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| NPRR Number | [1204](https://www.ercot.com/mktrules/issues/NPRR1204) | NPRR Title | Considerations of State of Charge with Real-Time Co-Optimization Implementation |
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| **Date** | November 1, 2023 |
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| **Submitter’s Information** |
| **Name** |  |
| **E-mail Address** |  |
| **Company** |  |
| **Phone Number** |  |
| **Cell Number** |  |
| **Market Segment** |  |

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| **Comments** |

**Hunt Energy Network comments:**

Hunt Energy Network (HEN) appreciates the opportunity to submit these comments on Nodal Protocol Revision Request (NPRR) 1204. These comments clarify that the duration requirements for the various Ancillary Services (“AS”) and energy used in the Reliability Unit Commitment (RUC) process should be different from the duration requirements used in Security-Constrainted Economic Dispatch (SCED) under Real-Time Co-optimization (RTC) and that these duration requirements should not be confused with any qualification-related duration requirements for AS.

**Duration Requirements for AS Qualification**

Given the five-minute award of energy and AS under RTC, RTC AS qualification-related duration requirements are 15 minutes for Responsive Reserve (RRS) and Regulation Up Service (Reg-Up) and were one hour for ERCOT Contingency Reserve Service (ECRS) and Non-Spinning Reserve (Non-Spin), before NPRR1096, Require Sustained Two-Hour Capability for ECRS and Four-Hour Capability for Non-Spin, was adopted. HEN supports using the RTC levels of duration for RRS and Reg-Up as specified in the current Nodal Protocols and returning to the pre-NPRR1096 one-hour duration requirement for ECRS and Non-Spin under RTC.

**Duration Requirements for RUC**

Regardless of qualification duration requirements of the various Ancillary Services, HEN recommends that RUC use no greater than a 15-minute duration for RRS and Reg-Up and one-hour duration for ECRS and Non-Spin for ensuring that an Energy Storage Resource (ESR) has sufficient State of Charge (SOC) above its minimum SOC to provide the corresponding AS. Otherwise, RUC may unnecessarily commit additional Resources even though ESRs may have sufficient SOC to provide the required energy and/or AS.

**Duration Requirements for SCED**

For SCED, any duration requirement for Energy or Ancillary Service awards should not be greater than that required for five minutes of sustained response. Use of a longer SCED duration requirement for energy and AS will lead to stranded SOC since SCED awards energy and AS every five minutes. A requirement imposed on ESRs to reserve SOC for future SCED intervals would unnecessarily discriminate against ESRs since SCED will award energy and/or AS in the current SCED interval to any other Resource technology that was shutting down in the very next SCED interval. Thus, these comments change “duration requirements” for the SCED process to “SCED duration requirements” to differentiate between AS qualification related duration requirements and duration requirements for the SCED process.

**Projected AS Deployment Factors**

These comments also require ERCOT to provide projections of Ancillary Service Deployment Factors as part of ERCOT's methodology for determining the minimum Ancillary Service requirements to allow Market Participants to better determine the Hour Beginning Planned SOC based on Energy and/or Ancillary Services that their ESRs are expecting to provide.

**Luminant’s comments:**

Luminant submits these comments on Nodal Protocol Revision Request (NPRR) 1204 on top of the 10/23/23 Hunt Energy Network (HEN) comments. Luminant agrees in part and disagrees in part with HEN. In addition, Luminant recommends changes to provide ERCOT operators more discretion when evaluating Reliability Unit Commitment (RUC) engine recommendations that are driven by the Planned State of Charge (SOC) telemetry in the Current Operating Plans (COPs) of Energy Storage Resources (ESRs). These are addressed in reverse order below. Luminant also recommends consistent use of “Round Trip” or “Roundtrip” terminology, and would like to use this opportunity to discuss potential near-term improvements to reflect ESR contributions in the Ancillary Service Capacity Monitor (but has not proposed any redlines to that effect).

**Planned SOC Use in RUC Studies**

As discussed at the October 5, 2023 RTCBTF meeting, Luminant has significant concerns with ERCOT taking action to force unit commitment based on an ESR’s (or the collective fleet of ESRs’) Planned SOCs – as those are going to inherently be guesses. While that RTCBTF discussion also highlighted that ESRs would be considered short on capacity and therefore first in line for RUC make-whole charge allocation, Luminant is not convinced that that Settlement treatment is (or even can be) sufficient to “ensure” that ESRs’ Planned SOC telemetry is “right”. This is because ESRs cannot always predict (let alone predict with any certainty) when Ancillary Services will be deployed (notwithstanding ERCOT’s proposal to assist with that via providing hourly Ancillary Service Deployment Factors) or when energy arbitrage opportunities will arise. Indeed, the quick response capabilities that ESRs have should allow them to naturally and economically respond to Real-Time price signals, so if there is a shortage of capacity in a future hour due to ESR charging expectations, it is reasonable to believe that Real-Time Market (RTM) price signals would disincentivize ESRs from realizing their “plan” for SOC.

All of this is not to say that Luminant fully opposes ERCOT’s proposed framework incorporating Planned SOC into the RUC analysis – Luminant recognizes the ISO’s interest in taking SOC projections into account for RUC studies, and that ERCOT’s proposed framework is a “light touch” approach that gives Market Participants an opportunity to provide their best guess into the process. The alternative of ERCOT performing its own projections about ESR operations is, at this time, a less appealing approach. So to that end, Luminant does not propose to eliminate Planned SOC consideration from the RUC evaluation, but rather to make it less of a binding constraint on RUC decisions. This should help to balance the ISO’s interests, ESRs’ interests, and other generators’ interests – ultimately reducing costs to Loads and more holistically serving the public interest.

**Response to HEN Comments**

Luminant agrees with HEN that ERCOT should be transparent with its Ancillary Service Deployment Factors (ASDFs), and would add that ERCOT should not only publish the ASDFs as part of its minimum Ancillary Service methodology approval process, but also provide a Day-Ahead ASDF report via the Market Information System (MIS). Luminant presumes that, just as Ancillary Service quantities can vary from the approved minimum quantities, the ASDFs could vary throughout the year and ESR operators would benefit from having the latest information systematically available.

While Luminant is not taking a position on whether duration requirements for Ancillary Service qualifications or RUC considerations should be changed at this time, Luminant does have concerns with the HEN proposal that there be a separate Ancillary Service duration requirement for Security-Constrained Economic Dispatch (SCED) apart from the Ancillary Service qualification. The Ancillary Service qualification criteria are inherently tied to the Ancillary Service itself, so setting a different criteria for actual Ancillary Service awards would seemingly undermine the value of the service.

While Real-Time Co-optimization (RTC) may only award the Ancillary Service for a single five-minute SCED interval, that Ancillary Service award carries with it the responsibility to be able to provide the defined service for which the Resource is qualified. Using the current two-hour qualification duration requirement for ERCOT Contingency Reserve Service (ECRS) as an example, the Ancillary Service award is effectively ERCOT buying an option to call on up to two hours’ worth of energy at up to the awarded MW level during that interval. Therefore it would be inappropriate to allow a Resource to be awarded at its maximum ECRS-qualified capability based on two hours’ worth of SOC if it only had sufficient SOC for five minutes’ worth of response. To use a 100 MW/100 MWh example, the ESR may be qualified for 50 MW of ECRS, but if it only has 9 MWh SOC, it should only be awarded up to 4.5 MW of ECRS for that SCED interval, not 50 MW.

Luminant looks forward to discussion at the next RTCBTF meeting.

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| **Revised Cover Page Language** |

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| Revision Description | This Nodal Protocol Revision Request (NPRR) implements the State of Charge (SOC) concepts necessary for awareness, accounting, and monitoring of SOC for ESRs within the RTC+B implementation and allow the design to evolve from the interim solutions being proposed under NPRR1186. The changes in this NPRR can be summarized as:* Day-Ahead Market (DAM) SOC changes: No changes recommended for inclusion in the RTC+B Program..
* RUC SOC changes: RUC will use new Qualified Scheduling Entity (QSE)-submitted Current Operating Plan (COP) SOC data to determine energy and Ancillary Service dispatch to Energy Storage Resources (ESRs) within the optimization solution. This will help inform the determination of whether incremental commitment of generation is necessary to meet projected demand, Ancillary Service, and congestion needs for future hours. The NPRR does not contemplate commitment of ESRs through RUC processes or require the commitment of other Resources to support an ESR’s planned SOC. This NPRR also introduces the concept of Ancillary Service Deployment Factors to model the likelihood of Ancillary Services being dispatched for certain hours. These factors are used to model the projected usage of energy from ESRs from one hour to the next within the RUC study.
* Security-Constrained Economic Dispatch (SCED) SOC changes: SCED is modified to incorporate SOC accounting within the optimization. This is intended to ensure that awards to ESRs are feasible and that there is sufficient energy to sustain the MW awards for energy (Base Points) and Ancillary Services for their respective duration requirements and does not violate the telemetered minimum and maximum SOC values for ESRs.

Additional changes include adding Round Trip Efficiency as a new Resource parameter for ESRs, reporting changes associated with the consideration of SOC and the use of Ancillary Service Deployment Factors, and other changes to RUC-related language necessary to accommodate the changes previously described. It is important to note that this NPRR does not address SOC duration requirements for Real-Time Co-optimization (RTC) in the Day-Ahead Market (DAM), SCED, or RUC. Rather, the Protocol formulas use “parameters” for duration to allow for the development of the market systems while SOC duration issues can be considered in parallel in future market discussions. |

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| **Revised Proposed Protocol Language** |

## 2.1 DEFINITIONS

Round Trip Efficiency

The percentage of electrical energy consumed by an Energy Storage Resource (ESR) (i.e., charging) that is later returned back to the grid (i.e., discharging). The energy consumed by an ESR and energy returned back to the grid are measured at the Point of Interconnection (POI) or Point of Common Coupling (POCC). The charging and discharging energy does not include the energy consumed by the auxiliary Load of the ESR.

Ancillary Service Deployment Factors

Hourly parameters for each Ancillary Service type between 0 and 1 (or 0% to 100%) that indicate the expectation of an Ancillary Service deployment based on system conditions as new forecasts for Demand and Intermittent Renewable Resource (IRR) output are input to Reliability Unit Commitment (RUC). These factors are used in the RUC studies.

***3.2.5 Publication of Resource and Load Information***

(1) Two days after the applicable Operating Day, ERCOT shall post on the ERCOT website for the ERCOT System and, if applicable, for each Disclosure Area, the information derived from the first complete execution of Security-Constrained Economic Dispatch (SCED) in each 15-minute Settlement Interval. The Disclosure Area is the 2003 ERCOT CMZs. Posting requirements will be applicable to Generation Resources and Controllable Load Resources physically located in the defined Disclosure Area. This information shall not be posted if the posting of the information would reveal any individual Market Participant’s Protected Information. The information posted by ERCOT shall include:

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| ***[NPRR1007 and NPRR1014: Replace applicable portions of paragraph (1) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014:]***(1) Two days after the applicable Operating Day, ERCOT shall post on the ERCOT website for the ERCOT System and, if applicable, for each Disclosure Area, the information derived from each execution of SCED. The Disclosure Area is the 2003 ERCOT CMZs. Posting requirements will be applicable to Generation Resources, ESRs, and Controllable Load Resources physically located in the defined Disclosure Area. This information shall not be posted if the posting of the information would reveal any individual Market Participant’s Protected Information. The information posted by ERCOT shall include: |

(a) An aggregate energy supply curve based on non-IRR Generation Resources with Energy Offer Curves that are available to SCED. The energy supply curves will be calculated beginning at the sum of the Low Sustained Limits (LSLs) and ending at the sum of the HSLs for non-IRR Generation Resources with Energy Offer Curves, with the dispatch for each Generation Resource constrained between the Generation Resource’s LSL and HSL. The result will represent the ERCOT System energy supply curve economic dispatch of the non-IRR Generation Resources with Energy Offer Curves at various pricing points, not taking into consideration any physical limitations of the ERCOT System;

(b) An aggregate energy supply curve based on Wind-powered Generation Resources (WGRs) with Energy Offer Curves that are available to SCED. The energy supply curves will be calculated beginning at the sum of the LSLs and ending at the sum of the HSLs for WGRs with Energy Offer Curves, with the dispatch for each WGR constrained between the WGR’s LSL and HSL. The result will represent the ERCOT System energy supply curve economic dispatch of the WGRs with Energy Offer Curves at various pricing points, not taking into consideration any physical limitations of the ERCOT System;

