|  |  |  |  |
| --- | --- | --- | --- |
| NPRR Number | [1009](http://www.ercot.com/mktrules/issues/nprr1009) | NPRR Title | RTC – NP 5: Transmission Security Analysis and Reliability Unit Commitment |
| Date of Decision | November 18, 2020 |
| Action | Recommended Approval |
| Timeline  | Urgent |
| Proposed Effective Date | Upon system implementation of the Real-Time Co-Optimization (RTC) Project |
| Priority and Rank Assigned | Not applicable |
| Nodal Protocol Sections Requiring Revision  | 5.1, Introduction5.2.2.1, RUC Process Timeline After a Delay of the Day-Ahead Market5.2.2.2, RUC Process Timeline After an Aborted Day-Ahead Market5.3, ERCOT Security Sequence Responsibilities5.4, QSE Security Sequence Responsibilities5.4.1, Ancillary Service Positions (new)5.5.2, Reliability Unit Commitment (RUC) Process5.6.2, RUC Startup Cost Eligibility5.7.1.3, Revenue Less Cost Above LSL During RUC-Committed Hours5.7.1.4, Revenue Less Cost During QSE Clawback Intervals5.7.4.1.1, Capacity Shortfall Ratio Share5.8, Annual RUC Reporting Requirement |
| Related Documents Requiring Revision/Related Revision Requests | Nodal Operating Guide Revision Request (NOGRR) 211, RTC - NOG 2 and 9: System Operations and Control Requirements and Monitoring ProgramsNodal Protocol Revision Request (NPRR) 1007, RTC – NP 3: Management Activities for the ERCOT SystemNPRR1008, RTC – NP 4: Day-Ahead OperationsNPRR1010, RTC - NP 6: Adjustment Period and Real-Time OperationsNPRR1011, RTC - NP 8: Performance MonitoringNPRR1012, RTC - NP 9: Settlement and BillingNPRR1013, RTC - NP 1, 2, 16, and 25: Overview, Definitions and Acronyms, Registration and Qualification of Market Participants, and Market Suspension and RestartOther Binding Document Revision Request (OBDRR) 020, RTC - Methodology for Setting Maximum Shadow Prices for Network and Power Balance Constraints |
| Revision Description | This NPRR updates Transmission Security Analysis and Reliability Unit Commitment (RUC) to address changes associated with the implementation of RTC. Specifically, this NPRR addresses the following Key Principles:* KP3 – Reliability Unit Commitment
* KP4 – The Supplemental Ancillary Service Market Process
* KP5 – Day-Ahead Market
* KP6 – Market-Facing Reports
* KP7 – Performance Monitoring
 |
| Reason for Revision |  Addresses current operational issues. Meets Strategic goals (tied to the [ERCOT Strategic Plan](http://www.ercot.com/content/wcm/lists/144926/ERCOT_Strategic_Plan_2019-2023.pdf) or directed by the ERCOT Board). Market efficiencies or enhancements Administrative Regulatory requirements Other: (explain)*(please select all that apply)* |
| Business Case | Aligns Transmission Security Analysis and RUC with the upcoming RTC terminology and operating environment. |
| Credit Work Group Review | See 11/17/20 Credit Work Group (Credit WG) comments to NPRR1007 |
| PRS Decision | On 6/11/20, PRS unanimously voted via roll call to table NPRR1009. All Market Segments were present for the vote.On 11/11/20, PRS unanimously voted via roll call to grant NPRR1009 Urgent status; to recommend approval of NPRR1009 as amended by the 10/23/20 ERCOT comments; and to forward to TAC NPRR1009 and the Impact Analysis. All Market Segments were present for the vote. |
| Summary of PRS Discussion | On 6/11/20, there was no discussion.On 11/11/20, ERCOT Staff provided an overview of the RTC initiative, noting the filed comments reflecting consensus reached by the Real-Time Co-Optimization Task Force (RTCTF), and participants reviewed the Impact Analysis and discussed the appropriate priority and rank for the RTC project. |
| **TAC Decision** | On 11/18/20, TAC unanimously voted via roll call to recommend approval of NPRR1009 as recommended by PRS in the 11/11/20 PRS Report. All Market Segments were present for the vote.  |
| **Summary of TAC Discussion** | On 11/18/20, there was no discussion. |
| **ERCOT Opinion** | ERCOT supports approval of NPRR1009. |

|  |
| --- |
| Sponsor |
| Name | Dave Maggio |
| E-mail Address | David.Maggio@ercot.com |
| Company | ERCOT |
| Phone Number | 512-248-6998 |
| Cell Number |  |
| Market Segment | Not applicable |

|  |
| --- |
| **Market Rules Staff Contact** |
| **Name** | Cory Phillips |
| **E-Mail Address** | Cory.phillips@ercot.com |
| **Phone Number** | 512-248-6464 |

|  |
| --- |
| **Comments Received** |
| **Comment Author** | **Comment Summary** |
| ERCOT 070820 | Proposed additional revisions reflecting consensus of the RTCTF |
| ERCOT 102320 | Proposed additional revisions reflecting consensus of the RTCTF and requested Urgent status for NPRR1009 |

|  |
| --- |
| **Market Rules Notes** |

Please note the baseline Protocol language in the following sections has been updated to reflect the incorporation of the following NPRR(s) into the Protocols:

* NPRR856, Treatment of OFFQS Status in Day-Ahead Make Whole and RUC Settlements (unboxed 5/29/20)
	+ Section 5.6.2
* NPRR884, Adjustments to Pricing and Settlement for Reliability Unit Commitments (RUCs) of On-Line Combined Cycle Generation Resources (unboxed 5/29/20)
	+ Section 5.5.2
	+ Section 5.7.1.3
	+ Section 5.7.4.1.1
* NPRR930, Process, Pricing, and Cost Recovery for Delayed Resource Outages (unboxed 7/1/20)
	+ Section 5.1
	+ Section 5.5.2
	+ Section 5.8
* NPRR977, Create MIS Posting for RUC Cancellations (unboxed 8/7/20)
	+ Section 5.3

Please note that the following NPRR(s) also propose revisions to the following section(s):

* NPRR1014, BESTF-4 Energy Storage Resource Single Model
	+ Section 5.3
	+ Section 5.4
* NPRR1028, RUC Process Alignment with Resource Limits
	+ Section 5.5.2
* NPRR1029, BESTF-6 DC-Coupled Resources
	+ Section 5.7.4.1.1
* NPRR1032, Consideration of Physical Limits of DC Ties in RUC Optimization and Settlements
	+ Section 5.5.2
	+ Section 5.7.4.1.1
* NPRR1039, Replace the Term MIS Public Area with ERCOT Website
	+ Section 5.2.2.1
	+ Section 5.2.2.2
	+ Section 5.3
* NPRR1054, Removal of Oklaunion Exemption Language
	+ Section 5.7.4.1.1

Please note administrative changes have been made below and authored as "ERCOT Market Rules".

|  |
| --- |
| Proposed Protocol Language Revision |

**5.1 Introduction**

(1) Transmission security analysis and Reliability Unit Commitment (RUC) are used to ensure ERCOT System reliability and to ensure that enough Resource capacity and qualified Ancillary Service capacity are committed in the right locations to reliably serve the forecasted Load and Ancillary Service needs on the ERCOT System including Direct Current Tie (DC Tie) Load that has not been curtailed.

