRS) shall be capable of independently detecting and recording system frequency with an accuracy of at least one mHz and a resolution of no less than 32 samples per second. The Resource shall also be capable of measuring and recording MW output with a resolution of no less than 32 samples per second.

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| ***[NPRR1011 and NPRR1014: Delete paragraph (4) above upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1011; or upon system implementation for NPRR1014; and renumber accordingly.]*** |

(5) A Reg-Up and Reg-Down qualification test for each Resource is conducted during a continuous 60-minute period agreed on in advance by the QSE and ERCOT. QSEs may qualify a Resource to provide Reg-Up or Reg-Down, or both, in separate testing. ERCOT shall administer the following test requirements:

(a) ERCOT shall confirm the date and time of the test with the QSE.

(b) For the 60-minute duration of the test, when market and reliability conditions allow, the ERCOT Control Area Operator shall send a random sequence of increasing ramp, hold, and decreasing ramp control signals to the QSE for a specific Resource. ERCOT shall maintain a duration interval, for each increasing ramp, hold, or decreasing ramp sequence, of no less than two minutes. The control signals may not request Resource performance beyond the HSL, LSL, and ramp rate limit agreed on prior to the test. During the test, ERCOT shall structure the test sequence such that at least one five-minute test interval is used to test the Resource’s ability to achieve the entire amount of Reg-Up or Reg-Down requested for qualification.

(c) ERCOT shall measure and record the average real power output for each minute of the Resource(s) being tested represented by the QSE. During at least one five minute duration interval selected to evaluate each of the Reg-Up and Reg-Down amounts being tested, the Generation/Controllable Load Resource Energy Deployment Performance (GREDP/CLREDP) calculated in accordance with Section 8.1.1.4.1, Regulation Service and Generation Resource/Controllable Load Resource Energy Deployment Performance, and Ancillary Service Capacity Performance Metrics, over the entire five minute interval must be less than or equal to 3.5%. Additionally, in all other test sequence intervals, the Resource’s measured GREDP/CLREDP must be less than or equal to 5% as calculated for the entire duration of each test interval.

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| ***[NPRR963 and NPRR1014: Replace applicable portions of paragraph (c) above with the following upon system implementation:]***(c) ERCOT shall measure and record the average real power output for each minute of the Resource(s) being tested represented by the QSE. (i) During at least one five minute duration interval selected to evaluate each of the Reg-Up and Reg-Down amounts being tested, the Generation/Controllable Load Resource/Energy Storage Resource Energy Deployment Performance (GREDP/CLREDP/ESREDP) calculated in accordance with Section 8.1.1.4.1, Regulation Service and Generation Resource/Controllable Load Resource/Energy Storage Resource Energy Deployment Performance, and Ancillary Service Capacity Performance Metrics, over the entire five minute interval must be less than or equal to 3.5%. (ii) Additionally, in all other test sequence intervals, the Resource’s measured GREDP/CLREDP/ESREDP must be less than or equal to 5% as calculated for the entire duration of each test interval.(iii) During at least one five-minute duration interval selected to evaluate each of the Reg-Up and Reg-Down amounts being tested, the Energy Storage Resource Energy Deployment Performance (ESREDP) calculated in accordance with Section 8.1.1.4.1, Regulation Service and Generation Resource/Controllable Load Resource Energy Deployment Performance, and Ancillary Service Capacity Performance Metrics, over the entire five minute interval must be less than or equal to 3.0%. (iv) For an Energy Storage Resource (ESR), in all other test sequence intervals, the Resource’s measured ESREDP must be less than or equal to 3.0% as calculated for the entire duration of each test interval. |

(d) On successful demonstration of the above test criteria, ERCOT shall qualify that the Resource is capable of providing Regulation Service and shall provide a copy of the certificate to the QSE and the Resource.

(6) A QSE may also qualify a Resource to provide Fast Responding Regulation Up Service (FRRS-Up), Fast Responding Regulation Down Service (FRRS-Down), or both. In addition to the test criteria described in paragraph (5) above, ERCOT shall verify the following capabilities through testing:

(a) The Resource will be required to demonstrate that it can deploy within 60 cycles of either (i) receipt of a deployment signal from ERCOT, or (ii) a deviation of frequency in excess of +/-0.09 Hz from 60 Hz.