(c) An aggregate energy supply curve based on PhotoVoltaic Generation Resources (PVGRs) with Energy Offer Curves that are available to SCED. The energy supply curves will be calculated beginning at the sum of the LSLs and ending at the sum of the HSLs for PVGRs with Energy Offer Curves, with the dispatch for each PVGR constrained between the PVGR’s LSL and HSL. The result will represent the ERCOT System energy supply curve economic dispatch of the PVGRs with Energy Offer Curves at various pricing points, not taking into consideration any physical limitations of the ERCOT System;

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| ***[NPRR1014: Insert paragraph (d) below upon system implementation and renumber accordingly:]*** (d) An aggregated energy supply and demand curve based on Energy Bid/Offer Curves that are available to SCED. The curves will be calculated beginning at the sum of the LSLs and ending at the sum of the HSLs for the Energy Bid/Offer Curves, with the dispatch for each Resource constrained between the Resource’s LSL and HSL. The result will represent the ERCOT System energy supply and demand curve economic dispatch of the ESRs with Energy Bid/Offer Curves at various pricing points, not taking into consideration any physical limitations of the ERCOT System; |

(d) The sum of LSLs, sum of Output Schedules, and sum of HSLs for Generation Resources without Energy Offer Curves;

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| ***[NPRR1014: Replace paragraph (d) above with the following upon system implementation:]***(e) The sum of LSLs, sum of Output Schedules, and sum of HSLs for Generation Resources without Energy Offer Curves and ESRs without Energy Bid/Offer Curves; |

(e) The sum of the Base Points, High Ancillary Service Limit (HASL) and Low Ancillary Service Limit (LASL) of non-IRR Generation Resources with Energy Offer Curves, sum of the Base Points, HASL and LASL of WGRs with Energy Offer Curves, sum of the Base Points, HASL and LASL of PVGRs with Energy Offer Curves, and the sum of the Base Points, HASL and LASL of all remaining Generation Resources dispatched in SCED;

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| ***[NPRR1007 and NPRR1014: Replace applicable portions of paragraph (e) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014:]***(f) The sum of the Base Points of non-IRR Generation Resources with Energy Offer Curves, sum of the Base Points of WGRs with Energy Offer Curves, sum of the Base Points of PVGRs with Energy Offer Curves, sum of the Base Points of ESRs with Energy Bid/Offer Curves, and the sum of the Base Points of all remaining Resources dispatched in SCED; |

(f) The sum of the telemetered Generation Resource net output used in SCED; and

(g) An aggregate energy Demand curve based on the Real-Time Market (RTM) Energy Bid curves available to SCED. The energy Demand curve will be calculated beginning at the sum of the Low Power Consumptions (LPCs) and ending at the sum of the Maximum Power Consumptions (MPCs) for Controllable Load Resources with RTM Energy Bids, with the dispatch for each Controllable Load Resource constrained between the Controllable Load Resource’s LPC and MPC. The result will represent the ERCOT System Demand response capability available to SCED of the Controllable Load Resources with RTM Energy Bids at various pricing points, not taking into consideration any physical limitations of the ERCOT System.

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| ***[NPRR1014: Replace paragraph (g) above with the following upon system implementation:]***(h) An aggregate energy Demand curve based on the Real-Time Market (RTM) Energy Bid curves available to SCED. The energy Demand curve will be calculated beginning at the sum of the Low Power Consumptions (LPCs) and ending at the sum of the Maximum Power Consumptions (MPCs), with the dispatch for each Controllable Load Resource constrained between the Controllable Load Resource’s LPC and MPC. The result will represent the ERCOT System Demand response capability available to SCED of the Controllable Load Resources with RTM Energy Bids at various pricing points, not taking into consideration any physical limitations of the ERCOT System; |

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| ***[NPRR1007 and NPRR1014: Insert applicable portions of paragraphs (i)-(k) below upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014:]***(i) The aggregate Ancillary Service Offers (prices and quantities) in the RTM, for each type of Ancillary Service. For Responsive Reserve (RRS) and ERCOT Contingency Reserve Service (ECRS), ERCOT shall separately post aggregated offers from Generation Resources, Energy Storage Resources (ESRs), Controllable Load Resources, and Load Resources other than Controllable Load Resources. Linked Ancillary Service Offers will be included as non-linked Ancillary Service Offers;(j) The sum of the Base Points of ESRs in discharge mode; and(k) The sum of the Base Points of ESRs in charge mode. |

(2) Two days after the applicable Operating Day, ERCOT shall post on the ERCOT website for the ERCOT System the following information derived from the first complete execution of SCED in each 15-minute Settlement Interval:

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| ***[NPRR1007 and NPRR1014: Replace applicable portions of paragraph (2) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014:]***(2) Two days after the applicable Operating Day, ERCOT shall post on the ERCOT website for the ERCOT System the following information derived from each execution of SCED: |

(a) Each telemetered Dynamically Scheduled Resource (DSR) Load, and the telemetered DSR net output(s) associated with each DSR Load; and

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| ***[NPRR1000: Delete paragraph (a) above upon system implementation and renumber accordingly.]*** |

(b) The actual ERCOT Load as determined by subtracting the DC Tie Resource actual telemetry from the sum of the telemetered Generation Resource net output as used in SCED.

(3) Two days after the applicable Operating Day, ERCOT shall post on the ERCOT website the following information for the ERCOT System and, if applicable, for each Disclosure Area from the Day-Ahead Market (DAM) for each hourly Settlement Interval:

(a) An aggregate energy supply curve based on all energy offers that are available to the DAM, not taking into consideration Resource Startup Offer or Minimum-Energy Offer or any physical limitations of the ERCOT System. The result will represent the energy supply curve at various pricing points for energy offers available in the DAM;

(b) Aggregate minimum energy supply curves based on all Minimum-Energy Offers that are available to the DAM;

(c) An aggregate energy Demand curve based on the DAM Energy Bid curves available to the DAM, not taking into consideration any physical limitations of the ERCOT System;

(d) The aggregate amount of cleared energy bids and offers including cleared Minimum-Energy Offer quantities;

(e) The aggregate Ancillary Service Offers (prices and quantities) in the DAM, for each type of Ancillary Service regardless of a Resource’s On-Line or Off-Line status. For Responsive Reserve (RRS), ERCOT shall separately post aggregated offers from Resources providing Primary Frequency Response, Fast Frequency Response (FFR), and Load Resources controlled by high-set under-frequency relays. For ERCOT Contingency Reserve Service (ECRS), ERCOT shall separately post aggregated offers from Resources that are SCED-dispatchable and those that are manually dispatched. Linked Ancillary Service Offers will be included as non-linked Ancillary Service Offers;

(f) The aggregate Self-Arranged Ancillary Service Quantity, for each type of service, by hour. For RRS, ERCOT shall separately post aggregated Self-Arranged Ancillary Service Quantities from Resources providing Primary Frequency Response, FFR, and Load Resources controlled by high-set under-frequency relays. For ECRS, ERCOT shall separately post aggregated Self-Arranged Ancillary Service Quantities from Resources that are SCED-dispatchable and those that are manually dispatched;

(g) The aggregate amount of cleared Ancillary Service Offers. For RRS, ERCOT shall separately post aggregated Ancillary Service Offers from Resources providing Primary Frequency Response, FFR, and Load Resources controlled by high-set under-frequency relays. For ECRS, ERCOT shall separately post aggregated Ancillary Service Offers from Resources that are SCED-dispatchable and those that are manually dispatched; and

(h) The aggregate Point-to-Point (PTP) Obligation bids (not-to-exceed price and quantities) for the ERCOT System and the aggregate PTP Obligation bids that sink in the Disclosure Area for each Disclosure Area.

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| ***[NPRR1007 and NPRR1014: Replace applicable portions of paragraph (3) above with the following upon system implementation for NPRR1014; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007:]***(3) Two days after the applicable Operating Day, ERCOT shall post on the ERCOT website the following information for the ERCOT System and, if applicable, for each Disclosure Area from the DAM for each hourly Settlement Interval:(a) An aggregate energy supply curve based on all energy offers that are available to the DAM, including the offer portion of Energy Bid/Offer Curves submitted for ESRs, not taking into consideration Resource Startup Offer or Minimum-Energy Offer or any physical limitations of the ERCOT System. The result will represent the energy supply curve at various pricing points for energy offers available in the DAM;(b) Aggregate minimum energy supply curves based on all Minimum-Energy Offers that are available to the DAM;(c) An aggregate energy Demand curve based on the DAM Energy Bid curves and including the bid portion of Energy Bid/Offer Curves available to the DAM, not taking into consideration any physical limitations of the ERCOT System;(d) The aggregate amount of cleared energy bids and offers including cleared Minimum-Energy Offer quantities;(e) The aggregate Ancillary Service Offers (prices and quantities) in the DAM, for each type of Ancillary Service regardless of a Resource’s On-Line or Off-Line status and including Ancillary Service Only Offers. For RRS, ERCOT shall separately post aggregated offers from Resources providing Primary Frequency Response (including Ancillary Service Only Offers), Fast Frequency Response (FFR), and Load Resources controlled by high-set under-frequency relays. For ERCOT Contingency Reserve Service (ECRS), ERCOT shall separately post aggregated offers from Resources that are SCED-dispatchable (including Ancillary Service Only Offers) and those that are manually dispatched. Linked Ancillary Service Offers will be included as non-linked Ancillary Service Offers;(f) The aggregate Self-Arranged Ancillary Service Quantity, for each type of service, by hour. For RRS, ERCOT shall separately post aggregated Self-Arranged Ancillary Service Quantities from Resources providing Primary Frequency Response, FFR, and Load Resources controlled by high-set under-frequency relays. For ECRS, ERCOT shall separately post aggregated Self-Arranged Ancillary Service Quantities from Resources that are SCED-dispatchable and those that are manually dispatched;(g) The aggregate amount of cleared Resource-specific Ancillary Service Offers and Ancillary Service Only Offers. For RRS, ERCOT shall separately post aggregated Ancillary Service Offers from Resources providing Primary Frequency Response (including Ancillary Service Only Offers), FFR, and Load Resources controlled by high-set under-frequency relays. For ECRS, ERCOT shall separately post aggregated Ancillary Service Offers from Resources that are SCED-dispatchable (including Ancillary Service Only Offers) and those that are manually dispatched; and(h) The aggregate Point-to-Point (PTP) Obligation bids (not-to-exceed price and quantities) for the ERCOT System and the aggregate PTP Obligation bids that sink in the Disclosure Area for each Disclosure Area. |

(4) ERCOT shall post on the ERCOT website the following information for each Resource for each 15-minute Settlement Interval 60 days prior to the current Operating Day:

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| ***[NPRR1007 and NPRR1014: Replace applicable portions of paragraph (4) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014:]***(4) ERCOT shall post on the ERCOT website the following information for each Resource for each execution of SCED 60 days prior to the current Operating Day: |

(a) The Generation Resource name and the Generation Resource’s Energy Offer Curve (prices and quantities):

(i) As submitted;

(ii) As submitted and extended (or truncated) with proxy Energy Offer Curve logic by ERCOT to fit to the operational HSL and LSL values that are available for dispatch by SCED; and

(iii) As mitigated and extended for use in SCED, including the Incremental and Decremental Energy Offer Curves for DSRs;

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| ***[NPRR1000: Replace paragraph (iii) above with the following upon system implementation:]***(iii) As mitigated and extended for use in SCED; |

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| ***[NPRR1007 and NPRR1014: Insert applicable portions of paragraph (b) below upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014; and renumber accordingly:]***(b) The Resource name and the Resource’s Ancillary Service Offer Curve (prices and quantities) for each type of Ancillary Service:(i) As submitted; and(ii) As submitted and extended with proxy Ancillary Service Offer Curve logic by ERCOT. |

(b) The Load Resource name and the Load Resource’s bid to buy (prices and quantities);

(c) The Generation Resource name and the Generation Resource’s Output Schedule;

(d) For a DSR, the DSR Load and associated DSR name and DSR net output;

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| ***[NPRR1000: Delete paragraph (d) above upon system implementation and renumber accordingly.]*** |

(e) The Generation Resource name and actual metered Generation Resource net output;

(f) The self-arranged Ancillary Service by service for each QSE;

(g) The following Generation Resource data using a single snapshot during the first SCED execution in each Settlement Interval:

(i) The Generation Resource name;

(ii) The Generation Resource status;

(iii) The Generation Resource HSL, LSL, HASL, LASL, High Dispatch Limit (HDL), and Low Dispatch Limit (LDL);

(iv) The Generation Resource Base Point from SCED;

(v) The telemetered Generation Resource net output used in SCED;

(vi) The Ancillary Service Resource Responsibility for each Ancillary Service;

(vii) The Generation Resource Startup Cost and minimum energy cost used in the Reliability Unit Commitment (RUC); and

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| ***[NPRR1007 and NPRR1014: Replace applicable portions of paragraph (g) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014:]***(h) The following Generation Resource data using a snapshot from each execution of SCED: (i) The Generation Resource name;(ii) The Generation Resource status;(iii) The Generation Resource HSL, LSL, High Dispatch Limit (HDL), and Low Dispatch Limit (LDL);(iv) The Generation Resource Base Point from SCED;(v) The telemetered Generation Resource net output used in SCED;(vi) The Ancillary Service Resource awards for each Ancillary Service;(vii) The Generation Resource Startup Cost and minimum energy cost used in the Reliability Unit Commitment (RUC);(viii) The telemetered Normal Ramp Rates; (ix) The telemetered Ancillary Service capabilities; and |

(h) The following Load Resource data using a single snapshot during the first SCED execution in each Settlement Interval:

(i) The Load Resource name;

(ii) The Load Resource status;

(iii) The MPC for a Load Resource;

(iv) The LPC for a Load Resource;

(v) The Load Resource HASL, LASL, HDL, and LDL, for a Controllable Load Resource that has a Resource Status of ONRGL or ONCLR for the interval snapshot;

(vi) The Load Resource Base Point from SCED, for a Controllable Load Resource that has a Resource Status of ONRGL or ONCLR for the interval snapshot;

(vii) The telemetered real power consumption; and

(viii) The Ancillary Service Resource Responsibility for each Ancillary Service.