(2) ERCOT shall conduct at least one Day-Ahead Reliability Unit Commitment (DRUC) and at least one Hourly Reliability Unit Commitment (HRUC) before each hour of the Operating Day. ERCOT, in its sole discretion, may conduct a RUC at any time to evaluate and resolve reliability issues.

(3) The DRUC must be run after the close of the Day-Ahead Market (DAM).

(4) The DRUC uses Three-Part Supply Offers, capped at the maximum of generic or verifiable minimum energy and Startup Costs, submitted before the DAM by Qualified Scheduling Entities (QSEs) that were considered in the DAM but not awarded in the DAM. A QSE may not submit a Three-Part Supply Offer to be considered in the DRUC unless the offer was also submitted for consideration in the DAM.

(5) ERCOT must initiate the HRUC process at least one hour before the Operating Hour to fine-tune the Resource commitments using updated Load forecasts and updated Outage information.

(6) The RUC Study Period for DRUC is the next Operating Day. The RUC Study Period for HRUC is the balance of the current Operating Day plus the next Operating Day if the DRUC for the Operating Day has been solved.

(7) HRUC may decommit Resources only to maintain the reliability of the ERCOT System.

(8) For each RUC Study Period, the RUC considers capacity requirements for each hour of the RUC Study Period with the objective of minimizing costs based on logic described in Section 5.5.2, Reliability Unit Commitment (RUC) Process.

(9) The calculated Resource commitments arising from each RUC process, and a list of Off-Line Available Resources having a start-up time of one hour or less, must be reviewed by ERCOT before issuing Dispatch Instructions to QSEs to commit, extend, or decommit Resources.

(10) The Security Sequence is a set of prerequisite processes for RUC that describes the key system components and inputs that are required to support the RUC process, the RUC process itself, and the ERCOT review of the Resource commitment recommendations made by the RUC process.

(11) After the use of market processes to the fullest extent practicable without jeopardizing the reliability of the ERCOT System, any ERCOT Dispatch Instructions for additional capacity that order a QSE to commit a specific Generation Resource to be On-Line shall be considered a RUC Dispatch for the purpose of the Settlement of payments and charges related to the committed Generation Resource. An Operating Condition Notice (OCN), Advisory, Watch, or Emergency Notice requesting the available capacity of any currently available Generation Resources but not naming specific Generation Resources is not considered a RUC Dispatch for purposes of Settlement.

(12) ERCOT shall post on the Market Information System (MIS) Certified Area, for each Off-Line Generation Resource that may be selected by an HRUC process, the current time since the Generation Resource last went Off-Line (in hours) and the corresponding start-up times ERCOT is using for each such Off-Line Generation Resource. The time since the Generation Resource last went Off-Line and start-up times shall be updated at least hourly.

(13) Prior to 1330 in the Day-Ahead, ERCOT may issue a Weekly Reliability Unit Commitment (WRUC) Verbal Dispatch Instruction (VDI) to inform a QSE that a Resource is required to be On-Line for all or part of a future Operating Day. Following the receipt of a WRUC:

(a) The QSE may self-commit the Resource for the WRUC-instructed hours by updating the Resource’s Current Operating Plan (COP) to reflect the appropriate On-Line Resource Status for the WRUC-instructed hours prior to the DRUC process execution for the associated Operating Day. Resources that have been self-committed by a QSE in accordance with a WRUC:

(i) May have a Three-Part Supply Offer submitted into the DAM, and any of the WRUC-instructed hours in which the Three-Part Supply Offer is awarded in the DAM become DAM-Committed Intervals for the Resource and are settled accordingly; and

(ii) Will not be issued a RUC commitment for the WRUC-instructed hours that were self-committed or DAM-committed.

(b) ERCOT will commit the Resource as part of the DRUC process for the relevant Operating Day for all WRUC-instructed hours not DAM-committed or QSE self-committed. For all purposes, including RUC Settlement, the Resource will be considered as committed by the DRUC for these hours.

(14) If ERCOT issues an Outage Schedule Adjustment (OSA) pursuant to Section 3.1.4.6, Outage Coordination of Potential Transmission Emergency Conditions, or Section 3.1.6.9, Withdrawal of Approval or Acceptance and Rescheduling of Approved or Accepted Planned Outages of Resource Facilities, QSEs with Resources that received an OSA shall be made whole to their actual costs incurred due to delaying or canceling and rescheduling the Outage as described in Section 5.6.5.1, Make-Whole Payment for Canceled or Delayed Outages for OSAs.

**5.2.2.1 RUC Process Timeline After a Delay of the Day-Ahead Market**

(1) If the Day-Ahead Market (DAM) execution is delayed in accordance with Section 4.1.2, Day-Ahead Process and Timing Deviations, ERCOT shall conduct a Day-Ahead Reliability Unit Commitment (DRUC) after 1430 in the Day-Ahead and no earlier than one hour following the posting of DAM awards information on the Market Information System (MIS) Public Area as set forth in Section 4.5.3, Communicating DAM Results. In this event, ERCOT will use the RUC Snapshot taken just prior to the execution of the DRUC to settle RUC charges.

**5.2.2.2 RUC Process Timeline After an Aborted Day-Ahead Market**

(1) If ERCOT aborts all or part of the Day-Ahead process in accordance with Section 4.1.2, Day-Ahead Process and Timing Deviations, for any reason not due to a Market Suspension, then ERCOT shall use the Hourly Reliability Unit Commitment (HRUC) process described in this Section in lieu of the DRUC process. If ERCOT aborts the Day-Ahead process due to a Market Suspension, it shall act in accordance with Section 25.3, Market Restart Processes.

**5.3 ERCOT Security Sequence Responsibilities**

(1) ERCOT shall start the Day-Ahead Reliability Unit Commitment (DRUC) process at 1430 in the Day-Ahead.

(2) For each DRUC, ERCOT shall use a snapshot of Resource commitments taken at 1430 in the Day-Ahead for Reliability Unit Commitment (RUC) Settlement. For each Hourly Reliability Unit Commitment (HRUC), ERCOT shall use a snapshot of Resource commitments from each Qualified Scheduling Entity’s (QSE’s) most recently submitted Current Operating Plan (COP) before HRUC execution for RUC Settlement.

(3) For each RUC process, ERCOT shall:

(a) Execute the Security Sequence described in Section 5.5, Security Sequence, Including RUC, including:

(i) Validating Three-Part Supply Offers, defined in Section 4.4.9.1, Three-Part Supply Offers, and Ancillary Service Offers, defined in Section 4.4.7.2, Ancillary Service Offers;

(ii) Reviewing the Resource commitment recommendations made by the RUC algorithm; and

(iii) Reviewing the list of Off-Line Available Resources having a start-up time of one hour or less;

(b) Post to the Market Information System (MIS) Secure Area all Resources that were committed or decommitted by the RUC process including verbal RUC commitments and decommitments and Weekly Reliability Unit Commitment (WRUC) instructions;

(c) Post to the MIS Public Area, all active and binding transmission constraints (contingency and overloaded element pair information where available) used as inputs to the RUC; and

(d) Issue Dispatch Instructions to notify each QSE of its Resource commitments or decommitments.

(e) Post to the MIS Secure Area all Resources that were committed by the RUC process, including verbal RUC commitments, but were subsequently cancelled by the ERCOT Operator.