(b) Upon deployment, the Resource will be required to demonstrate that it can sustain the deployment for a minimum of eight minutes at a minimum level of 95% and a maximum level of 110% of the proposed maximum capacity obligation.

(c) ERCOT shall use the Resource’s high-resolution recorded frequency and MW output data to determine whether the Resource met its performance obligations during the test.

(d) On successful demonstration of the above test criteria, ERCOT shall qualify that the Resource is capable of providing FRRS and shall provide a copy of the certificate to the QSE and the Resource.

(e) A QSE representing a Resource qualified to provide FRRS shall not offer to provide more FRRS than the maximum capacity obligation that the Resource is qualified to provide, as shown in the certificate provided to the QSE and the Resource.

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| ***[NPRR1011 and NPRR1014: Replace applicable portions of paragraph (6) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1011; or upon system implementation for NPRR1014:]***(5) The maximum quantity of Reg-Up or Reg-Down that an individual Resource is qualified to provide is limited to the amount of Ancillary Service that can be sustained by the Resource for at least 30 minutes. |

**8.1.1.2.1.2 Responsive Reserve Qualification**

(1) RRS may be provided by:

(a) On-Line Generation Resource capacity;

(b) Resources capable of providing FFR;

(c) Generation Resources operating in the synchronous condenser fast-response mode;

(d) Load Resources controlled by high-set under-frequency relays; and

(e) Controllable Load Resources (CLRs).

(2) The amount of RRS provided by individual Generation Resources or CLRs is limited by the ERCOT-calculated maximum MW amount of RRS for the Generation Resource or CLR subject to its verified droop performance as described in the Nodal Operating Guide. The default value for any newly qualified Generation Resource or CLR shall be 20% of its HSL. A Private Use Network with a registered Resource may use the gross HSL for qualification and establishing a limit on the amount of RRS capacity that the Resource within the Private Use Network can provide.

(3) A QSE’s Load Resource must be loaded and capable of unloading the scheduled amount of RRS within ten minutes of instruction by ERCOT and must either be immediately responsive to system frequency or be interrupted by action of under-frequency relays with settings as specified by the Operating Guides.

(4) Any QSE providing RRS shall provide communications equipment to provide ERCOT with telemetry for the output of the Resource.

(5) Resources capable of FFR providing RRS must provide a telemetered output signal, including breaker status and status of the frequency detection device.

(6) Each QSE shall ensure that each Resource is able to meet the Resource’s obligations to provide the Ancillary Service Resource Responsibility. Each Resource providing RRS must meet additional technical requirements specified in this Section.

(7) Generation Resources providing RRS shall have their Governors in service.

(8) Generation Resources and Resources capable of FFR providing RRS shall have a Governor droop setting that is no greater than 5.0%.

(9) Resources may be provisionally qualified by ERCOT to provide RRS for 90 days. Within the 90-day provisional window, a Resource must successfully complete one of the Governor tests identified in the Nodal Operating Guide Section 8, Attachment C, Turbine Governor Speed Tests, before being declared fully qualified to provide RRS.

(10) A qualification test for each Resource to provide RRS is conducted during a continuous eight-hour period agreed to by the QSE and ERCOT. ERCOT shall confirm the date and time of the test with the QSE. ERCOT shall administer the following test requirements:

(a) At any time during the window, which is selected by ERCOT when market and reliability conditions allow and not previously disclosed to the QSE, ERCOT shall notify the QSE that it is to provide an amount of RRS from its Resource to be qualified equal to the amount for which the QSE is requesting qualification. The QSE shall acknowledge the start of the test.

(b) For Generation Resources desiring qualification to provide RRS, ERCOT shall send a signal to the Resource’s QSE to deploy RRS indicating the MW amount. ERCOT shall monitor the QSE’s telemetry of the Resource’s Ancillary Service Schedule for an update within 15 seconds. ERCOT shall measure the test Resource’s response as described under Section 8.1.1.4.2, Responsive Reserve Service Energy Deployment Criteria. ERCOT shall evaluate the response of the Generation Resource given the current operating conditions of the system and determine the Resource’s qualification to provide RRS.