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| ***[NPRR1007 and NPRR1014: Replace applicable portions of paragraph (h) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014:]***(i) The following Load Resource data using a snapshot from each execution of SCED: (i) The Load Resource name;(ii) The Load Resource status;(iii) The MPC for a Load Resource;(iv) The LPC for a Load Resource;(v) The Load Resource HDL and LDL, for a Controllable Load Resource that has a Resource Status of ONL;(vi) The Load Resource Base Point from SCED, for a Controllable Load Resource that has a Resource Status of ONL;(vii) The telemetered real power consumption;(viii) The Ancillary Service Resource awards for each Ancillary Service;(ix) The telemetered self-provided Ancillary Service amount for each Ancillary Service;(x) The telemetered Normal Ramp Rates; (xi) The telemetered Ancillary Service capabilities; and(j) The ESR name and the ESR’s Energy Bid/Offer Curve (prices and quantities):(i) As submitted; and(ii) As submitted and extended with proxy Energy Offer Curve logic by ERCOT to fit to the operational HSL and LSL values that are available for dispatch by SCED;(k) The following ESR data using a snapshot from each execution of SCED: (i) The ESR name;(ii) The ESR status;(iii) The ESR HSL, LSL, High Dispatch Limit (HDL), and Low Dispatch Limit (LDL);(iv) The ESR Base Point from SCED;(v) The telemetered ESR net output used in SCED;(vi) The Ancillary Service Resource awards for each Ancillary Service;(vii) The telemetered Normal Ramp Rates; (viii) The telemetered Ancillary Service capabilities;(ix) The telemetered State of Charge in MWh;(x) The telemetered Minimum State of Charge (MinSOC) in MWh; and(xi) The telemetered Maximum State of Charge (MaxSOC) in MWh. |

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| ***[NPRR1007 and NPRR1058: Insert applicable portions of paragraph (5) below upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1058; and renumber accordingly:]***(5) ERCOT shall post on the ERCOT website for each Resource for each Operating Hour 60 days prior to the current Operating Day a count of the number of times for each Ancillary Service that the Resource’s Ancillary Service Offer quantity or price was updated within the Operating Period. ERCOT shall post on the ERCOT website for each Resource for each Operating Hour 60 days prior to the current Operating Day, a count of the number of times a Resource’s Energy Offer quantity or price was updated within the Operating Hour, including any reason accompanying the update. |

(5) If any Real-Time Locational Marginal Price (LMP) exceeds 50 times the Fuel Index Price (FIP) during any 15-minute Settlement Interval for the applicable Operating Day, ERCOT shall post on the ERCOT website the portion of any Generation Resource’s as-submitted and as-mitigated and extended Energy Offer Curve that is at or above 50 times the FIP for each 15-minute Settlement Interval seven days after the applicable Operating Day.

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| ***[NPRR1007 and NPRR1014: Replace applicable portions of paragraph (5) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014:]***(6) If any Real-Time Locational Marginal Price (LMP) exceeds 50 times the Fuel Index Price (FIP) during any SCED interval for the applicable Operating Day, ERCOT shall post on the ERCOT website the portion of any Generation Resource’s as-submitted and as-mitigated and extended Energy Offer Curve or any ESR’s as-submitted and as-mitigated and extended Energy Bid/Offer Curve that is at or above 50 times the FIP for that SCED interval seven days after the applicable Operating Day. |

(6) If any Market Clearing Price for Capacity (MCPC) for an Ancillary Service exceeds 50 times the FIP for any Operating Hour in a DAM or Supplemental Ancillary Services Market (SASM) for the applicable Operating Day, ERCOT shall post on the ERCOT website the portion on any Resource’s Ancillary Service Offer that is at or above 50 times the FIP for that Ancillary Service for each Operating Hour seven days after the applicable Operating Day.

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| ***[NPRR1007 and NPRR1014: Replace applicable portions of paragraph (6) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014:]***(7) If any Market Clearing Price for Capacity (MCPC) for an Ancillary Service exceeds 50 times the FIP for any Operating Hour in a DAM or any SCED interval in the RTM for the applicable Operating Day, ERCOT shall post on the ERCOT website the portion on any Resource’s Ancillary Service Offer that is at or above 50 times the FIP for that Ancillary Service for that Operating Hour for the DAM or SCED interval for the RTM seven days after the applicable Operating Day. |

(7) ERCOT shall post on the ERCOT website the offer price and the name of the Entity submitting the offer for the highest-priced offer selected or Dispatched by SCED three days after the end of the applicable Operating Day. If multiple Entities submitted the highest-priced offers selected, all Entities shall be identified on the ERCOT website.

(8) ERCOT shall post on the ERCOT website the bid price and the name of the Entity submitting the bid for the highest-priced bid selected or Dispatched by SCED three days after the end of the applicable Operating Day. If multiple Entities submitted the highest-priced bids selected, all Entities shall be identified on the ERCOT website.

(9) ERCOT shall post on the ERCOT website the offer price and the name of the Entity submitting the offer for the highest-priced Ancillary Service Offer selected in the DAM for each Ancillary Service three days after the end of the applicable Operating Day. This same report shall also include the highest-priced Ancillary Service Offer selected for any SASMs cleared for that same Operating Day. If multiple Entities submitted the highest-priced offers selected, all Entities shall be identified on the ERCOT website. The report shall specify whether the Ancillary Service Offer was selected in a DAM or a SASM.

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| ***[NPRR1007 and NPRR1014: Replace applicable portions of paragraph (9) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014:]***(10) ERCOT shall post on the ERCOT website the offer price and the name of the Entity submitting the offer for the highest-priced Ancillary Service Offer selected in the DAM or RTM for each Ancillary Service three days after the end of the applicable Operating Day. If multiple Entities submitted the highest-priced offers selected, all Entities shall be identified on the ERCOT website. The report shall specify whether the Ancillary Service Offer was selected in a DAM or RTM. |

(10) ERCOT shall post on the ERCOT website for each Operating Day the following information for each Resource:

(a) The Resource name;

(b) The name of the Resource Entity;

(c) Except for Load Resources that are not SCED qualified, the name of the Decision Making Entity (DME) controlling the Resource, as reflected in the Managed Capacity Declaration submitted by the Resource Entity in accordance with Section 3.6.2, Decision Making Entity for a Resource; and

(d) Flag for Reliability Must-Run (RMR) Resources.

(11) ERCOT shall post on the ERCOT website the following information from the DAM for each hourly Settlement Interval for the applicable Operating Day 60 days prior to the current Operating Day:

(a) The Generation Resource name and the Generation Resource’s Three-Part Supply Offer (prices and quantities), including Startup Offer and Minimum-Energy Offer, available for the DAM;

(b) For each Settlement Point, individual DAM Energy-Only Offer Curves available for the DAM and the name of the QSE submitting the offer;

(c) The Resource name and the Resource’s Ancillary Service Offers available for the DAM;

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| ***[NPRR1007 and NPRR1014: Insert applicable portions of paragraph (d) below upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1014; and renumber accordingly:]***(d) The Ancillary Service Only Offer for each Ancillary Service and the name of the QSE submitting the offer; |

(d) For each Settlement Point, individual DAM Energy Bids available for the DAM and the name of the QSE submitting the bid;

(e) For each Settlement Point, individual PTP Obligation bids available to the DAM that sink at the Settlement Point and the QSE submitting the bid;

(f) The awards for each Ancillary Service from DAM for each Generation Resource;

(g) The awards for each Ancillary Service from DAM for each Load Resource;

(h) The award of each Three-Part Supply Offer from the DAM and the name of the QSE receiving the award;

(i) For each Settlement Point, the award of each DAM Energy-Only Offer from the DAM and the name of the QSE receiving the award;

(j) For each Settlement Point, the award of each DAM Energy Bid from the DAM and the name of the QSE receiving the award; and

(k) For each Settlement Point, the award of each PTP Obligation bid from the DAM that sinks at the Settlement Point, including whether or not the PTP Obligation bid was linked to an Option, and the QSE submitting the bid.

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| ***[NPRR1014: Insert items (m)-(o) below upon system implementation:]***(m) The ESR name and the ESR’s Energy Bid/Offer Curve (prices and quantities), available for the DAM;(n) The awards for each Ancillary Service from the DAM for each ESR; and(o) The award of each Energy Bid/Offer Curve from the DAM and the name of the QSE receiving the award. |

(12) ERCOT shall post on the ERCOT website the following information from any applicable SASMs for each hourly Settlement Interval for the applicable Operating Day 60 days prior to the current Operating Day:

(a) The Resource name and the Resource’s Ancillary Service Offers available for any applicable SASMs;

(b) The awards for each Ancillary Service from any applicable SASMs for each Generation Resource; and

(c) The awards for each Ancillary Service from any applicable SASMs for each Load Resource.

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| ***[NPRR1007: Delete paragraph (12) above upon system implementation of the Real-Time Co-Optimization (RTC) project.]*** |

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| ***[NPRR1002: Insert Section 3.7.1.3 below upon system implementation:]*****3.7.1.3 Energy Storage Resource Parameters**(1) Resource Parameters for an ESR that may be modified, with documented reason for change, by the QSE for immediate use upon ERCOT validation include:(a) Normal Ramp Rate curve;(b) Emergency Ramp Rate curve; and(c) Round Trip Efficiency. |

***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.

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| ***[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. Additionally, for a COP provided for an ESR, the QSE should, to the extent practicable, align 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. |

(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;

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| ***[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);

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| ***[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;

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| ***[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;

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| ***[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;

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| ***[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;

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| ***[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;

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| ***[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;

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| ***[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;

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| ***[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;

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| ***[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

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| ***[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.]*** |

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| ***[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.

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| ***[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;

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| ***[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;

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| ***[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;

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| ***[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;

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| ***[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;

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| ***[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.]*** |

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| ***[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. |

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| ***[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;

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| ***[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);

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| ***[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:

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| ***[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 Service (Reg-Up);

(ii) Regulation Down Service (Reg-Down);

(iii) RRS;

(iv) ECRS; and

(v) Non-Spin.

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| ***[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).

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| ***[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.

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| ***[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.

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| ***[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. |

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| ***[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. |

***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).

(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:

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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 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.