(4) ERCOT shall provide each QSE with the information necessary to pre-validate their data for DRUC and HRUC, including publishing validation rules for offers, bids, and trades.

**5.4 QSE Security Sequence Responsibilities**

(1) During the Security Sequence, each Qualified Scheduling Entity (QSE) must:

(a) Submit its Current Operating Plan (COP) and update its COP as required in Section 3.9, Current Operating Plan (COP);

(b) Submit any Three-Part Supply Offers and Ancillary Service Offers before:

(i) 1000 in the Day-Ahead for the Day-Ahead Market (DAM) and Day-Ahead Reliability Unit Commitment (DRUC) being run in that Day-Ahead, if the QSE wants the offer to be used in those DAM and DRUC processes; and

(ii) The end of the Adjustment Period for each Hourly Reliability Unit Commitment (HRUC), if the QSE wants the offer to be used in the HRUC process;

(c) Submit any Capacity Trades before 1430 in the Day-Ahead for the DRUC and before the end of the Adjustment Period for each HRUC, if the QSE wants those Capacity Trades included in the calculation of Reliability Unit Commitment (RUC) Settlement;

(d) Submit any Energy Trades, Ancillary Service Trades, and Direct Current Tie (DC Tie) Schedules corresponding to Electronic Tags (e-Tags) before 1430 in the Day-Ahead for the DRUC and by the end of the Adjustment Period for each HRUC; if the QSE wants those Energy Trades and DC Tie Schedules included in the calculation of RUC Settlement;

(e) Submit an updated COP before 1430 in the Day-Ahead; and

(f) Acknowledge receipt of Resource commitment or decommitment Dispatch Instructions by submitting an updated COP.

***5.4.1 Ancillary Service Positions***

(1) A QSE’s Ancillary Service Position is the net amount of Ancillary Service capacity to which the QSE has financially committed in the ERCOT market, by hour and service type, from self-arrangement, trades, and awards. The Ancillary Service Position is the difference in MW, by hour and service type, between the amounts specified in items (a) and (b) defined as follows:

(a) The sum of:

(i) The QSE’s Self-Arranged Ancillary Service Quantity; plus

(ii) The total (in MW) of Ancillary Service Trades for which the QSE is the seller; plus

(iii) Awards to the QSE of Ancillary Service Offers in the DAM; and

(b) The sum of:

(i) The total Ancillary Service Trades for which the QSE is the buyer.

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

(1) The RUC process recommends commitment of Generation Resources, to match ERCOT’s forecasted Load including Direct Current Tie (DC Tie) Schedules and RUC Ancillary Service Demand Curves (ASDCs), subject to all transmission constraints and Resource performance characteristics. The RUC process takes into account Resources already committed in the Current Operating Plans (COPs), Resources already committed in previous RUCs, and Off-Line Available Resources having a start-up time of one hour or less. The formulation of the RUC objective function must employ penalty factors on violations of security constraints. The objective of the RUC process is to minimize costs based on the Resource costs described in paragraphs (9) through (13) below.

(2) ERCOT shall create an Ancillary Service Demand Curve (ASDC) for each Ancillary Service for use in RUC. ERCOT shall post the ASDCs to the ERCOT website as soon as practicable after any change to the ASDCs.

(3) For all hours of the RUC Study Period within the RUC process, Quick Start Generation Resources (QSGRs) with a COP Resource Status of OFFQS shall be considered as On-Line with Low Sustained Limit (LSL) at zero MW. QSGRs with a Resource Status of OFFQS shall only be committed by ERCOT through a RUC instruction in instances when a reliability issue would not otherwise be managed through Dispatch Instructions from Security-Constrained Economic Dispatch (SCED).

(4) In addition to On-Line qualified Resources, the RUC engine shall consider a COP Resource status of OFFQS for QSGRs that are qualified for ERCOT Contingency Reserve Service (ECRS), as being eligible to provide ECRS constrained by the Ancillary Service capability in the COP.(5) In addition to On-Line qualified Resources, the RUC engine shall consider a COP Resource Status of OFFQS for QSGRs that are qualified for Non-Spinning Reserve (Non-Spin), as being eligible to provide Non-Spin constrained by the Ancillary Service Capability in the COP. The RUC engine shall also consider a COP Resource Status of OFF (Off-Line but available for commitment in the DAM and RUC) for a Resource that is qualified for Non-Spin, as being eligible to provide Non-Spin constrained by the Ancillary Service capability in the COP.

(6) The RUC process can recommend Resource decommitment. ERCOT may only decommit a Resource to resolve transmission constraints that are otherwise unresolvable. Qualifying Facilities (QFs) may be decommitted only after all other types of Resources have been assessed for decommitment. In addition, the HRUC process provides decision support to ERCOT regarding a Resource decommitment requested by a Qualified Scheduling Entity (QSE).

(7) ERCOT shall review the RUC-recommended Resource commitments and the list of Off-Line Available Resources having a start-up time of one hour or less to assess feasibility and shall make any changes that it considers necessary, in its sole discretion. During the RUC process, ERCOT may also review and commit, through a RUC instruction, Combined Cycle Generation Resources that are currently planned to be On-Line but are capable of transitioning to a configuration with additional capacity. ERCOT may deselect Resources recommended in DRUC and in all HRUC processes if in ERCOT’s sole discretion there is enough time to commit those Resources in the future HRUC processes, taking into account the Resources’ start-up times, to meet ERCOT System reliability. After each RUC run, ERCOT shall post the amount of capacity deselected per hour in the RUC Study Period to the MIS Secure Area. A Generation Resource shown as On-Line and available for SCED dispatch for an hour in its COP prior to a DRUC or HRUC process execution, according to Section 5.3, ERCOT Security Sequence Responsibilities, will be considered self-committed for that hour. For purpose of Settlement, snapshot data will be used as specified in paragraph (2) of Section 5.3.

(8) ERCOT shall issue RUC instructions to each QSE specifying its Resources that have been committed as a result of the RUC process. ERCOT shall, within one day after making any changes to the RUC-recommended commitments, post to the MIS Secure Area any changes that ERCOT made to the RUC-recommended commitments with an explanation of the changes.

(9) ERCOT shall use the RUC process to evaluate the need to commit Resources for which a QSE has submitted Three-Part Supply Offers and other available Off-Line Resources in addition to Resources that are planned to be On-Line during the RUC Study Period. All of the above commitment information must be as specified in the QSE’s COP. For available Off-Line Resources with a cold start time of one hour or less that have not been removed from special consideration under paragraph (13) 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) 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.

(12) 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.

(13) For all available Off-Line Resources having a cold start time of one hour or less and not removed from special consideration pursuant to paragraph (4) of Section 8.1.2, ERCOT shall scale any approved verifiable Startup Cost and verifiable minimum-energy cost or if verifiable costs have not been approved, the applicable Resource Category Generic Startup Offer Cost and the applicable Resource Category Generic Minimum-Energy Offer Cost as specified in Section 4.4.9.2.3 for use in the RUC process.