(c) For CLRs desiring qualification to provide RRS, ERCOT shall send a signal to the Resource’s QSE to deploy RRS indicating the MW amount. ERCOT shall measure the test Resource’s response as described under Section 8.1.1.4.2. ERCOT shall evaluate the response of the CLR given the current operating conditions of the system and determine the CLR’s qualification to provide RRS.

(d) For Load Resources, excluding CLRs, desiring qualification to provide RRS, ERCOT shall deploy RRS indicating the MW amount. ERCOT shall measure the test Resource’s response as described under Section 8.1.1.4.2.

(e) On successful demonstration of all test criteria, ERCOT shall qualify that the Resource is capable of providing RRS and shall provide a copy of the certificate to the QSE and the Resource Entity.

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| ***[NPRR1011 and NPRR1014: Replace applicable portions of Section 8.1.1.2.1.2 above with the following upon system implementation for NPRR1014; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1011:]*****8.1.1.2.1.2 Responsive Reserve Qualification**(1) RRS may be provided by: (a) On-Line Generation Resource capacity; (b) Resources capable of providing FFR;(c) Generation Resources operating in the synchronous condenser fast-response mode;(d) Load Resources controlled by high-set under-frequency relays;(e) Controllable Load Resources (CLRs); and(f) Energy Storage Resources (ESRs).(2) The amount of RRS provided by individual Generation Resources, CLRs, or ESRs is limited by the ERCOT-calculated maximum MW amount of RRS for the Generation Resource, CLR, or ESR subject to its verified droop performance as described in the Nodal Operating Guide. The default value for any newly qualified Generation Resource, CLR, or ESR shall be 20% of its HSL. A Private Use Network with a registered Resource may use the gross HSL for qualification and establishing a limit on the amount of RRS capacity that the Resource within the Private Use Network can provide.(3) A QSE’s Load Resource must be loaded and capable of unloading the scheduled amount of RRS within ten minutes of instruction by ERCOT and must either be immediately responsive to system frequency or be interrupted by action of under-frequency relays with settings as specified by the Operating Guides.(4) Any QSE representing a Resource qualified to provide RRS shall provide communications equipment to provide ERCOT with telemetry for the output of the Resource.(5) Resources capable of FFR providing RRS must provide a telemetered output signal, including breaker status and status of the frequency detection device. (6) Each QSE shall ensure that each Resource is able to meet the Resource’s obligations to provide the RRS award. Each Resource providing RRS must meet additional technical requirements specified in this Section.(7) Generation Resources offering to provide RRS shall have their Governors in service.(8) Generation Resources and Resources capable of FFR providing RRS shall have a Governor droop setting that is no greater than 5.0%. (9) Resources may be provisionally qualified by ERCOT to provide RRS for 90 days. Within the 90-day provisional window, a Resource must successfully complete one of the Governor tests identified in the Nodal Operating Guide Section 8, Attachment C, Turbine Governor Speed Tests, before being declared fully qualified to provide RRS.(10) For Resources providing RRS and available for dispatch by SCED, the maximum quantity of RRS that a Resource is qualified to provide is limited to the amount of RRS that can be sustained by the Resource for at least 30 minutes. For all other Resources excluding non-CLRs providing FFR, the maximum quantity of RRS that a Resource is qualified to provide is limited to the amount of RRS that can be sustained by the Resource for at least one hour. The maximum quantity of FFR that any non-CLR qualified to provide FFR is limited to the amount of FFR that can be sustained by the Resource for at least 15 minutes.(11) A qualification test for each Resource to provide RRS is conducted during a continuous eight-hour period agreed to by the QSE and ERCOT. ERCOT shall confirm the date and time of the test with the QSE. ERCOT shall administer the following test requirements:(a) At any time during the window, which is selected by ERCOT when market and reliability conditions allow and not previously disclosed to the QSE, ERCOT shall notify the QSE that it is to provide an amount of RRS from its Resource to be qualified equal to the amount for which the QSE is requesting qualification. The QSE shall acknowledge the start of the test.(b) For Generation Resources desiring qualification to provide RRS, ERCOT shall send a signal to the Resource’s QSE to deploy RRS indicating the MW amount. ERCOT shall monitor the QSE’s telemetry of the Resource’s Ancillary Service Schedule for an update within 15 seconds. ERCOT shall measure the test Resource’s response as described under Section 8.1.1.4.2, Responsive Reserve Service Energy Deployment Criteria. ERCOT shall evaluate the response of the Generation Resource given the current operating conditions of the system and determine the Resource’s qualification to provide RRS.(c) For CLRs desiring qualification to provide RRS, ERCOT shall send a signal to the Resource’s QSE to deploy RRS indicating the MW amount. ERCOT shall measure the test Resource’s response as described under Section 8.1.1.4.2. ERCOT shall evaluate the response of the CLR given the current operating conditions of the system and determine the CLR’s qualification to provide RRS. (d) For Load Resources, excluding CLRs, desiring qualification to provide RRS, ERCOT shall deploy RRS indicating the MW amount. ERCOT shall measure the test Resource’s response as described under Section 8.1.1.4.2.(e) On successful demonstration of all test criteria, ERCOT shall qualify that the Resource is capable of providing RRS and shall provide a copy of the certificate to the QSE and the Resource Entity. |