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| ***[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. For On-Line Energy Storage Resources (ESRs), RUC-projected dispatch for energy and Ancillary Service in one interval shall be such that the ESR’s minimum and maximum SOC values from COP are respected and the SOC required to support these dispatch levels for energy and Ancillary Service will match as closely as possible the difference between the COP values of the next interval’s Hour Beginning Planned SOC and the current interval’s Hour Beginning Planned SOC. The SOC accounting for a given interval will account for that interval’s Ancillary Service Deployment Factors. ERCOT shall provide the projected expected, minimum and maximum Ancillary Service Deployment Factors for each hour of the typical day for each month for the following year as part of ERCOT's methodology for determining the minimum Ancillary Service requirements for that year. Additionally, if ERCOT utilizes different Ancillary Service Deployment Factors following approval of the minimum Ancillary Service requirements methodology, ERCOT shall publish those updated Ancillary Service Deployment Factors on at least a Day-Ahead basis. The formulation of the RUC objective function must employ penalty factors on violations of security constraints and violations of ESR COP Hour Beginning Planned SOC. Any violations of the Hour Beginning Planned SOC from RUC output will be reviewed by the ERCOT Operator. The objective of the RUC process is to minimize costs based on the Resource costs described in paragraphs (9) through (13) below. ESR energy dispatch costs (Bid/Offer) 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) 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, any ESR planned SOCs contributing to any 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. In addition, after each RUC run, ERCOT shall post the Ancillary Service Deployment Factors used by that RUC process for each hour in the RUC Study Period to the MIS Secure Area. (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. For ESRs, energy dispatch costs are not considered in determining projected energy output levels.(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. For ESRs, Ancillary Service Offer costs are not considered in determining projected Ancillary Service awards.(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:

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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. |

(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;(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.(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.(d) For the HRUC, DRUC, and WRUC processes, a feasibility check on the COP submitted Hour Beginning Planned SOC will be performed. This check may reduce the Hour Beginning Planned SOC 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 Hour Beginning Planned SOC is achievable from the previous interval. If it is not feasible, then RUC will reduce the Hour Beginning Planned SOC to the closest achievable value.(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 PeriodReview the list of Off-Line Available Resources with a start-up time of one hour or lessReview and communicate HRUC commitments and Direct Current Tie (DC Tie) Schedule curtailmentsSnapshot the Scheduled Power Consumption for Controllable Load Resources |
| Before the start of each SCED run | Update Output Schedules for DSRs | Validate Output Schedules for DSRsExecute 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 ResourceAcknowledge receipt of Dispatch InstructionsComply with Dispatch Instruction Review Resource Status to assure current state of the Resources is properly telemeteredUpdate COP with actual Resource Status and limits and Ancillary Service Schedules Communicate Resource Forced Outages to ERCOT 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 | 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 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)Monitor Resource Status and identify discrepancies between COP and telemetered Resource StatusRestart Real-Time Sequence on major change of Resource or Transmission Element StatusMonitor ERCOT total system capacity providing Ancillary ServicesValidate COP informationMonitor ERCOT control performanceDistribute 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 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 effectivePost 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 effectivePost 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 effectivePost 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 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 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 projectionsPost each hour on the ERCOT website binding SCED Shadow Prices and active binding transmission constraints by Transmission Element name (contingency /overloaded element pairs) 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 IntervalPost 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 Post parameters as required by Section 6.4.9, Ancillary Services Capacity During the Adjustment Period and in Real-Time, on the ERCOT website |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[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  |  | Execute the Hour-Ahead Sequence, including HRUC, beginning with the second hour of the Operating PeriodReview the list of Off-Line Available Resources with a start-up time of one hour or lessReview and communicate HRUC commitments and Direct Current Tie (DC Tie) Schedule curtailmentsSnapshot the Scheduled Power Consumption for Controllable Load Resources |
| SCED run |  | Execute SCED and pricing run to determine impact of reliability deployments on energy and Ancillary Service prices |
| During the Operating Hour | Acknowledge receipt of Dispatch InstructionsComply with Dispatch Instruction Review Resource Status to assure current state of the Resources is properly telemeteredUpdate COP and telemetry with actual Resource Status and limits and Ancillary Service capabilitiesSubmit and update Ancillary Service OffersCommunicate Resource Forced Outages to ERCOT Submit and update Energy Offer Curves and/or RTM Energy Bids  | 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 applicableMonitor Resource Status and identify discrepancies between COP and telemetered Resource StatusRestart Real-Time Sequence on major change of Resource or Transmission Element StatusMonitor ERCOT total system capacity providing Ancillary ServicesValidate COP informationValidate Ancillary Service TradesMonitor ERCOT control performanceDistribute 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 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 from SCED with the time stamp the prices are effectivePost 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 effectivePost every 15 minutes on the ERCOT website the aggregate net injection from Settlement Only Generators (SOGs) and Settlement Only Energy Storage Systems (SOESSs)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 projectionsPost 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 be broken out by Ancillary Service sub-type, where applicablePost each hour on the ERCOT website binding SCED Shadow Prices and active binding transmission constraints by Transmission Element name (contingency /overloaded element pairs) 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 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 |

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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.

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| ***[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 and, for ESRs, further capped by Ancillary Service duration requirements and current available State of Charge (SOC), 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. |

***6.4.9.1.1 ERCOT Increases to the Ancillary Services Plan***

(1) If ERCOT determines in the Adjustment Period, in its sole discretion, that more Ancillary Services are needed for one or more Operating Hours than were provided in the Day-Ahead Ancillary Services Plan, it shall notify each QSE of its increased Ancillary Service Supply Obligation.

(2) ERCOT may procure more Ancillary Services through a SASM, as described below in Section 6.4.9.2, Supplemental Ancillary Services Market, if the Self-Arranged Ancillary Service Quantities are insufficient to meet the total Ancillary Service Supply Obligation.

(3) When a SASM has been executed in response to ERCOT increasing the Ancillary Services Plan, each QSE that purchases Ancillary Service capacity shall be charged its share of the net cost incurred for that service, in accordance with Section 6.7.4, Adjustments to Cost Allocations for Ancillary Services Procurement.

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| ***[NPRR1010: Replace Section 6.4.9.1.1 above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]******6.4.9.1.1 Ancillary Service Awards***(1) Ancillary Service awards will be based on Resource capability (qualification, operating limits, Ancillary Service limits, ramp rates, State of Charge (SOC), SOC limits, etc.) and Ancillary Service Demand Curves (ASDCs) regardless of the quantity of Ancillary Service under deployment. (2) QSEs representing Resources that are qualified to provide an Ancillary Service must submit valid Ancillary Service Offers for use in Real-Time clearing. QSEs shall submit Resource-specific telemetry indicating the Resource’s ability to provide Ancillary Service in Real-Time.(3) QSEs representing Load Resources providing Ancillary Service via high-set under-frequency relays may self-provide high-set under-frequency relay-controlled RRS and ECRS; the amount of self-provision shall be limited based on the QSE’s Day-Ahead Market (DAM) Ancillary Service awards and trades. (4) A previously Off-Line Generation Resource in startup mode due to a manual deployment of Non-Spin by ERCOT will continue to be eligible for Non-Spin. The eligible capacity shall be based on the telemetered HSL of the Resource minus its Base Point Dispatch Instruction by SCED interval.(5) A Quick Start Generation Resource (QSGR) in startup mode due to an ERCOT Dispatch Instruction will continue to be eligible for ECRS and Non-Spin.  The eligible capacity shall be based on the telemetered HSL of the Resource minus its Base Point Dispatch Instruction by Security-Constrained Economic Dispatch (SCED) interval.(6) ERCOT may manually reduce the amount of Ancillary Service eligible to be awarded to a Resource that, if deployed, could violate a transmission constraint. ERCOT shall notify the Resource’s QSE in Real-Time of any Ancillary Service capability that has been derated by ERCOT, including the Resource’s new Ancillary Service limit in MWs. Should the deration impact payments the QSE would have received under Section 6.7.5.1, Real-Time Ancillary Service Imbalance, the QSE will be eligible for consideration of a payment under Section 6.7.5.7, Real-Time Derated Ancillary Service Capability Payment. (7)      Sixty days after the applicable Operating Day, ERCOT shall post to the ERCOT website the instances of ERCOT Operator reduction of Ancillary Services capability, including the name of the Resource, the type and reduced MW by Ancillary Service, and the reason for the reduction.(8) Ancillary Service awards and Real-Time Market Clearing Prices for Capacity (MCPCs) are immediately binding upon the completion of a SCED run. |

**6.5.7.3 Security Constrained Economic Dispatch**

(1) The SCED process is designed to simultaneously manage energy, the system power balance and network congestion through Resource Base Points and calculation of LMPs every five minutes. The SCED process uses a two-step methodology that applies mitigation prospectively to resolve Non-Competitive Constraints for the current Operating Hour. The SCED process evaluates Energy Offer Curves, Output Schedules and Real-Time Market (RTM) Energy Bids to determine Resource Dispatch Instructions by maximizing bid-based revenues minus offer-based costs, subject to power balance and network constraints. The SCED process uses the Resource Status provided by SCADA telemetry under Section 6.5.5.2, Operational Data Requirements, and validated by the Real-Time Sequence, instead of the Resource Status provided by the COP.

(2) The SCED solution must monitor cumulative deployment of Regulation Services and ensure that Regulation Services deployment is minimized over time.

(3) In the Generation To Be Dispatched (GTBD) determined by LFC, ERCOT shall subtract the sum of the telemetered net real power consumption from all Controllable Load Resources available to SCED.

(4) For use as SCED inputs, ERCOT shall use the available capacity of all committed Generation Resources by creating proxy Energy Offer Curves for certain Resources as follows:

(a) Non-IRRs and Dynamically Scheduled Resources (DSRs) without Energy Offer Curves

(i) ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below for:

(A) Each non-IRR for which its QSE has submitted an Output Schedule instead of an Energy Offer Curve; and

(B) Each DSR that has not submitted incremental and decremental Energy Offer Curves.

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL | SWCAP |
| Output Schedule MW plus 1 MW | SWCAP minus $0.01 |
| Output Schedule MW | -$249.99 |
| LSL | -$250.00 |

(b) DSRs with Energy Offer Curves

(i) For each DSR that has submitted incremental and decremental Energy Offer Curves, ERCOT shall create a monotonically increasing proxy Energy Offer Curve. That curve must consist of the incremental Energy Offer Curve that reflects the available capacity above the Resource’s Output Schedule to its HSL and the decremental Energy Offer Curve that reflects the available capacity below the Resource’s Output Schedule to the LSL. The curve must be created as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| Output Schedule MW plus 1 MW to HSL | Incremental Energy Offer Curve |
| LSL to Output Schedule MW  | Decremental Energy Offer Curve |

(c) Non-IRRs without full-range Energy Offer Curves

(i) For each non-IRR for which its QSE has submitted an Energy Offer Curve that does not cover the full range of the Resource’s available capacity, ERCOT shall create a proxy Energy Offer Curve that extends the submitted Energy Offer Curve to use the entire available capacity of the Resource above the highest point on the Energy Offer Curve to the Resource’s HSL and the offer floor from the lowest point on the Energy Offer Curve to its LSL, using these points:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL (if more than highest MW in submitted Energy Offer Curve) | Price associated with highest MW in submitted Energy Offer Curve |
| Energy Offer Curve | Energy Offer Curve |
| 1 MW below lowest MW in Energy Offer Curve (if more than LSL) | -$249.99 |
| LSL (if less than lowest MW in Energy Offer Curve) | -$250.00 |

(d) IRRs

(i) For each IRR that has not submitted an Energy Offer Curve, ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL | $1,500 |
| HSL minus 1 MW | -$249.99 |
| LSL | -$250.00 |

(ii) For each IRR for which its QSE has submitted an Energy Offer Curve that does not cover the full range of the IRR’s available capacity, ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL (if more than highest MW in submitted Energy Offer Curve) | Price associated with the highest MW in submitted Energy Offer Curve |
| Energy Offer Curve | Energy Offer Curve |
| 1 MW below lowest MW in Energy Offer Curve (if more than LSL) | -$249.99 |
| LSL (if less than lowest MW in Energy Offer Curve) | -$250.00 |

(e) RUC-committed Resources

(i) For each RUC-committed Resource that has not submitted an Energy Offer Curve, ERCOT shall create a proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL  | $250 |
| Zero | $250 |

(ii) For each RUC-committed Resource that has submitted an Energy Offer Curve, ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL (if more than highest MW in Energy Offer Curve) | Greater of $250 or price associated with the highest MW in QSE submitted Energy Offer Curve |
| Energy Offer Curve | Greater of $250 or the QSE submitted Energy Offer Curve |
| Zero | Greater of $250 or the first price point of the QSE submitted Energy Offer Curve |

(iii) For each Combined Cycle Generation Resource that was RUC-committed from one On-Line configuration in order to transition to a different configuration with additional capacity, as instructed by ERCOT, that has not submitted an Energy Offer Curve for the RUC-committed configuration, ERCOT shall create a proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL of RUC-committed configuration  | $250 |
| Zero | $250 |

(iv) For each Combined Cycle Generation Resource that was RUC-committed from one On-Line configuration in order to transition to a different configuration with additional capacity, as instructed by ERCOT, that has submitted an Energy Offer Curve for the RUC-committed configuration, ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL of RUC-committed configuration (if more than highest MW in Energy Offer Curve) | Greater of $250 or price associated with the highest MW in QSE submitted Energy Offer Curve |
| Energy Offer Curve for MW at and above HSL of QSE-committed configuration | Greater of $250 or the QSE submitted Energy Offer Curve |
| HSL of QSE-committed configuration (if more than highest MW in Energy Offer Curve and price associated with highest MW in Energy Offer Curve is less than $250) | $250 |
| HSL of QSE-committed configuration (if more than highest MW in Energy Offer Curve) | Price associated with the highest MW in QSE submitted Energy Offer Curve |
| Energy Offer Curve for MW at and below HSL of QSE-committed configuration | The QSE submitted Energy Offer Curve |
| 1 MW below lowest MW in Energy Offer Curve (if more than LSL) | -$249.99 |
| LSL (if less than lowest MW in Energy Offer Curve) | -$250.00 |

(5) The Entity with decision making authority, as more fully described in Section 3.19.1, Constraint Competitiveness Test Definitions, over how a Resource or Split Generation Resource is offered or scheduled, shall be responsible for all offers associated with each Resource, including offers represented by a proxy Energy Offer Curve.