The above parameter is defined as follows:

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Current Value\*** |
| 1HRLESSCOSTSCALING | Percentage | Maximum value of 20% |
| \* 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. |

(14) Factors included in the RUC process are:

(a) ERCOT System-wide hourly Load forecast allocated appropriately over Load buses;

(b) ERCOT’s Ancillary Service Plans in the form of ASDCs;

(c) Transmission constraints – Transfer limits on energy flows through the electricity network;

(i) Thermal constraints – protect transmission facilities against thermal overload;

(ii) Generic constraints – protect the transmission system against transient instability, dynamic instability or voltage collapse;

(d) Planned transmission topology;

(e) Energy sufficiency constraints;

(f) Inputs from the COP, as appropriate;

(g) Inputs from Resource Parameters, including a list of Off-Line Available Resources having a start-up time of one hour or less, as appropriate;

(h) Each Generation Resource’s Minimum-Energy Offer and Startup Offer, from its Three-Part Supply Offer;

(i) Any Generation Resource that is Off-Line and available but does not have a Three-Part Supply Offer;

(j) Forced Outage information; and

(k) Inputs from the eight-day look ahead planning tool, which may potentially keep a unit On-Line (or start a unit for the next day) so that a unit minimum duration between starts does not limit the availability of the unit (for security reasons).

(15) 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.

(16) 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.

(17) 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 (16) 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.

(18) 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.

(19) 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 and Section 6.5.7.3.1, Determination of Real-Time Reliability Deployment Price Adders.

***5.6.2 RUC Startup Cost Eligibility***

(1) For purposes of this Section 5.6.2, all contiguous RUC-Committed Hours are considered as one RUC instruction. For each Resource, only one Startup Cost is eligible per block of contiguous RUC-Committed Hours.

(2) For a Resource’s Startup Costs in the Operating Day, per RUC instruction, to be included in the calculation of the RUC guarantee for that Operating Day, all the criteria below must be met:

(a) According to the RUC Snapshot for the RUC process that committed the Resource, the Resource must not be QSE-committed in the Settlement Interval immediately before the designated start hour or after the last hour of the RUC instruction;

(b) A later RUC instruction or QSE commitment must not connect the designated start hour or last hour of the RUC instruction to a block of QSE-committed Intervals that was QSE-committed before the RUC instruction was given, according to the RUC Snapshot for the RUC process that committed the Resource;

(c) The generation breakers must have been open, as indicated by a telemetered Resource Status of Off-Line, for at least five minutes during the six hours preceding the first RUC-Committed Hour; and

(d) The generation breakers must have been closed, as indicated by a telemetered Resource Status of On-Line, for at least one minute during the RUC commitment period or after the determined five-minute open breaker, as indicated by a telemetered Resource Status of Off-Line, in the six hours preceding the first RUC-Committed Hour.

(3) Notwithstanding paragraphs (2)(c) and (2)(d) above, the QSE of a RUC-committed Resource may submit a Settlement dispute for a Resource’s Startup Costs in the Operating Day, per RUC instruction, to be included in the calculation of the RUC guarantee for that Operating Day if the startup time for the RUC-committed Resource is greater than six hours. The dispute is subject to verification and approval by ERCOT based on the criteria below:

(a) The generation breakers must have been open, as indicated by a telemetered Resource Status of Off-Line, for at least five minutes between the time the QSE is notified of the RUC instruction and the first RUC-Committed Hour;

(b) The generation breakers must have been closed, as indicated by a telemetered Resource Status of On-Line, for at least one minute during the RUC commitment period or after the five-minute open breaker determined in item (a) above;

(c) The breaker open-close sequence from items (a) and (b) above does not make the Resource eligible for Startup Cost compensation in the Day-Ahead Market (DAM) or for any other contiguous block of RUC-Committed Hours; and

(d) The startup time used to process the dispute will be the startup time considered by the ERCOT Operator at the time the RUC instruction was issued.

(4) For purposes of this Section 5.6.2, the telemetered Resource Status of OFFQS shall be considered as Off-Line.

(5) A Resource that has a Three-Part Supply Offer cleared in the DAM and subsequently receives a RUC commitment for the Operating Hour for which it was awarded will be settled in accordance with Section 4.6.2.3, Day-Ahead Make-Whole Settlements.

**5.7.1.3 Revenue Less Cost Above LSL During RUC-Committed Hours**

(1) The total revenue for a Resource operating above its LSL less the cost based on the Resource’s Energy Offer Curve capped by the Energy Offer Curve Cap (as described in Sections 4.4.9.3, Energy Offer Curve, and 4.4.9.3.3, Energy Offer Curve Caps for Make-Whole Calculation Purposes) or proxy Energy Offer Curve described in Section 6.5.7.3, Security Constrained Economic Dispatch, as applicable, during all RUC-Committed Hours of the Operating Day is Revenue Less Cost Above LSL During RUC-Committed Hours.

|  |
| --- |
| ***[NPRR971: Replace paragraph (1) above with the following upon system implementation:]***(1) The total revenue for a Resource operating above its LSL less the cost based on the Energy Offer Curve Cost Cap (as described in Section 4.4.9.3.3, Energy Offer Curve Cost Caps) during all RUC-Committed Hours of the Operating Day is Revenue Less Cost Above LSL During RUC-Committed Hours. |

(2) The LSL and RTAIEC used to calculate Revenue Less Cost Above LSL During RUC-Committed Hours for a Combined Cycle Train are the LSL and RTAIEC that correspond to the Combined Cycle Generation Resource, within the Combined Cycle Train, that is RUC-committed for the hour.

|  |
| --- |
| ***[NPRR971: Replace paragraph (2) above with the following upon system implementation:]***(2) The LSL used to calculate Revenue Less Cost Above LSL During RUC-Committed Hours for a Combined Cycle Train is the LSL that corresponds to the Combined Cycle Generation Resource, within the Combined Cycle Train, that is RUC-committed for the hour. |

(3) For each RUC-committed Resource, Revenue Less Cost Above LSL During RUC-Committed Hours is calculated as follows:

RUCEXRR *q, r, d* = Max {0, [RUCEXRR96 *q, r, i*]}

Where,

RUCEXRR96*q, r, i* = RTSPP *p, i* \* Max (0, RTMG *q, r, i* – (LSL *q, r, i* \* (¼)))

 + RTASREV *q, r, i*

 + (-1) \* (VSSVARAMT *q, r, i* + VSSEAMT *q, r, i*)

 + (-1) \* EMREAMT *q, r, i*

 – RTAIEC *q, r, i* \* Max (0, RTMG *q, r, i* – (LSL *q, r, i* \* (¼)))]}

|  |
| --- |
| ***[NPRR971: Replace the formula “RUCEXRR96******q, r, i” above with the following upon system implementation:]***RUCEXRR96*q, r, i* = RTSPP *p, i* \* Max (0, RTMG *q, r, i* – (LSL *q, r, i* \* (¼)))  + RTASREV *q, r, i*  + (-1) \* (VSSVARAMT *q, r, i* + VSSEAMT *q, r, i*) + (-1) \* EMREAMT *q, r, i*  – RTEOCOST *q, r, i* \* Max (0, RTMG *q, r, i* – (LSL *q, r, i* \* (¼))) |

Where,

RTASREV *q, r, i =* RTRUREV *q, r, i +* RTRDREV *q, r, i +* RTRRREV *q, r, i +* RTECRREV *q, r, i +* RTNSREV *q, r, i*