**8.1.1.2.1.3 Non-Spinning Reserve Qualification**

(1) Each Resource providing Non-Spin must be capable of being synchronized and ramped to its Ancillary Service Schedule for Non-Spin within 30 minutes. Non-Spin may be provided from Generation Resource capacity that can ramp within 30 minutes or Load Resources capable of unloading within 30 minutes. Non-Spin may only be provided from capacity that is not fulfilling any other energy or capacity commitment.

(2) A Load Resource providing Non-Spin must provide a telemetered output signal.

(3) Each Generation Resource and Load Resource providing Non-Spin must meet additional technical requirements specified in this Section.

(4) QSEs using a Controllable Load Resource to provide Non-Spin must be capable of responding to ERCOT Dispatch Instructions in a similar manner to QSEs using Generation Resource to provide Non-Spin.

(5) Each QSE shall ensure that each Resource is able to meet the Resource’s obligations to provide the Ancillary Service Resource Responsibility. Each Generation Resource and Controllable Load Resource providing Non-Spin must meet additional technical requirements specified in this Section.

(6) For any Resource requesting qualification for Non-Spin, a qualification test for each Resource to provide Non-Spin is conducted during a continuous eight hour period agreed to by the QSE and ERCOT. ERCOT shall confirm the date and time of the test with the QSE. ERCOT shall administer the following test requirements.

(a) At any time during the window (selected by ERCOT when market and reliability conditions allow and not previously disclosed to the QSE), ERCOT shall notify the QSE by using the messaging system and requesting that the QSE provide an amount of Non-Spin from each Resource equal to the amount for which the QSE is requesting qualification. The QSE shall acknowledge the start of the test.

(b) For Generation Resources: during the test window, ERCOT shall send a message to the QSE representing a Generation Resources to deploy Non-Spin. ERCOT shall monitor the adjustment of the Generation Resource’s Non-Spin Ancillary Service Schedule within five minutes for Resources On-Line. ERCOT shall measure the test Resource’s response as described under Section 8.1.1.4.3, Non-Spinning Reserve Service Energy Deployment Criteria. ERCOT shall evaluate the response of the Generation Resource given the current operating conditions of the system and determine the Resource’s qualification to provide Non-Spin.

(c) For Load Resources, ERCOT shall send an instruction to deploy Non-Spin. ERCOT shall measure the Resource’s response as described under Section 8.1.1.4.3.