(6) For a Controllable Load Resource whose QSE has submitted an RTM Energy Bid that does not cover the full range of the Resource’s available Demand response capability, consistent with the Controllable Load Resource’s telemetered quantities, ERCOT shall create a proxy energy bid as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| LPC to MPC minus maximum MW of RTM Energy Bid | Price associated with the lowest MW in submitted RTM Energy Bid curve |
| MPC minus maximum MW of RTM Energy Bid to MPC | RTM Energy Bid curve |
| MPC | Right-most point (lowest price) on RTM Energy Bid curve |

(7) ERCOT shall ensure that any RTM Energy Bid is monotonically non-increasing. The QSE representing the Controllable Load Resource shall be responsible for all RTM Energy Bids, including bids updated by ERCOT as described above.

(8) If a Controllable Load Resource telemeters a status of OUTL, it is not considered as dispatchable capacity by SCED. A QSE may use this function to inform ERCOT of instances when the Controllable Load Resource is unable to follow SCED Dispatch Instructions. Under all telemetered statuses including OUTL, the remaining telemetry quantities submitted by the QSE shall represent the operating conditions of the Controllable Load Resource that can be verified by ERCOT. A QSE representing a Controllable Load Resource with a telemetered status of OUTL is still obligated to provide any applicable Ancillary Service Resource Responsibilities previously awarded to that Controllable Load Resource. This paragraph does not apply to ESRs.

(9) Energy Offer Curves that were constructed in whole or in part with proxy Energy Offer Curves shall be so marked in all ERCOT postings or references to the energy offer.

(10) The two-step SCED methodology referenced in paragraph (1) above is:

(a) The first step is to execute the SCED process to determine Reference LMPs. In this step, ERCOT executes SCED using the full Network Operations Model while only observing limits of Competitive Constraints. Energy Offer Curves for all On-Line Generation Resources and RTM Energy Bids from available Controllable Load Resources, whether submitted by QSEs or created by ERCOT under this Section, are used in the SCED to determine “Reference LMPs.”

(b) The second step is to execute the SCED process to produce Base Points, Shadow Prices, and LMPs, subject to security constraints (including Competitive and Non-Competitive Constraints) and other Resource constraints. The second step must:

(i) Use Energy Offer Curves for all On-Line Generation Resources, whether submitted by QSEs or created by ERCOT. Each Energy Offer Curve must be bounded at the lesser of the Reference LMP (from Step 1) or the appropriate Mitigated Offer Floor. In addition, each Energy Offer Curve subject to mitigation under the criteria described in Section 3.19.4, Security-Constrained Economic Dispatch Constraint Competitiveness Test, must be capped at the greater of the Reference LMP (from Step 1) at the Resource Node plus a variable not to exceed 0.01 multiplied by the value of the Resource’s Mitigated Offer Cap (MOC) curve at the LSL or the appropriate MOC;

(ii) Use RTM Energy Bid curves for all available Controllable Load Resources, whether submitted by QSEs or created by ERCOT. There is no mitigation of RTM Energy Bids. An RTM Energy Bid from a Controllable Load Resource represents the bid for energy distributed across all nodes in the Load Zone in which the Controllable Load Resource is located. For an ESR, an RTM Energy Bid represents a bid for energy at the ESR’s Resource Node; and

(iii) Observe all Competitive and Non-Competitive Constraints.

(c) ERCOT shall archive information and provide monthly summaries of security violations and any binding transmission constraints identified in Step 2 of the SCED process. The summary must describe the limiting element (or identified operator-entered constraint with operator’s comments describing the reason and the Resource-specific impacts for any manual overrides). ERCOT shall provide the summary to Market Participants on the MIS Secure Area and to the Independent Market Monitor (IMM).

(11) For each SCED process, in addition to the binding Base Points and LMPs, ERCOT shall calculate a non-binding projection of the Base Points and Resource Node LMPs, Real-Time Reliability Deployment Price Adders, Real-Time On-Line Reserve Price Adders, Real-Time Off-Line Reserve Price Adders, Hub LMPs and Load Zone LMPs at a frequency of every five minutes for at least 15 minutes into the future based on the same inputs to the SCED process as described in this Section, except that the Resource’s HDL and LDL and the total generation requirement will be as estimated at future intervals. The Resource’s HDL and LDL will be calculated for each interval of the projection based on the ramp rate capability over the study period. ERCOT shall estimate the projected total generation requirement by calculating a Load forecast for the study period. In lieu of the steps described in Section 6.5.7.3.1, Determination of Real-Time On-Line Reliability Deployment Price Adder, the non-binding projection of Real-Time Reliability Deployment Price Adders shall be estimated based on GTBD, reliability deployments MWs, and aggregated offers. The Energy Offer Curve from SCED Step 2, the virtual offers for Load Resources deployed and the power balance penalty curve will be compared against the updated GTBD to get an estimate of the System Lambda from paragraph (2)(m) of Section 6.5.7.3.1. ERCOT shall post the projected non-binding Base Points for each Resource for each interval study period on the MIS Certified Area and the projected non-binding LMPs for Resource Nodes, Real-Time Reliability Deployment Price Adders, Real-Time On-Line Reserve Price Adders, Real-Time Off-Line Reserve Price Adders, Hub LMPs and Load Zone LMPs on the ERCOT website pursuant to Section 6.3.2, Activities for Real-Time Operations.

(12) For each SCED process, ERCOT shall calculate a Real-Time On-Line Reserve Price Adder and a Real-Time Off-Line Reserve Price Adder based on the On-Line and Off-Line available reserves in the ERCOT System and the Operating Reserve Demand Curve (ORDC). The Real-Time Off-Line available reserves shall be administratively set to zero when the SCED snapshot of the Physical Responsive Capability (PRC) is equal to or below the PRC MW at which Energy Emergency Alert (EEA) Level 1 is initiated. In addition, for each SCED process, ERCOT shall calculate a Real-Time On-Line Reliability Deployment Price Adder. The sum of the Real-Time Reliability Deployment Price Adder and the Real-Time On-Line Reserve Price Adder shall be averaged over the 15-minute Settlement Interval and added to the Real-Time LMPs to determine the Real-Time Settlement Point Prices. The price after the addition of the sum of the Real-Time On-Line Reliability Deployment Price Adder and the Real-Time On-Line Reserve Price Adder to LMPs approximates the pricing outcome of the impact to energy prices from reliability deployments and the Real-Time energy and Ancillary Service co-optimization since the Real-Time On-Line Reserve Price Adder captures the value of the opportunity cost of reserves based on the defined ORDC. An Ancillary Service imbalance Settlement shall be performed pursuant to Section 6.7.5, Real-Time Ancillary Service Imbalance Payment or Charge, to make Resources indifferent to the utilization of their capacity for energy or Ancillary Service reserves.

(13) ERCOT shall determine the methodology for implementing the ORDC to calculate the Real-Time On-Line Reserve Price Adder and Real-Time Off-Line Reserve Price Adder. Following review by TAC, the ERCOT Board shall review the recommendation and approve a final methodology. Within two Business Days following approval by the ERCOT Board, ERCOT shall post the methodology on the ERCOT website.

(14) At the end of each season, ERCOT shall determine the ORDC for the same season in the upcoming year, based on historic data using the ERCOT Board-approved methodology for implementing the ORDC. Annually, ERCOT shall verify that the ORDC is adequately representative of the loss of Load probability for varying levels of reserves. Twenty days after the end of the Season, ERCOT shall post the ORDC for the same season of the upcoming year on the ERCOT website.

(15) ERCOT may override one or more of a Controllable Load Resource’s parameters in SCED if ERCOT determines that the Controllable Load Resource’s participation is having an adverse impact on the reliability of the ERCOT System.

(16) The QSE representing an ESR, in order to charge the ESR, must submit RTM Energy Bids, and the ESR may withdraw energy from the ERCOT System only when dispatched by SCED to do so. An ESR may telemeter a status of OUTL only if the ESR is in Outage status.

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| ***[NPRR930, NPRR1000, NPRR1010, NPRR1014, and NPRR1019: Replace applicable portions of Section 6.5.7.3 above with the following upon system implementation for NPRR930, NPRR1000, NPRR1014, or NPRR1019; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010:]*****6.5.7.3 Security Constrained Economic Dispatch**(1) The SCED process is designed to simultaneously manage energy, Ancillary Services, the system power balance and network congestion through Resource Base Points, Ancillary Service awards, and the calculation of LMPs and Real-Time MCPCs approximately every five minutes, or more frequently if necessary. The SCED process uses a two-step methodology that applies mitigation to offers for energy prospectively to resolve Non-Competitive Constraints for the current Operating Hour. The SCED process evaluates Energy Offer Curves, Energy Bid/Offer Curves, Ancillary Service Offers, Output Schedules and Real-Time Market (RTM) Energy Bids to determine Resource Dispatch Instructions and Ancillary Service awards by maximizing bid-based revenues minus offer-based costs, subject to power balance, Ancillary Service Demand Curves (ASDCs), and network constraints. The SCED process uses the Resource Status provided by SCADA telemetry under Section 6.5.5.2, Operational Data Requirements, and validated by the Real-Time Sequence, instead of the Resource Status provided by the COP. In addition, the SCED process accounts for each Energy Storage Resource’s (ESR’s) State of Charge (SOC) and SOC operating limits. This is to ensure that the SCED process will issue ESR Base Points and Ancillary Service that are feasible taking into account duration requirements for Energy and Ancillary Service and also that do not violate the ESR’s MinSOC and MaxSOC limits.(2) The SCED solution must monitor cumulative deployment of Regulation Services and ensure that Regulation Services deployment is minimized over time.(3) In the Generation To Be Dispatched (GTBD) determined by LFC, ERCOT shall subtract the sum of the telemetered net real power consumption from all Controllable Load Resources available to SCED.(4) For use as SCED inputs for determining energy dispatch and Ancillary Service awards, ERCOT shall use the available capacity of all committed Generation Resources by creating proxy Energy Offer Curves for certain Resources as follows: (a) Non-IRRs without Energy Offer Curves(i) ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below for:(A) Each non-IRR for which its QSE has submitted an Output Schedule instead of an Energy Offer Curve.