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| RUCEXRR *q, r, d* | $ | *Revenue Less Cost Above LSL During RUC-Committed Hours*—The sum of the total revenue for Resource *r* represented by QSE *q* operating above its LSL less the cost during all RUC-Committed Hours, for the Operating Day *d*. When one or more Combined Cycle Generation Resources are committed by RUC, revenue less cost above LSL is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCEXRR96 *q, r, i* | $ | *Revenue Less Cost Above LSL During RUC-Committed Hours by interval*—The total revenue for Resource *r* represented by QSE *q* operating above its LSL less the cost during all RUC-Committed hours, for the Settlement Interval *i*. When one or more Combined Cycle Generation Resources are committed by RUC, revenue less cost above LSL is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price*—The Real-Time Settlement Point Price at the Resource’s Resource Node Settlement Point *p* for the Settlement Interval *i*. |
| RTAIEC *q, r, i* | $/MWh | *Real-Time Average Incremental Energy Cost*⎯The average incremental energy cost for Resource *r* represented by QSE *q*, calculated using the Energy Offer Curve capped by the Energy Offer Curve Cap, for the Resource’s generation above the LSL for the Settlement Interval *i.*  SeeSection 4.6.5, Calculation of “Average Incremental Energy Cost” (AIEC). Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
|

|  |  |  |  |
| --- | --- | --- | --- |
| ***[NPRR971: Replace the variable “RTAIEC q, r, i” above with the following upon system implementation:]***

|  |  |  |
| --- | --- | --- |
| RTEOCOST *q, r, i* | $/MWh | *Real-Time Energy Offer Curve Cost Cap*⎯The Energy Offer Curve Cost Cap for Resource *r* represented by QSE *q*, for the Resource’s generation above the LSL for the Settlement Interval *i.*  SeeSection 4.4.9.3.3, Energy Offer Curve Cost Caps. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |

 |

 |
| RTMG *q, r, i* | MWh | *Real-Time Metered Generation*—The metered generation of Resource *r* represented by QSE *q* for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| LSL *q, r, i* | MW | *Low Sustained Limit*—The LSL of Generation Resource *r* represented by QSE *q* for the hour that includes the Settlement Interval *i*, as submitted in the COP. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.  |
| RTASREV *q, r, i* | $ | *Real-Time Ancillary Service Revenue* — The total Real-Time Ancillary Service revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRUREV *q, r, i* | $ | *Real-Time Reg-Up Revenue* — The Real-Time Reg-Up revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.7.5. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRDREV *q, r, i* | $ | *Real-Time Reg-Down Revenue* — The Real-Time Reg-Down revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.7.5. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRRREV *q, r, i* | $ | *Real-Time Responsive Reserve Revenue* — The Real-Time RRS revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.7.5. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTNSREV *q, r, i* | $ | *Real-Time Non-Spin Revenue* — The Real-Time Non-Spin revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.7.5. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTECRREV *q, r, i* | $ | *Real-Time ERCOT Contingency Reserve Service Revenue* — The Real-Time ECRS revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.7.5. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| VSSVARAMT *q, r, i* | $ | *Voltage Support Service VAr Amount*—The payment to the QSE *q* for the Voltage Support Service (VSS) provided by Generation Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.6.7.1, Voltage Support Service Payments. Payment for VSS is made to the Combined Cycle Train. |
| VSSEAMT *q, r, i* | $ | *Voltage Support Service Energy Amount*—The lost opportunity payment to the QSE *q* for ERCOT-directed VSS from the Generation Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.6.7.1. Payment for emergency energy is made to the Combined Cycle Train. |
| EMREAMT *q, r, i* | $ | *Emergency Energy Amount*—The payment to the QSE *q* as additional compensation for the additional energy or Ancillary Services produced by the Generation Resource *r* in Real-Time during the Emergency Condition, for the 15-minute Settlement Interval *i*. See Section 6.6.9.1, Payment for Emergency Power Increase Directed by ERCOT. Payment for emergency energy is made to the Combined Cycle Train. |
| *q* | none | A QSE. |
| *r* | none | A RUC-committed Generation Resource. |
| *d* | none | An Operating Day containing the RUC-commitment. |
| *p* | none | A Resource Node Settlement Point. |
| *i* | none | A 15-minute Settlement Interval within the hour that includes a RUC instruction. |

**5.7.1.4 Revenue Less Cost During QSE Clawback Intervals**

(1) The total revenue for a Resource less the cost based on the Resource’s Energy Offer Curve capped by the Energy Offer Curve Cap (as described in Sections 4.4.9.3, Energy Offer Curve, and 4.4.9.3.3, Energy Offer Curve Caps for Make-Whole Calculation Purposes) or proxy Energy Offer Curve described in Section 6.5.7.3, Security Constrained Economic Dispatch, as applicable, during all QSE Clawback Intervals of the Operating Day is Revenue Less Cost During QSE-Clawback Intervals.

|  |
| --- |
| ***[NPRR971: Replace paragraph (1) above with the following upon system implementation:]***(1) The total revenue for a Resource less the cost based on the Energy Offer Curve Cost Cap as described in Section 4.4.9.3.3, Energy Offer Curve Cost Caps, during all QSE Clawback Intervals of the Operating Day is Revenue Less Cost During QSE-Clawback Intervals. |

(2) The MEPR, LSL, and RTAIEC used to calculate Revenue Less Cost During QSE Clawback Intervals for a Combined Cycle Train is the MEPR, LSL, and RTAIEC that corresponds to the Combined Cycle Generation Resource, within a Combined Cycle Train, that operates in Real-Time for the QSE Clawback Interval.

|  |
| --- |
| ***[NPRR971: Replace paragraph (2) above with the following upon system implementation:]***(2) The MEPR and LSL used to calculate Revenue Less Cost During QSE Clawback Intervals for a Combined Cycle Train is the MEPR and LSL that corresponds to the Combined Cycle Generation Resource, within a Combined Cycle Train, that operates in Real-Time for the QSE Clawback Interval. |

(3) For each QSE Clawback Interval, Revenue Less Cost During QSE Clawback Intervals is calculated as follows:

**RUCEXRQC *q, r, d* = Max {0, [(RTSPP *p, i* \* RTMG *q, r, i*)**

 **+ RTASREV*q, r, i***

 **+ (-1) \* (VSSVARAMT *q, r, i* + VSSEAMT *q, r, i*)**

 **+ (-1) \* EMREAMT *q, r, i***

 **– [MEPR *q, r, i* \* Min (RTMG *q, r, i*, (LSL *q, r, i* \* (¼)))]**

 **– [**RTAIEC ***q, r, i* \* Max (0, RTMG *q, r, i* – (LSL *q, r, i* \* (¼)))]]}**

|  |
| --- |
| ***[NPRR971: Replace the formula “RUCEXRQC q, r, d” above with the following upon system implementation:]***RUCEXRQC *q, r, d* = Max {0, [(RTSPP *p, i* \* RTMG *q, r, i*) **+ RTASREV*q, r, i*** + (-1) \* (VSSVARAMT *q, r, i* + VSSEAMT *q, r, i*) + (-1) \* EMREAMT *q, r, i* – [MEPR *q, r, i* \* Min (RTMG *q, r, i*, (LSL *q, r, i* \* (¼)))]  – [RTEOCOST *q, r, i* \* Max (0, RTMG *q, r, i* – (LSL *q, r, i* \* (¼)))]]}  |

If the QSE submitted a validated Three-Part Supply Offer for the Resource,

 Then, MEPR *q, r, i* = Min (MEO *q, r, i*, MECAP *q, r, i*)