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| ***[NPRR1011: Replace Section 8.1.1.2.1.3 above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]*****8.1.1.2.1.3 Non-Spinning Reserve Qualification**(1) Each Off-Line Resource being offered in to provide Non-Spin must be capable of being synchronized and ramped to its Ancillary Service award for Non-Spin within 30 minutes. Non-Spin may be provided from Generation Resource capacity that can ramp within 30 minutes or Load Resources capable of unloading within 30 minutes. Non-Spin may only be provided from capacity that is not fulfilling any other energy or capacity commitment.(2) All Resources qualified to participate in SCED are also qualified to provide Non-Spin when the Resource is On-Line. The amount of Non-Spin for which the Resource is qualified when On-Line is limited to the amount of capacity that can be ramped or unloaded within 30 minutes.(3) A Controllable Load Resource offering to provide Non-Spin must be qualified to participate in SCED and must provide a telemetered output signal, including breaker status. (4) Each Resource providing Non-Spin when Off-Line or providing Non-Spin as a Load Resource other than a Controllable Load Resource must meet additional technical requirements specified in this Section.(5) QSEs using a Controllable Load Resource to provide Non-Spin must be capable of responding to ERCOT Dispatch Instructions in a similar manner to QSEs using Generation Resource to provide Non-Spin.(6) Each QSE shall ensure that each Resource is able to meet the Resource’s obligations to provide the Ancillary Service award.(7) For any Resource requesting qualification for providing Non-Spin when Off-Line or providing Non-Spin as a Load Resource other than a Controllable Load Resource, a qualification test for each Resource to provide Non-Spin is conducted during a continuous eight hour period agreed to by the QSE and ERCOT. ERCOT shall confirm the date and time of the test with the QSE. ERCOT shall administer the following test requirements. (a) At any time during the window (selected by ERCOT when market and reliability conditions allow and not previously disclosed to the QSE), ERCOT shall notify the QSE by using the messaging system and requesting that the QSE provide an amount of Non-Spin from each Resource equal to the amount for which the QSE is requesting qualification. The QSE shall acknowledge the start of the test.(b) For the Resources being tested during the test window, ERCOT shall send a message to the QSE representing a Resource to deploy Non-Spin. ERCOT shall measure the test Resource’s response as described under Section 8.1.1.4.3, Non-Spinning Reserve Service Energy Deployment Criteria. ERCOT shall evaluate the response of the Resource given the current operating conditions of the system and determine the Resource’s qualification to provide Non-Spin.(8) The maximum quantity of Non-Spin that an individual Resource is qualified to provide is limited to the amount of Non-Spin that can be sustained by the Resource for at least one hour. |

***8.1.1.3.1 Regulation Service Capacity Monitoring Criteria***

(1) ERCOT shall continuously monitor the capacity of each Resource to provide Reg-Up and Reg-Down. When determining this available capacity, ERCOT shall consider for each Resource with REG status, the actual generation or Load, the Ancillary Service Schedule for Reg-Up and Reg-Down, the HSL, the LSL, ramp rates, any other commitments of Ancillary Service capacity.

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| ***[NPRR1011: Replace paragraph (1) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]***(1) ERCOT shall continuously monitor the capacity of each Resource to provide Reg-Up and Reg-Down. When determining this available capacity, ERCOT shall consider for each Resource the Resource Status, the actual generation or Load, the Ancillary Service award for Reg-Up and Reg-Down, the HSL, the LSL, ramp rates, and the Resource’s qualification to provide Reg-Up and Reg-Down.(2) For the Reg-Up and Reg-Down capability provided for a Resource to ERCOT by the Resource’s QSE, the amount of Reg-Up or Reg-Down reflected in that capability must be limited to the amount of Reg-Up or Reg-Down that can be sustained by the Resource for at least 30 minutes. |

***8.1.1.3.2 Responsive Reserve Capacity Monitoring Criteria***

(1) ERCOT shall continuously monitor the capacity of each Resource to provide RRS. ERCOT shall consider for each Resource providing RRS capacity, actual generation or Load, the Ancillary Service Schedule for RRS, the HSL, the LSL, and any other commitments of Ancillary Service capacity.

(2) For Load Resources not deployed by a Dispatch Instruction from ERCOT, the amount of RRS capacity provided must be measured as the Load Resource’s average Load level in the last five minutes.

(3) A Resource that is capable of providing RRS and that has a Resource Status code of ONRR is considered to be providing frequency responsive capability to the extent that it is not using that capacity to provide energy.