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL | RTSWCAP |
| Output Schedule MW plus 1 MW | RTSWCAP minus $0.01 |
| Output Schedule MW | -$249.99 |
| LSL | -$250.00 |

(b) Non-IRRs without full-range Energy Offer Curves (i) For each non-IRR for which its QSE has submitted an Energy Offer Curve that does not cover the full range of the Resource’s available capacity, ERCOT shall create a proxy Energy Offer Curve that extends the submitted Energy Offer Curve to use the entire available capacity of the Resource above the highest point on the Energy Offer Curve to the Resource’s HSL and the offer floor from the lowest point on the Energy Offer Curve to its LSL, using these points:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL (if more than highest MW in submitted Energy Offer Curve) | Price associated with highest MW in submitted Energy Offer Curve |
| Energy Offer Curve | Energy Offer Curve |
| 1 MW below lowest MW in Energy Offer Curve (if more than LSL) | -$249.99 |
| LSL (if less than lowest MW in Energy Offer Curve) | -$250.00 |

(c) IRRs(i) For each IRR that has not submitted an Energy Offer Curve, ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL | $1,500 |
| HSL minus 1 MW | -$249.99 |
| LSL | -$250.00 |

(ii) For each IRR for which its QSE has submitted an Energy Offer Curve that does not cover the full range of the IRR’s available capacity, ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL (if more than highest MW in submitted Energy Offer Curve) | Price associated with the highest MW in submitted Energy Offer Curve |
| Energy Offer Curve | Energy Offer Curve |
| 1 MW below lowest MW in Energy Offer Curve (if more than LSL) | -$249.99 |
| LSL (if less than lowest MW in Energy Offer Curve) | -$250.00 |

(d) RUC-committed Resources (i) For each RUC-committed Resource that has not submitted an Energy Offer Curve, ERCOT shall create a proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL  | $250 |
| Zero | $250 |

(ii) For each RUC-committed Resource that has submitted an Energy Offer Curve, ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL (if more than highest MW in Energy Offer Curve) | Greater of $250 or price associated with the highest MW in QSE submitted Energy Offer Curve |
| Energy Offer Curve | Greater of $250 or the QSE submitted Energy Offer Curve |
| Zero | Greater of $250 or the first price point of the QSE submitted Energy Offer Curve |

(iii) For each RUC-committed Resource during the time period stated in the Advance Action Notice (AAN) if any Resource received an Outage Schedule Adjustment, ERCOT shall create a proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL | $4,500 or the effective Value of Lost Load (VOLL), whichever is less. |
| Zero | $4,500 or the effective VOLL, whichever is less. |

(iv) For each Combined Cycle Generation Resource that was RUC-committed from one On-Line configuration in order to transition to a different configuration with additional capacity, as instructed by ERCOT, that has not submitted an Energy Offer Curve for the RUC-committed configuration, ERCOT shall create a proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL of RUC-committed configuration  | $250 |
| Zero | $250 |

(v) For each Combined Cycle Generation Resource that was RUC-committed from one On-Line configuration in order to transition to a different configuration with additional capacity, as instructed by ERCOT, that has submitted an Energy Offer Curve for the RUC-committed configuration, ERCOT shall create a monotonically increasing proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL of RUC-committed configuration (if more than highest MW in Energy Offer Curve) | Greater of $250 or price associated with the highest MW in QSE submitted Energy Offer Curve |
| Energy Offer Curve for MW at and above HSL of QSE-committed configuration | Greater of $250 or the QSE submitted Energy Offer Curve |
| HSL of QSE-committed configuration (if more than highest MW in Energy Offer Curve and price associated with highest MW in Energy Offer Curve is less than $250) | $250 |
| HSL of QSE-committed configuration (if more than highest MW in Energy Offer Curve) | Price associated with the highest MW in QSE submitted Energy Offer Curve |
| Energy Offer Curve for MW at and below HSL of QSE-committed configuration | The QSE submitted Energy Offer Curve |
| 1 MW below lowest MW in Energy Offer Curve (if more than LSL) | -$249.99 |
| LSL (if less than lowest MW in Energy Offer Curve) | -$250.00 |

(vi) For each RUC-committed Switchable Generation Resource (SWGR) that is not part of a Combined Cycle Train already operating in ERCOT, that has not submitted an Energy Offer Curve, and that has a COP Resource Status of EMRSWGR for the instructed Operating Hour at the time of the RUC instruction, ERCOT shall create a proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL | $4,500 or the effective Value of Lost Load (VOLL), whichever is less |
| Zero | $4,500 or the effective VOLL, whichever is less |

(vii) For each RUC-committed SWGR that is not part of a Combined Cycle Train already operating in ERCOT, that has submitted an Energy Offer Curve, and that has a COP Resource Status of EMRSWGR for the instructed Operating Hour at the time of the RUC instruction, ERCOT shall create a proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL (if more than highest MW in Energy Offer Curve) | Greater of: $4,500 or the effective VOLL, whichever is less; and the price associated with the highest MW in QSE-submitted Energy Offer Curve |
| Energy Offer Curve | Greater of: $4,500 or the effective VOLL, whichever is less; and the QSE-submitted Energy Offer Curve |
| Zero | Greater of: $4,500 or the effective VOLL, whichever is less; and the first price point of the QSE-submitted Energy Offer Curve |

(viii) For each Combined Cycle Train configuration that includes at least one SWGR that is operating in a non-ERCOT Control Area as part of a configuration with a COP Resource Status of EMRSWGR for the instructed Operating Hour at the time of a RUC instruction requiring the switching of the SWGR into the ERCOT Control Area, if the QSE for the Combined Cycle Train has not submitted an Energy Offer Curve for the RUC-committed configuration, ERCOT shall create a proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL of RUC-committed configuration  | $4,500 or the effective VOLL, whichever is less |
| Zero | $4,500 or the effective VOLL, whichever is less |

(ix) For each Combined Cycle Train configuration that includes at least one SWGR that is operating in a non-ERCOT Control Area as part of a configuration with a COP Resource Status of EMRSWGR for the instructed Operating Hour at the time of a RUC instruction requiring the switching of the SWGR into the ERCOT Control Area, if the QSE for the Combined Cycle Train has submitted an Energy Offer Curve for the RUC-committed configuration, ERCOT shall create a proxy Energy Offer Curve as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL of RUC-committed configuration (if more than highest MW in Energy Offer Curve) | Greater of: $4,500 or the effective VOLL, whichever is less; and the price associated with the highest MW in QSE-submitted Energy Offer Curve |
| Energy Offer Curve for MW at and above HSL of QSE-committed configuration | Greater of: $4,500 or the effective VOLL, whichever is less; and the QSE-submitted Energy Offer Curve |
| HSL of QSE-committed configuration (if more than highest MW in Energy Offer Curve and price associated with highest MW in Energy Offer Curve is less than $4,500) | $4,500 or the effective VOLL, whichever is less |
| HSL of QSE-committed configuration (if more than highest MW in Energy Offer Curve) | Price associated with the highest MW in QSE-submitted Energy Offer Curve |
| Energy Offer Curve for MW at and below HSL of QSE-committed configuration | The QSE-submitted Energy Offer Curve |
| 1 MW below lowest MW in Energy Offer Curve (if more than LSL) | -$249.99 |
| LSL (if less than lowest MW in Energy Offer Curve) | -$250.00 |

(5) For use as SCED inputs for determining energy dispatch and Ancillary Service awards, ERCOT shall use the available Ancillary Service MW capacity of all Resources by creating a proxy Ancillary Service Offer for qualified Resources as follows:(a) The proxy Ancillary Service Offer shall be a linked Ancillary Service Offer across all Ancillary Service products for which a Resource is qualified to provide. For Generation Resources, the proxy Ancillary Service Offer MW shall be equal to the Resource’s telemetered HSL. For ESRs, the proxy Ancillary Service Offer MW shall be equal to the difference between the Resource’s telemetered HSL and LSL. For Load Resources, the proxy Ancillary Service Offer MW shall be equal to the Resource’s telemetered Maximum Power Consumption (MPC).(b) For Resources that are not RUC-committed, the price in the proxy Ancillary Service Offer shall be set to:(i) For Reg-Up and RRS, the maximum of:(A) The proxy Ancillary Service Offer price floor for Reg-Up or RRS, respectively;(B) The Resource’s highest submitted Ancillary Service Offer price for Reg-Up or RRS, respectively;(C) The Resource’s highest Ancillary Service Offer price for ECRS (submitted or proxy); or(D) The Resource’s highest Ancillary Service Offer price for Non-Spin (submitted or proxy).(ii) For ECRS, the maximum of: (A) The proxy Ancillary Service Offer price floor for ECRS; (B) The Resource’s highest submitted Ancillary Service Offer price for ECRS; or(C) The Resource’s highest Ancillary Service Offer price for Non-Spin (submitted or proxy).(iii) For Non-Spin, the maximum of: (A) The proxy Ancillary Service Offer price floor for Non-Spin; or(B) The Resource’s highest submitted Ancillary Service Offer price for Non-Spin.(iv) For Reg-Down, the maximum of:(A) The proxy Ancillary Service Offer price floor for Reg-Down; or(B) The Resource’s highest submitted Ancillary Service Offer price for Reg-Down.(c) ERCOT systems shall be designed to allow for proxy Ancillary Service Offer price floors to differ when the same Ancillary Service product can be provided by either On-Line or Off-Line Resources, and/or an Ancillary Service product has sub-types. (d) Proxy Ancillary Service Offer price floors shall be approved by TAC and posted on the ERCOT website.(e) For RUC-committed Resources:(i) If a RUC-committed Resource does not have an Ancillary Service Offer for an Ancillary Service product that the Resource is qualified to provide, ERCOT shall create an Ancillary Service Offer for that Ancillary Service product at a value of $250/MWh for the full operating range of the Resource up to its telemetered HSL.(ii) For each Ancillary Service product for which a RUC-committed Resource has an Ancillary Service Offer, the Ancillary Service Offer used by SCED for that Ancillary Service product across the full operating range of the Resource up to its telemetered HSL shall be the maximum of: (A) The Resource’s highest submitted Ancillary Service Offer price; or (B) $250/MWh.(6) For use as SCED inputs for determining energy Dispatch and Ancillary Service awards, ERCOT shall use the available capacity of all On-Line ESRs by creating proxy Energy Bid/Offer Curves for certain Resources as follows: (a) For each ESR for which its QSE has submitted an Energy Bid/Offer Curve that does not cover the full offer range (LSL to HSL) of the Resource’s available capacity, ERCOT shall create a proxy Energy Bid/Offer Curve that extends the submitted Energy Bid/Offer Curve to use the entire available capacity of the Resource above the highest MW point on the Energy Bid/Offer Curve to the Resource’s HSL and from the lowest MW point on the Energy Bid/Offer Curve to LSL, using these prices for the corresponding MW segments:

|  |  |  |
| --- | --- | --- |
| **Scenario** | **MW Segment** | **Price (per MWh)** |
| HSL MW and the highest MW point on the Energy Bid/Offer are both greater than or equal to zero, and,HSL is greater than the highest MW in submitted Energy Bid/Offer Curve | From highest MW point on submitted Energy Bid/Offer Curve to HSL MW | RTSWCAP  |
| HSL MW is greater than or equal to zero, and,the highest MW point on the Energy Bid/Offer is less than zero | From highest MW point on submitted Energy Bid/Offer Curve to 0 MWFrom 0 MW to HSL | Price associated with the highest MW in submitted Energy Bid/Offer CurveRTSWCAP |
| HSL is less than zero and is also greater than the highest MW in submitted Energy Bid/Offer Curve | From highest MW point on submitted Energy Bid/Offer Curve to HSL MW | Price associated with the highest MW in submitted Energy Bid/Offer Curve |
| Energy Bid/Offer Curve |  | Energy Bid/Offer Curve |
| LSL MW and the lowest MW point on the Energy Bid/Offer Curve are both greater than or equal to zero, and,LSL is less than the lowest MW in submitted Energy Bid/Offer Curve | From LSL to lowest MW point on submitted Energy Bid/Offer Curve | Price associated with the lowest MW in submitted Energy Bid/Offer Curve |
| LSL MW is less than zero,and,the lowest MW point on the Energy Bid/Offer Curve is greater than zero | From LSL to 0 MWFrom 0 MW to lowest MW point on submitted Energy Bid/Offer Curve | -$250.00Price associated with the lowest MW in submitted Energy Bid/Offer Curve |
| LSL and the lowest MW point on the Energy Bid/Offer Curve are both less than or equal to zero,and,LSL is less than the lowest MW point on the Energy Bid/Offer Curve | From LSL to lowest MW point on submitted Energy Bid/Offer Curve | -$250.00 |

(b) At the time of SCED execution, if a valid Energy Bid/Offer Curve or Output Schedule does not exist for an ESR that has a status of On-Line, then ERCOT shall notify the QSE and create a proxy Energy Bid/Offer Curve priced at -$250/MWh for the MW portion of the curve less than zero MW, and priced at the RTSWCAP for the MW portion of the curve greater than zero MW.(c) At the time of SCED execution, if a QSE representing an ESR has submitted an Output Schedule instead of an Energy Bid/Offer Curve, ERCOT shall create a proxy Energy Bid/Offer Curve priced at -$250/MWh for the MW portion of the curve from its LSL to the MW amount on the Output Schedule, and priced at the RTSWCAP for the MW portion of the curve from the MW amount on the Output Schedule to its HSL.(7) The Entity with decision-making authority, as more fully described in Section 3.19.1, Constraint Competitiveness Test Definitions, over how a Resource or Split Generation Resource is offered or scheduled, shall be responsible for all offers associated with each Resource, including offers represented by a proxy Energy Offer Curve, proxy Energy Bid/Offer Curve, or proxy Ancillary Service Offer. (8) For a Controllable Load Resource whose QSE has submitted an RTM Energy Bid that does not cover the full range of the Resource’s available Demand response capability, consistent with the Controllable Load Resource’s telemetered quantities, ERCOT shall create a proxy energy bid as described below:

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| LPC to MPC minus maximum MW of RTM Energy Bid | Price associated with the lowest MW in submitted RTM Energy Bid curve |
| MPC minus maximum MW of RTM Energy Bid to MPC | RTM Energy Bid curve |
| MPC | Right-most point (lowest price) on RTM Energy Bid curve |