 Otherwise, MEPR *q, r, i* = MECAP *q, r, i*

If ERCOT has approved verifiable minimum-energy costs for the Resource,

 Then, MECAP *q, r, i* = verifiable minimum-energy costs *q, r, i*

 Otherwise, MECAP *q, r, i* = RCGMEC *i*

Where,

RTASREV *q, r, i =* RTRUREV *q, r, i +* RTRDREV *q, r, i +* RTRRREV *q, r, i +* RTECRREV *q, r, i +* RTNSREV *q, r, i*

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| RUCEXRQC *q, r, d* | $ | *Revenue Less Cost During QSE-Clawback Intervals*—The sum of the total revenue for Resource *r* less the cost during all QSE-Clawback Intervals for the Operating Day. When one or more Combined Cycle Generation Resources are committed by RUC, Revenue Less Cost During QSE-Clawback Intervals is calculated for the Combined Cycle Train for all Combined Cycle Generation Resources earning revenue in QSE-Clawback Intervals. |
| RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price*—The Real-Time Settlement Point Price at the Resource’s Settlement Point for the Settlement Interval *i*. |
| MEPR *q, r, i* | $/MWh | *Minimum-Energy Price*—The Settlement price for Resource *r* for minimum energy for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MEO *q, r, i* | $/MWh | *Minimum-Energy Offer*—Represents an offer for the costs incurred by Resource *r* in producing energy at the Resource’s LSL for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MECAP *q, r, i* | $/MWh | *Minimum-Energy Cap*—The amount used for Resource *r* for minimum-energy costs. The minimum cost is the Resource Category Minimum-Energy Generic Cap (RCGMEC) unless ERCOT has approved verifiable unit-specific minimum energy costs for that Resource, in which case the Minimum-Energy Cap is the verifiable unit-specific minimum energy cost. See Section 5.6.1, Verifiable Costs, for more information on verifiable costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RCGMEC *i*  | $/MWh | *Resource Category Generic Minimum-Energy Cost*—The Resource Category Generic Minimum-Energy Cost cap for the category of the Resource, according to Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, for the Operating Day. |
| RTAIEC *q, r, i* | $/MWh | *Real-Time Average Incremental Energy Cost* - The average incremental energy cost for Resource *r*, calculated using the Energy Offer Curve capped by the Energy Offer Curve Cap, for the Resource’s generation above the LSL for the Settlement Interval *i*. See Section 4.6.5, Calculation of “Average Incremental Energy Cost” (AIEC). Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
|

|  |  |  |  |
| --- | --- | --- | --- |
| ***[NPRR971: Replace the variable “RTAIEC q, r, i” above with the following upon system implementation:]***

|  |  |  |
| --- | --- | --- |
| RTEOCOST *q, r, i* | $/MWh | *Real-Time Energy Offer Curve Cost Cap*⎯The Energy Offer Curve Cost Cap for Resource *r* represented by QSE *q*, for the Resource’s generation above the LSL for the Settlement Interval *i.*  SeeSection 4.4.9.3.3, Energy Offer Curve Cost Caps. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |

 |

 |
| RTMG *q, r, i* | MWh | *Real-Time Metered Generation*—The Resource *r*’s metered generation for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| LSL *q, r, i* | MW | *Low Sustained Limit*—The LSL of Generation Resource *r* represented by QSE *q* for the hour that includes the Settlement Interval *i*, as submitted in the COP. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTASREV *q, r, i* | $ | *Real-Time Ancillary Service Revenue* — The total Real-Time Ancillary Service revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRUREV *q, r, i* | $ | *Real-Time Reg-Up Revenue* — The Real-Time Reg-Up revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.7.5, Real-Time Ancillary Service Imbalance Payment or Charge. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRDREV *q, r, i* | $ | *Real-Time Reg-Down Revenue* — The Real-Time Reg-Down revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.7.5. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRRREV *q, r, i* | $ | *Real-Time Responsive Reserve Revenue* — The Real-Time RRS revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.7.5. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTNSREV *q, r, i* | $ | *Real-Time Non-Spin Revenue* — The Real-Time Non-Spin revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.7.5. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTECRREV *q, r, i* | $ | *Real-Time ERCOT Contingency Reserve Service Revenue* — The Real-Time ECRS revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.7.5. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| VSSVARAMT *q, r, i* | $ | *Voltage Support Service VAr Amount*—The payment to the QSE for the VSS provided by Generation Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.6.7.1, Voltage Support Service Payments. Payment for VSS is made to the Combined Cycle Train. |
| VSSEAMT *q, r, i* | $ | *Voltage Support Service Energy Amount*—The lost opportunity payment to the QSE for ERCOT-directed VSS from the Generation Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.6.7.1. Payment for VSS is made to the Combined Cycle Train.  |
| EMREAMT *q, r, i* | $ | *Emergency Energy Amount*—The payment to the QSE as additional compensation for the additional energy or Ancillary Services produced by the Generation Resource *r* in Real-Time during the Emergency Condition, for the 15-minute Settlement Interval *i*. See Section 6.6.9.1, Payment for Emergency Power Increase Directed by ERCOT. Payment for emergency energy is made to the Combined Cycle Train.  |
| *q* | none | A QSE. |
| *r* | none | A RUC-committed Generation Resource. |
| *d* | none | An Operating Day containing the RUC-commitment. |
| *p* | none | A Resource Node Settlement Point. |
| *i* | none | A 15-minute Settlement Interval within the hour that is identified as a QSE-Clawback Interval. |

5.7.4.1.1 Capacity Shortfall Ratio Share

(1) In calculating the shortfall amount for each QSE, the Resource capacity (RCAP) is calculated for a Generation Resource that meets any of the following conditions:

(a) QSE-committed;

(b) Planning to operate as a Quick Start Generation Resource (QSGR) for the Settlement Interval as shown by the COP Status of OFFQS in the RUC Snapshot for the RUC Process and/or Adjustment Period; or

(c) A Switchable Generation Resource (SWGR) that is released by a non-ERCOT Control Area Operator (CAO) to operate in the ERCOT Control Area due to an ERCOT RUC instruction for an actual or anticipated EEA condition and that is shown as On-Line in its COP; or

(d) If the Settlement Interval is a RUCAC-Interval, the Combined Cycle Generation Resource that was QSE-committed at the time the RUCAC was issued, excluding the condition for SWGRs as describe in paragraph (c) above.

(2) In calculating the amount short for each QSE, the Wind-powered Generation Resource Production Potential (WGRPP), as described in Section 4.2.2, Wind-Powered Generation Resource Production Potential, for a Wind-powered Generation Resource (WGR), or the PhotoVoltaic Generation Resource Production Potential (PVGRPP), as described in Section 4.2.3, PhotoVoltaic Generation Resource Production Potential, for a PhotoVoltaic Generation Resource (PVGR), at the time of RUC execution, shall be considered the available capacity of the WGR or PVGR when determining responsibility for the corresponding RUC charges, regardless of the Real-Time output of the WGR or PVGR. Therefore, the RCAPSNAP variable used below shall be equal to the WGRPP and PVGRPP described above.

(3) In calculating the amount short for each QSE, the QSE must be given a capacity credit for non-Intermittent Renewable Resources (IRRs) that were given notice of decommitment within the two hours before the Operating Hour as a result of the RUC process by setting the RCAPSNAP and RCAPADJ variables used below equal to the RCAPSNAP value for the Resource immediately before the decommitment instruction was given.