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| ***[NPRR1011: Replace Section 8.1.1.3.2 above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]*****8.1.1.3.2 Responsive Reserve Capacity Monitoring Criteria**(1) ERCOT shall continuously monitor the capacity of each Resource to provide RRS. ERCOT shall consider for each Resource the Resource Status, actual generation or Load, the Ancillary Service award for RRS, the HSL, the LSL, any other Resource-specific RRS capabilities telemetered by the QSE, and the Resource’s qualification to provide RRS. (2) For Load Resources, excluding Controllable Load Resources, that have an RRS award, the amount of RRS capacity provided must be measured as the Load Resource’s average Load level in the last five minutes.(3) A Resource that is capable of providing RRS and that has a Resource Status code of ONSC and an RRS award is considered to be providing frequency responsive capability to the extent that it is not using that capacity to provide energy or other Ancillary Services.(4) For Resources that are providing RRS and are available for Dispatch by SCED, for the RRS capability provided for a Resource to ERCOT by the Resource’s QSE, the amount of RRS reflected in that capability must be limited to the amount of RRS that can be sustained by the Resource for at least 30 minutes. For all other Resources excluding non-Controllable Load Resources providing FFR, for the RRS capability provided for a Resource to ERCOT by the Resource’s QSE, the amount of RRS reflected in that capability must be limited to the amount of RRS that can be sustained by the Resource for at least one hour. Any non-Controllable Load Resources qualified to provide FFR, for the FFR capability provided for a Resource to ERCOT by the Resource’s QSE, the amount of FFR reflected in that capability must be limited to the amount of FFR that can be sustained by the Resource for at least 15 minutes. |

**8.1.1.3.3 Non-Spinning Reserve Capacity Monitoring Criteria**

(1) ERCOT shall continuously monitor the capacity of each Resource to provide Non-Spin. ERCOT shall consider for each Resource providing Non-Spin capacity, the actual generation, or Load, the Ancillary Service Schedule for Non-Spin, the HSL/Maximum Power Consumption (MPC), the LSL/Low Power Consumption (LPC), ramp rates, and any other commitments of Ancillary Service capacity. ERCOT shall also monitor Non-Spin provided on Resources with OFFNS status.

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| [NPRR1011: Replace paragraph (1) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:](1) ERCOT shall continuously monitor the capacity of each Resource to provide Non-Spin. ERCOT shall consider for each Resource the Resource Status, the actual generation or Load, the Ancillary Service award for Non-Spin, the HSL/Maximum Power Consumption (MPC), the LSL/Low Power Consumption (LPC), ramp rates, and the Resource’s qualification to provide Non-Spin. ERCOT shall also monitor Non-Spin available from and awarded to qualified Resources with an OFF status. |

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| [NPRR1011 and NPRR1096: Insert applicable portions of paragraph (2) below upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1011; or upon system implementation for NPRR1096:](2) For the Non-Spin capability provided for a Resource to ERCOT by the Resource’s QSE, the amount of Non-Spin reflected in that capability must be limited to the amount of Non-Spin that can be sustained by the Resource for at least one hour. |

**8.1.1.3.4 ERCOT Contingency Reserve Service Capacity Monitoring Criteria**

(1) ERCOT shall continuously monitor the capacity of each Resource to provide ECRS. ERCOT shall consider for each Resource providing ECRS capacity, the On-Line versus Off-Line status, actual generation or Load, the Ancillary Service Schedule for ECRS, the HSL, the LSL, ramp rates, relay status, and any other commitments of Ancillary Service capacity.

(2) For Load Resources not deployed by a Dispatch Instruction from ERCOT, the amount of ECRS capacity provided must be measured as the Load Resource’s average Load level in the last five minutes.

(3) A Resource that is capable of providing ECRS and that has a Resource Status code of ONECRS is considered to be providing capability to the extent that it is not using that capacity to provide energy.

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| ***[NPRR1011: Replace Section 8.1.1.3.4 above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]*****8.1.1.3.4 ERCOT Contingency Reserve Service Capacity Monitoring Criteria**(1) ERCOT shall continuously monitor the capacity of each Resource to provide ECRS. ERCOT shall consider for each Resource the Resource Status, the On-Line versus Off-Line status, actual generation or Load, the Ancillary Service award for ECRS, the HSL, the LSL, ramp rates, relay status, and the Resource’s qualification to provide ECRS.(2) For the ECRS capability provided for a Resource to ERCOT by the Resource’s QSE, the amount of ECRS reflected in that capability must be limited to the amount of ECRS that can be sustained by the Resource for at least one hour.(3) For Load Resources, excluding Controllable Load Resources, that have an ECRS award, the amount of ECRS capacity provided must be measured as the Load Resource’s average Load level in the last five minutes.(4) A Resource that is capable of providing ECRS and that has a Resource Status code of ONSC and an ECRS award is considered to be providing capability to the extent that it is not using that capacity to provide energy or other Ancillary Services. |