(9) ERCOT shall ensure that any RTM Energy Bid is monotonically non-increasing. The QSE representing the Controllable Load Resource shall be responsible for all RTM Energy Bids, including bids updated by ERCOT as described above.(10) If a Controllable Load Resource telemeters a status of OUTL, it is not considered as dispatchable capacity by SCED. A QSE may use this function to inform ERCOT of instances when the Controllable Load Resource is unable to follow SCED Dispatch Instructions. Under all telemetered statuses including OUTL, the remaining telemetry quantities submitted by the QSE shall represent the operating conditions of the Controllable Load Resource that can be verified by ERCOT. A QSE representing a Controllable Load Resource with a telemetered status of OUTL is still obligated to provide any applicable Ancillary Services awarded to the Resource. This paragraph does not apply to ESRs. (11) Energy Offer Curves that were constructed in whole or in part with proxy Energy Offer Curves shall be so marked in all ERCOT postings or references to the energy offer.(12) SCED will enforce Resource-specific Ancillary Service constraints to ensure that Ancillary Service awards are aligned with a Resource’s qualifications and telemetered Ancillary Service capabilities.(13) Energy Bid/Offer Curves that were constructed in whole or in part with proxy Energy Bid/Offer Curves shall be so marked in all ERCOT postings or references to the energy bid/offer.(14) The two-step SCED methodology referenced in paragraph (1) above is:(a) The first step is to execute the SCED process to determine Reference LMPs. In this step, ERCOT executes SCED using the full Network Operations Model while only observing limits of Competitive Constraints in addition to power balance and Ancillary Service constraints. Energy Offer Curves for all On-Line Generation Resources, Energy Bid/Offer Curves for all On-Line ESRs, and RTM Energy Bids from available Controllable Load Resources, whether submitted by QSEs or created by ERCOT under this Section, are used in the SCED to determine “Reference LMPs.” (b) The second step is to execute the SCED process to produce Base Points, Ancillary Service awards, Shadow Prices, Real-Time MCPCs, and LMPs, subject to security constraints (including Competitive and Non-Competitive Constraints) and other Resource constraints. The second step must:(i) Use Energy Offer Curves for all On-Line Generation Resources, whether submitted by QSEs or created by ERCOT. Each Energy Offer Curve must be bounded at the lesser of the Reference LMP (from Step 1) or the appropriate Mitigated Offer Floor. In addition, each Energy Offer Curve subject to mitigation under the criteria described in Section 3.19.4, Security-Constrained Economic Dispatch Constraint Competitiveness Test, must be capped at the greater of the Reference LMP (from Step 1) at the Resource Node plus a variable not to exceed 0.01 multiplied by the value of the Resource’s Mitigated Offer Cap (MOC) curve at the LSL or the appropriate MOC; (ii) Use Energy Bid/Offer Curves for all On-Line ESRs, whether submitted by QSEs or created by ERCOT. Each Energy Bid/Offer Curve must be bounded at the lesser of the Reference LMP (from Step 1) or the appropriate Mitigated Offer Floor. The offer portion of each Energy Bid/Offer Curve subject to mitigation under the criteria described in Section 3.19.4, Security-Constrained Economic Dispatch Constraint Competitiveness Test, must be capped at the greater of the Reference LMP (from Step 1) at the Resource Node plus a variable not to exceed 0.01 multiplied by the value of the Resource’s MOC curve at the LSL or the appropriate MOC; (iii) Use RTM Energy Bid curves for all available Controllable Load Resources, whether submitted by QSEs or created by ERCOT. There is no mitigation of RTM Energy Bids. An RTM Energy Bid from a Controllable Load Resource represents the bid for energy distributed across all nodes in the Load Zone in which the Controllable Load Resource is located. For an ESR, an RTM Energy Bid represents a bid for energy at the ESR’s Resource Node; (iv) Observe all Competitive and Non-Competitive Constraints; and(v) Use Ancillary Service Offers to determine Ancillary Service awards.(c) ERCOT shall archive information and provide monthly summaries of security violations and any binding transmission constraints identified in Step 2 of the SCED process. The summary must describe the limiting element (or identified operator-entered constraint with operator’s comments describing the reason and the Resource-specific impacts for any manual overrides). ERCOT shall provide the summary to Market Participants on the MIS Secure Area and to the Independent Market Monitor (IMM).(d) The System Lambda used to determine LMPs from SCED Step 2 shall be capped at the effective VOLL. (15) For each SCED process, in addition to the binding Base Points, Ancillary Service awards, Real-Time MCPCs, and LMPs, ERCOT shall calculate a non-binding projection of the Base Points, Ancillary Service awards, MCPCs, Resource Node LMPs, Real-Time Reliability Deployment Price Adders, Hub LMPs, and Load Zone LMPs at a frequency of every five minutes for at least 15 minutes into the future based on the same inputs to the SCED process as described in this Section, except that the Resource’s HDL and LDL and the total generation requirement will be as estimated at future intervals. The Resource’s HDL and LDL will be calculated for each interval of the projection based on the ramp rate capability over the study period. ERCOT shall estimate the projected total generation requirement by calculating a Load forecast for the study period. In lieu of the steps described in Section 6.5.7.3.1, Determination of Real-Time Reliability Deployment Price Adders, the non-binding projection of Real-Time Reliability Deployment Price Adders shall be estimated based on GTBD, reliability deployments MWs, and aggregated offers. The Energy Offer Curve and Energy Bid/Offer Curves from SCED Step 2, the virtual offers for Load Resources deployed and the power balance penalty curve will be compared against the updated GTBD to get an estimate of the System Lambda from paragraph (2)(m) of Section 6.5.7.3.1. ERCOT shall post the projected non-binding Base Points and Ancillary Service awards for each Resource for each interval study period on the MIS Certified Area and the projected non-binding LMPs for Resource Nodes, Real-Time MCPCs, Real-Time Reliability Deployment Price Adders, Hub LMPs and Load Zone LMPs on the ERCOT website pursuant to Section 6.3.2, Activities for Real-Time Operations.(16) ERCOT may override one or more of a Controllable Load Resource’s parameters in SCED if ERCOT determines that the Controllable Load Resource’s participation is having an adverse impact on the reliability of the ERCOT System.(17) The QSE representing an ESR may withdraw energy from the ERCOT System only when dispatched by SCED to do so. An ESR may telemeter a status of OUT only if the ESR is in Outage status. |

**6.5.7.5 Ancillary Services Capacity Monitor**

(1) ERCOT shall calculate the following every ten seconds and provide Real-Time summaries to ERCOT Operators and all Market Participants using ICCP, giving updates of calculations every ten seconds, and posting on the ERCOT website, giving updates of calculations every five minutes, which show the Real-Time total system amount of:

(a) RRS capacity from:

(i) Generation Resources;

(ii) Load Resources excluding Controllable Load Resources;

(iii) Controllable Load Resources; and

(iv) Resources capable of Fast Frequency Response (FFR);

(b) Ancillary Service Resource Responsibility for RRS from:

(i) Generation Resources;

(ii) Load Resources excluding Controllable Load Resources;

(iii) Controllable Load Resources; and

(iv) Resources capable of FFR;

(c) ECRS capacity from:

(i) Generation Resources;

(ii) Load Resources excluding Controllable Load Resources;

(iii) Controllable Load Resources; and

(iv) Quick Start Generation Resources (QSGRs);

(d) Ancillary Service Resource Responsibility for ECRS from:

(i) Generation Resources;

(ii) Load Resources excluding Controllable Load Resources; and

(iii) Controllable Load Resources; and

(iv) QSGRs;

(e) ECRS deployed to Generation and Load Resources;

(f) Non-Spin available from:

(i) On-Line Generation Resources with Energy Offer Curves;

(ii) Undeployed Load Resources;

(iii) Off-Line Generation Resources; and

(iv) Resources with Output Schedules;

(g) Ancillary Service Resource Responsibility for Non-Spin from:

(i) On-Line Generation Resources with Energy Offer Curves;

(ii) On-Line Generation Resources with Output Schedules;

(iii) Load Resources;

(iv) Off-Line Generation Resources excluding QSGRs; and

(v) QSGRs;

(h) Undeployed Reg-Up and Reg-Down;

(i) Ancillary Service Resource Responsibility for Reg-Up and Reg-Down;

(j) Deployed Reg-Up and Reg-Down;

(k) Available capacity:

(i) With Energy Offer Curves in the ERCOT System that can be used to increase Generation Resource Base Points in SCED;

(ii) With Energy Offer Curves in the ERCOT System that can be used to decrease Generation Resource Base Points in SCED;

(iii) Without Energy Offer Curves in the ERCOT System that can be used to increase Generation Resource Base Points in SCED;

(iv) Without Energy Offer Curves in the ERCOT System that can be used to decrease Generation Resource Base Points in SCED;

(v) With RTM Energy Bid curves from available Controllable Load Resources in the ERCOT System that can be used to decrease Base Points (energy consumption) in SCED;

(vi) With RTM Energy Bid curves from available Controllable Load Resources in the ERCOT System that can be used to increase Base Points (energy consumption) in SCED;

(vii) From Resources participating in SCED plus the Reg-Up, ECRS, and RRS from Load Resources and the Net Power Consumption minus the Low Power Consumption from Load Resources with a validated Real-Time RRS and ECRS Schedule;

(viii) From Resources included in item (vii) above plus reserves from Resources that could be made available to SCED in 30 minutes;

(ix) In the ERCOT System that can be used to increase Generation Resource Base Points in the next five minutes in SCED; and

(x) In the ERCOT System that can be used to decrease Generation Resource Base Points in the next five minutes in SCED;

(l) Aggregate telemetered HSL capacity for Resources with a telemetered Resource Status of EMR;

(m) Aggregate telemetered HSL capacity for Resources with a telemetered Resource Status of OUT;

(n) Aggregate net telemetered consumption for Resources with a telemetered Resource Status of OUTL; and

(o) The ERCOT-wide PRC calculated as follows:

**PRC1 = Min(Max((RDF\*(HSL-NFRC) – Actual Net Telemetered Output)i , 0.0) , 0.2\*RDF\*(HSL-NFRC)i),**

where the included On-Line Generation Resources do not include WGRs, nuclear Generation

Resources, or Generation Resources with an output less than or equal to 95% of telemetered LSL or

with a telemetered status of ONTEST, ONHOLD, STARTUP, or SHUTDOWN.

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***WGRs***

***online***

***All***

***WGR***

***online***

***i***

**PRC2 = Min(Max((RDFW\*HSL – Actual Net Telemetered Output)i , 0.0) , 0.2\*RDFW\*HSLi),**

where the included On-Line WGRs only include WGRs that are Primary Frequency Response-capable.

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**PRC3 = ((Synchronous condenser output)i as qualified by item (8) of Operating Guide Section 2.3.1.2, Additional Operational Details for Responsive Reserve and ERCOT Contingency Reserve Service Providers))**

**PRC4 = (Min(Max((Actual Net Telemetered Consumption – LPC), 0.0), ECRS and RRS Ancillary Service Resource Responsibility \* 1.5) from all Load Resources controlled by high-set under frequency relays carrying an ECRS and/or RRS Ancillary Service Resource Responsibility)i**

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***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

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***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

**PRC5 = Min(Max((LRDF\_1\*Actual Net Telemetered Consumption – LPC)i, 0.0), (0.2 \* LRDF\_1 \* Actual Net Telemetered Consumption)) from all Controllable Load Resources active in SCED and carrying Ancillary Service Resource Responsibility**

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***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

**PRC6 = Min(Max((LRDF\_2 \* Actual Net Telemetered Consumption – LPC)i, 0.0), (0.2 \* LRDF\_2 \* Actual Net Telemetered Consumption)) from all Controllable Load Resources active in SCED and not carrying Ancillary Service Resource Responsibility**

**PRC7 = (Capacity from Resources capable of providing FFR)i**

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***resources***

***FFR***

***online***

***All***

***resource***

***FFR***

***online***

***i***

**PRC8 = (If discharging or idle, Min(X% of HSL based on droop, HSL-ESR-Gen “injection”, the capacity that can be sustained for 15 minutes per the State of Charge), else Min(X% of (HSL – LSL(ESR “charging”) based on droop, the capacity that can be sustained for 15 minutes per the State of Charge – LSL(ESR “charging”)))**

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***ESR***

***online***

***All***

***ESR***

***online***

***i***

**Excludes ESR capacity used to provide FFR**

**PRC = PRC1 + PRC2 + PRC3 + PRC4 + PRC5 + PRC6 + PRC7 + PRC8**

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| PRC1 | MW | Generation On-Line greater than 0 MW |
| PRC2 | MW | WGRs On-Line greater than 0 MW |
| PRC3 | MW | Synchronous condenser output |
| PRC4 | MW | Capacity from Load Resources carrying ECRS Ancillary Service Resource Responsibility |
| PRC5 | MW | Capacity from Controllable Load Resources active in SCED and carrying Ancillary Service Resource Responsibility |
| PRC6 | MW | Capacity from Controllable Load Resources active in SCED and not carrying Ancillary Service Resource Responsibility |
| PRC7 | MW | Capacity from Resources capable of providing FFR |
| PRC8 | MW | ESR capacity capable of providing Primary Frequency Response |
| PRC | MW | Physical Responsive Capability |
| X | Percentage | Percent threshold based on the Governor droop setting of ESRs |
| RDF |  | The currently approved Reserve Discount Factor  |
| RDFW |  | The currently approved Reserve Discount Factor for WGRs |
| LRDF\_1 |  | The currently approved Load Resource Reserve Discount Factor for Controllable Load Resources carrying Ancillary Service Resource Responsibility |
| LRDF\_2 |  | The currently approved Load Resource Reserve Discount Factor for Controllable Load Resources not carrying Ancillary Service Resource Responsibility |
| NFRC | MW | Non-Frequency Responsive Capacity |

(2) Each QSE shall operate Resources providing Ancillary Service capacity to meet its obligations. If a QSE experiences temporary conditions where its total obligation for providing Ancillary Service cannot be met on the QSE’s Resources, then the QSE may add additional capability from other Resources that it represents. It adds that capability by changing the Resource Status and updating the Ancillary Service Schedules and Ancillary Services Resource Responsibility of the affected Resources and notifying ERCOT under Section 6.4.9.1, Evaluation and Maintenance of Ancillary Service Capacity Sufficiency. If the QSE is unable to meet its total obligations to provide committed Ancillary Services capacity, the QSE shall notify ERCOT immediately of the expected duration of the QSE’s inability to meet its obligations. ERCOT shall determine whether replacement Ancillary Services will be procured to account for the QSE’s shortfall according to Section 6.4.9.1.

(3) The Load Resource Reserve Discount Factors (RDFs) for Controllable Load Resources (LRDF\_1 and LRDF\_2) shall be subject to review and approval by TAC.

(4) The RDFs used in the PRC calculation shall be posted to the ERCOT website no later than three Business Days after approval.

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| ***[NPRR1010, NPRR1014, and NPRR1029: Replace applicable portions of Section 6.5.7.5 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:]*****6.5.7.5 Ancillary Services Capacity Monitor**(1) Every ten seconds, ERCOT shall calculate the following and provide Real-Time summaries to ERCOT Operators and all Market Participants using ICCP and postings on the ERCOT website showing the Real-Time total system amount of:(a) RRS capability from: (i) Generation Resources and ESRs in the form of PFR that can be sustained for the duration requirements of PFR;(ii) Load Resources, excluding Controllable Load Resources, capable of responding via under-frequency relay;(iii) Controllable Load Resources in the form of PFR;(iv) Resources, other than ESRs, capable of Fast Frequency Response (FFR); and(v) ESRs in the form of FFR, that can be sustained for the duration requirements of FFR;(b) Ancillary Service Resource awards for RRS to: (i) Generation Resources and ESRs in the form of PFR;(ii) Load Resources, excluding Controllable Load Resources, capable of responding by under-frequency relay;(iii) Controllable Load Resources in the form of PFR; and(iv) Resources providing FFR;(c) ECRS capability from: (i) Generation Resources;(ii) Load Resources excluding Controllable Load Resources; (iii) Controllable Load Resources;(iv) Quick Start Generation Resources (QSGRs); and(v) ESRs that can be sustained for the duration requirements of ECRS.(d) Ancillary Service Resource awards for ECRS to: (i) Generation Resources;(ii) Load Resources excluding Controllable Load Resources; and(iii) Controllable Load Resources;(iv) QSGRs; and(v) ESRs.(e) ECRS manually deployed by Resources with a Resource Status of ONSC; (f) Non-Spin available from: (i) On-Line Generation Resources with Energy Offer Curves;(ii) Undeployed Load Resources; (iii) Off-Line Generation Resources and On-Line Generation Resources with power augmentation;(iv) Resources with Output Schedules; and(v) ESRs that can be sustained for the duration requirements of Non-Spin.(g) Ancillary Service Resource awards for Non-Spin to:(i) On-Line Generation Resources with Energy Offer Curves;(ii) On-Line Generation Resources with Output Schedules;(iii) Load Resources; (iv) Off-Line Generation Resources excluding Quick Start Generation Resources (QSGRs), including Non-Spin awards on power augmentation capacity that is not active on On-Line Generation Resources;(v) QSGRs; and(vi) ESRs.(h) Reg-Up and Reg-Down capability (for ESRs, the duration requirements of Reg-Up and Reg-Down are considered);(i) Undeployed Reg-Up and Reg-Down;(j) Ancillary Service Resource awards for Reg-Up and Reg-Down;(k) Deployed Reg-Up and Reg-Down;(l) Available capacity:(i) With Energy Offer Curves in the ERCOT System that can be used to increase Generation Resource Base Points in SCED;(ii) With Energy Offer Curves in the ERCOT System that can be used to decrease Generation Resource Base Points in SCED; (iii) Without Energy Offer Curves in the ERCOT System that can be used to increase Generation Resource Base Points in SCED; (iv) Without Energy Offer Curves in the ERCOT System that can be used to decrease Generation Resource Base Points in SCED; (v) With RTM Energy Bid curves from available Controllable Load Resources in the ERCOT System that can be used to decrease Base Points (energy consumption) in SCED;(vi) With RTM Energy Bid curves from available Controllable Load Resources in the ERCOT System that can be used to increase Base Points (energy consumption) in SCED; (vii) From Resources participating in SCED plus the Reg-Up, RRS, and ECRS from Load Resources and the Net Power Consumption minus the Low Power Consumption from Load Resources with a validated Real-Time RRS and ECRS awards;(viii) With Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to increase ESR Base Points in SCED while respecting duration requirements for ESR Base Points in SCED;(ix) With Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to decrease ESR Base Points in SCED while respecting duration requirements for ESR Base Points in SCED; (x) Without Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to increase ESR Base Points in SCED while respecting duration requirements for ESR Base Points in SCED; (xi) Without Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to decrease ESR Base Points in SCED while respecting duration requirements for ESR Base Points in SCED; (xii) From Resources included in item (vii) above plus reserves from Resources that could be made available to SCED in 30 minutes;(xiii) In the ERCOT System that can be used to increase Generation Resource Base Points in the next five minutes in SCED; and(xiv) In the ERCOT System that can be used to decrease Generation Resource Base Points in the next five minutes in SCED;(xv) The total capability of Resources available to provide the following combinations of Ancillary Services, based on the Resource telemetry from the QSE and capped by the limits of the Resource:(A) Capacity to provide Reg-Up, RRS, or both, irrespective of whether it is capable of providing ECRS or Non-Spin;(B) Capacity to provide Reg-Up, RRS, ECRS, or any combination, irrespective of whether it is capable of providing Non-Spin; and(C) Capacity to provide Reg-Up, RRS, ECRS, or Non-Spin, in any combination;(m) Aggregate telemetered HSL capacity for Resources with a telemetered Resource Status of EMR;(n) Aggregate telemetered HSL capacity for Resources with a telemetered Resource Status of OUT;(o) Aggregate net telemetered consumption for Resources with a telemetered Resource Status of OUTL; and(p) The ERCOT-wide PRC calculated as follows:**PRC1 = Min(Max((RDF\*FRCHL – FRCO)i , 0.0) , 0.2\*RDF\*FRCHLi),**where the included On-Line Generation Resources do not include WGRs, nuclear GenerationResources, or Generation Resources with an output less than or equal to 95% of telemetered LSL or with a telemetered status of ONTEST, ONHOLD, STARTUP, or SHUTDOWN.***WGRs******online******All******WGR******online******i*****PRC2 = Min(Max((RDFW\*HSL – Actual Net Telemetered Output)i , 0.0) , 0.2\*RDFW\*HSLi),**where the included On-Line WGRs only include WGRs that are Primary Frequency Response-capable.**PRC3 = ((Synchronous condenser output)i as qualified by item (8) of Operating Guide Section 2.3.1.2, Additional Operational Details for Responsive Reserve and ERCOT Contingency Reserve Service Providers))****PRC4 = (Min(Max((Actual Net Telemetered Consumption – LPC), 0.0), ECRS and RRS Ancillary Service Resource award \* 1.5) from all Load Resources controlled by high-set under-frequency relays with an ECRS and/or RRS Ancillary Service Resource award)i*****resources******load******online******All******resource******load******online******i*****PRC5 = Min(Max((LRDF\_1\*Actual Net Telemetered Consumption – LPC)i, 0.0), (0.2 \* LRDF\_1 \* Actual Net Telemetered Consumption)) from all Controllable Load Resources active in SCED with an Ancillary Service Resource award*****resources******load******online******All******resource******load******online******i*****PRC6 = Min(Max((LRDF\_2 \* Actual Net Telemetered Consumption – LPC)i, 0.0), (0.2 \* LRDF\_2 \* Actual Net Telemetered Consumption)) from all Controllable Load Resources active in SCED without an Ancillary Service Resource award*****resources******load******online******All******resource******load******online******i*****PRC7 = (Capacity from Resources capable of providing FFR)i*****resources******FFR******online******All******resource******FFR******online******i*****PRC8 = (If discharging or idle, Min(X% of HSL based on droop, HSL-ESR-Gen “injection”, the capacity that can be sustained for 15 minutes per the State of Charge), else Min(X% of (HSL – LSL(ESR “charging”) based on droop, the capacity that can be sustained for 15 minutes per the State of Charge – LSL(ESR “charging”)))** ***ESR******online******All******ESR******online******i*****Excludes ESR capacity used to provide FFR** **PRC9 = (If discharging or idle, Min(X% of HSL based on droop, HSL-Gen “injection”, the sum of the MW headroom available from the intermittent renewable generation component and the MW capacity that can be sustained for 15 minutes per the ESS State of Charge), else Min(X% of Real-Time Total Capacity based on droop, the sum of the MW headroom available from the intermittent renewable generation component and the MW capacity that can be sustained for 15 minutes per the ESS State of Charge))*****DC-Coupled Resources******online******All******ESR******online******i*****Excludes DC-Coupled Resource capacity used to provide FFR****PRC = PRC1 + PRC2 + PRC3+ PRC4 + PRC5 + PRC6 + PRC7 + PRC8 + PRC9**The above variables are defined as follows:

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| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| PRC1 | MW | Generation On-Line greater than 0 MW |
| PRC2 | MW | WGRs On-Line greater than 0 MW |
| PRC3 | MW | Synchronous condenser output |
| PRC4 | MW | Capacity from Load Resources with an ECRS Ancillary Service Resource award |
| PRC5 | MW | Capacity from Controllable Load Resources active in SCED with an Ancillary Service Resource award |
| PRC6 | MW | Capacity from Controllable Load Resources active in SCED without an Ancillary Service Resource award |
| PRC7 | MW | Capacity from Resources capable of providing FFR |
| PRC8 | MW | ESR capacity capable of providing Primary Frequency Response |
| PRC9 | MW | Capacity from DC-Coupled Resources capable of providing Primary Frequency Response |
| PRC | MW | Physical Responsive Capability |
| X | Percentage | Percent threshold based on the Governor droop setting of ESRs |
| RDF |  | The currently approved Reserve Discount Factor  |
| RDFW |  | The currently approved Reserve Discount Factor for WGRs |
| LRDF\_1 |  | The currently approved Load Resource Reserve Discount Factor for Controllable Load Resources awarded an Ancillary Service Resource award |
| LRDF\_2 |  | The currently approved Load Resource Reserve Discount Factor for Controllable Load Resources not awarded an Ancillary Service Resource award |
| FRCHL | MW | Telemetered High limit of the FRC for the Resource |
| FRCO | MW | Telemetered output of FRC portion of the Resource |

(2) The Load Resource Reserve Discount Factors (RDFs) for Controllable Load Resources (LRDF\_1 and LRDF\_2) shall be subject to review and approval by TAC.(3) The RDFs used in the PRC calculation shall be posted to the ERCOT website no later than three Business Days after approval.(4) ERCOT shall display on the ERCOT website and update every ten seconds a rolling view of the ERCOT-wide PRC, as defined in paragraph (1)(p) above, for the current Operating Day. |