(4) In calculating the short amount for each QSE, if the RCAPSNAP for a non-Intermittent Renewable Resource (IRR) was credited to the QSE during the RUC Snapshot but the Resource experiences a Forced Outage within two hours before the start of the Settlement Interval, then the RCAPSNAP for that Resource is also credited to the QSE in the RCAPADJ.

(5) In calculating the short amount for each QSE, if the DCIMPSNAP was credited to the QSE during the RUC Snapshot but the entire Direct Current Tie (DC Tie) experiences a Forced Outage within two hours before the start of the Settlement Interval, then the DCIMPSNAP is also credited to the QSE in the DCIMPADJ.

(6) For Combined Cycle Generation Resources, if more than one Combined Cycle Generation Resource is shown On-Line in its COP for the same Settlement hour, then the provisions of paragraph (6)(a) of Section 3.9.1, Current Operating Plan (COP) Criteria, apply in the determination of the On-Line Combined Cycle Generation Resource for that Settlement hour.

(7) The capacity shortfall ratio share of a specific QSE for a particular RUC process is calculated, for a 15-minute Settlement Interval, as follows:

RUCSFRS *ruc, i, q* = RUCSF *ruc, i, q* / RUCSFTOT *ruc, i*

Where:

RUCSFTOT *ruc, i* = RUCSF *ruc, i, q*

(8) The RUC Shortfall in MW for one QSE for one 15-minute Settlement Interval is:

RUCSF *ruc, i, q* = Max (0, Max (RUCSFSNAP *ruc, q, i*, RUCSFADJ *ruc, q, i*) – RUCCAPCREDIT *q, i, z*)

(9) The RUC Shortfall in MW for one QSE for one 15-minute Settlement Interval, as measured at the RUC Snapshot, is:

RUCSFSNAP *ruc, q, i* = Max (RUCOSFSNAP *ruc, q, i* , RUCASFSNAP *ruc, q, i*)

(10) The overall shortfall in MW that a QSE had according to the RUC Snapshot for a 15-minute Settlement Interval is:

**RUCOSFSNAP *ruc, q, i* = Max (0, ((RTAML *q, p, i* \* 4) +  RTDCEXP *q, p, i* + ASONPOSSNAP *ruc, q, i* – RUCCAPSNAP *ruc, q, i*))**

The QSE’s On-Line Ancillary Service Position according to the RUC Snapshot for a 15 minute Settlement Interval is:

ASONPOSSNAP ***ruc, q, i***= RUPOSSNAP *ruc, q, h* + RRPOSSNAP *ruc, q, h* + Max (0, (ECRPOSSNAP *ruc, q, h* + NSPOSSNAP *ruc, q, h* – ASOFFOFRSNAP *ruc, q, r, h*))

 The amount of capacity that a QSE had according to the RUC Snapshot for a 15-minute Settlement Interval is:

RUCCAPSNAP *ruc, q, i* =RCAPSNAP *ruc, q, r, h* + (RUCCPSNAP *ruc, q, h* – RUCCSSNAP *ruc, q, h*) + (DAEP *q, p, h* –DAES *q, p, h*) + (RTQQEPSNAP *ruc, q, p, i* – RTQQESSNAP *ruc, q, p, i*) +  DCIMPSNAP *ruc, q, p, i* + ASOFRLRSNAP *ruc, q, r, h* (11) The Ancillary Service shortfall calculation compares the Ancillary Service capability of the QSE, measured by the submitted Ancillary Service Offers, to the Ancillary Service Position. Because the same Resource capacity can be represented in Ancillary Offers for multiple products, the aggregated capability is accounted for by grouping Ancillary Service types in the calculation below. The Ancillary Service shortfall in MW that a QSE had according to the RUC Snapshot for a 15-minute Settlement Interval is:

**RUCASFSNAP *ruc, q, i* = Max (0, ASCAP1SNAP *ruc, q, i* , ASCAP2SNAP *ruc, q, i*, ASCAP3SNAP *ruc, q, i* , ASCAP4SNAP *ruc, q, i*, ASCAP5SNAP *ruc, q, i*) + Max (0, ASCAP6SNAP *ruc, q, i*)**

Where,

ASCAP1SNAP *ruc, q, i* = RUPOSSNAP *ruc, q, h* – ASOFR1SNAP *ruc, q, r, h*

ASCAP2SNAP *ruc, q, i* = RRPOSSNAP*ruc, q, h* –  ASOFR2SNAP *ruc, q, r, h*

ASCAP3SNAP *ruc, q, i* = (RUPOSSNAP *ruc, q, h* + RRPOSSNAP *ruc, q, h*) – ASOFR3SNAP *ruc, q, r, h*

ASCAP4SNAP *ruc, q, i* = (RUPOSSNAP *ruc, q, h* + RRPOSSNAP *ruc, q, h*  + ECRPOSSNAP *ruc, q, h*) – ASOFR4SNAP *ruc, q, r, h*

ASCAP5SNAP *ruc, q, i* = (RUPOSSNAP *ruc, q, h* + RRPOSSNAP *ruc, q, h*+ ECRPOSSNAP *ruc, q, h* + NSPOSSNAP *ruc, q, h*) – ASOFR5SNAP *ruc, q, r, h*

ASCAP6SNAP *ruc, q, i =* RDPOSSNAP *ruc, q, h* – ASOFR6SNAP *ruc, q, r, h*

(12) The RUC Shortfall in MW for one QSE for one 15-minute Settlement Interval, as measured at the end of the Adjustment Period,, is:

RUCSFADJ *ruc, q, i* = Max (RUCOSFADJ *ruc, q, i*, RUCASFADJ *q, i* )

(13) The overall shortfall in MW that a QSE had at the end of the Adjustment Period for a 15-minute Settlement Interval, but including capacity from IRRs as seen in the RUC Snapshot, is:

RUCOSFADJ *ruc, q, i*  = Max (0, ((RTAML *q, p, i* \*4) +  RTDCEXP *q, p, i* + ASONPOSADJ *q, i* – (RCAPSNAP *ruc, q, r, h* + RUCCAPADJ *q, i*)))

Where,

The On-Line Ancillary Service Position the QSE had at the end of the Adjustment Period for a 15-minute Settlement Interval is:

ASONPOSADJ *q ,i* = RUPOSADJ *q, h* + RRPOSADJ *q, h* + Max (0, (ECRPOSADJ *q, h* + NSPOSADJ *q,h* – ASOFFOFRADJ *q, r, h* ))

 The amount of capacity that a QSE had at the end of the Adjustment Period for a 15-minute Settlement Interval, excluding capacity from IRRs, is:

RUCCAPADJ *q, i* = RCAPADJ *q, r, h* + (RUCCPADJ *q, h* – RUCCSADJ *q, h*) + (DAEP *q, p, h* – DAES *q, p, h*) + (RTQQEPADJ *q, p, i* – RTQQESADJ *q, p, i*) +  DCIMPADJ *q, p, i*  ASOFRLRADJ *q, r, h* (14) The Ancillary Service shortfall calculation compares the Ancillary Service capability of the QSE, measured by the submitted Ancillary Service Offers, to the Ancillary Service Position. Because the same Resource capacity can be represented in Ancillary Offers for multiple products, the aggregated capability is accounted for by grouping Ancillary Service types in the calculation below. The Ancillary Service shortfall in MW that a QSE had at the end of the Adjustment Period for a 15-minute Settlement Interval is:

**RUCASFADJ *q, i* = Max (0, ASCAP1ADJ *q, i* , ASCAP2ADJ *q, i* , ASCAP3ADJ *q, i* , ASCAP4ADJ *q, i* , ASCAP5ADJ *q, i*) + Max (0, ASCAP6ADJ *q, i* )**

Where,

ASCAP1ADJ *q, i* = RUPOSADJ *q, h* –  ASOFR1ADJ *q, r, h*

ASCAP2ADJ *q, i* = RRPOSADJ *q, h* –  ASOFR2ADJ *q, r, h*

ASCAP3ADJ *q, i* = (RUPOSADJ *q, h* + RRPOSADJ *q, h* ) –  ASOFR3ADJ *q, r,h*

ASCAP4ADJ *q, i* = (RUPOSADJ *q, h* + RRPOSADJ *q, h* + ECRPOSADJ *q, h*) –  ASOFR4ADJ *q, r, h*

ASCAP5ADJ *q, i* = (RUPOSADJ *q, h* + RRPOSADJ *q, h* + ECRPOSADJ *q, h* + NSPOSADJ *q, h* ) –  ASOFR5ADJ *q, r, h*

ASCAP6ADJ *q, i* = RDPOSADJ *q, h* – ASOFR6ADJ *q, r, h*

The above variables are defined as follows:

| Variable | Unit | Definition |
| --- | --- | --- |
| RUCSFRS *ruc, i, q* | none | *RUC Shortfall Ratio Share*—The ratio of the QSE *q*’s capacity shortfall to the sum of all QSEs’ capacity shortfalls, for the RUC process *ruc*, for the 15-minute Settlement Interval *i*. |
| RUCSF *ruc, i, q* | MW | *RUC Shortfall*—The QSE *q*’s capacity shortfall for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| RUCSFTOT *ruc, i* | MW | *RUC Shortfall Total*—The sum of all QSEs’ capacity shortfalls, for a RUC process *ruc*, for a 15-minute Settlement Interval *i*. |
| RUCSFSNAP *ruc, q, i* | MW | *RUC Shortfall at Snapshot*—The QSE *q*’s capacity shortfall will be the maximum of the QSE’s overall shortfall or Ancillary Service shortfall, as calculated for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| RUCSFADJ *ruc, q, i* | MW | *RUC Shortfall at End of Adjustment Period*—The QSE *q*’s end of Adjustment Period capacity shortfall will be the maximum of the QSE’s overall shortfall or Ancillary Service shortfall, as calculated for the RUC process *ruc*, for the 15-minute Settlement Interval *i*. |
| RUCCAPCREDIT *q, i, z* | MW | *RUC Capacity Credit*—The QSE *q*’s capacity credit resulting from capacity paid through the RUC Capacity-Short Amount for RUC process *z* for the 15-minute Settlement Interval *i*. |
| RUCOSFSNAP *ruc, q, i* | MW | *RUC Overall Shortfall at Snapshot* —The QSE *q*’s overall capacity shortfall according to the RUC Snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| RUCASFSNAP *ruc, q, i* | MW | *RUC Ancillary Service Shortfall at Snapshot* —The QSE *q*’s Ancillary Service capacity shortfall according to the RUC Snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASONPOSSNAP *ruc ,q ,i* | MW | *Ancillary Service On-Line Position at Snapshot –* The QSE *q’s* total On-Line Ancillary Service position according to the RUC Snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i.*  |
| RUPOSSNAP *ruc, q, h* | MW | *Regulation Up Position at Snapshot* ⎯The QSE *q’s* Real-Time Reg-Up Ancillary Service Position according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| RRPOSSNAP *ruc, q, h* | MW | *Responsive Reserve Service Position at Snapshot* ⎯The QSE *q’s* Real-Time RRS Ancillary Service Position according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| ECRPOSSNAP *ruc, q, h* | MW | *ERCOT Contingency Reserve Service Position at Snapshot* ⎯The QSE *q’s* Real-Time ECRS Ancillary Service Position according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| NSPOSSNAP *ruc, q, h* | MW | *Non-Spin Reserve Service Position at Snapshot* ⎯The QSE *q’s* Real-Time Non-Spin Ancillary Service Position according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| RDPOSSNAP *ruc, q, h* | MW | *Regulation Down Position at Snapshot* ⎯The QSE *q’s* Real-Time Reg-Down Ancillary Service Position according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| ASOFFOFRSNAP *ruc, q, r, h* | MW | *Ancillary Service Offline Offers at Snapshot –*The capacity represented by validated Ancillary Service Offers for ECRS and Non-Spin for Resource *r* represented by QSE *q* according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFRLRSNAP *ruc, q, r, h* | MW | *Ancillary Service Offer per Load Resource at Snapshot –* The capacity represented by validated Ancillary Service Offers for Reg-Up, Non-Spin, RRS, and ECRS for the Load Resource *r*  represented by QSE *q* according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASCAP1SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 1 at Snapshot* ⎯The net capacity for Reg-Up for QSE *q*, according to the RUC Snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASCAP2SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 2 at Snapshot* ⎯The net capacity for RRS for QSE *q*, according to the RUC Snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASCAP3SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 3 at Snapshot* ⎯The net capacity for Reg-Up and RRS for QSE *q*, according to the RUC Snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASCAP4SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 4 at Snapshot* ⎯The net capacity for Reg-Up, RRS, and ECRS for QSE *q*, according to the RUC Snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASCAP5SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 5 at Snapshot* ⎯The net capacity for Reg-Up, RRS, ECRS, and Non-Spinning Reserve (Non-Spin) for QSE *q*, according to the RUC Snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASCAP6SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 6 at Snapshot* ⎯The net capacity for Regulation Down Service (Reg-Down) for QSE *q*, according to the RUC Snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASOFR1SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 1 at Snapshot –* The capacity represented by validated Reg-Up Ancillary Service Offers for Resource *r* represented by QSE *q* according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR2SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 2 at Snapshot –* The capacity represented by validated RRS Ancillary Service Offers for Resource *r* represented by QSE *q* according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*.  |
| ASOFR3SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 3 at Snapshot –* The capacity represented by validated Reg-Up and RRS Ancillary Service Offers for Resource *r* represented by QSE *q* according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR4SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 4 at Snapshot –* The capacity represented by validated Reg-Up, RRS, and ECRS Ancillary Service Offers for Resource *r* represented by QSE *q* according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR5SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 5 at Snapshot –* The capacity represented by validated Reg-Up, RRS, ECRS, and Non-Spin Ancillary Service Offers for Resource *r* represented by QSE *q* according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR6SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 6 at Snapshot –* The capacity represented by validated Reg-Down Ancillary Service Offers for Resource *r* represented by QSE *q* according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| RUCOSFADJ *ruc, q, i* | MW | *RUC Overall Shortfall at End of Adjustment Period* —The QSE *q’s* overall capacity shortfall at the end of the Adjustment Period, including capacity from IRRs as seen in the RUC Snapshot for the RUC process *ruc*, for the 15-minute Settlement Interval *i*. |
| RUCASFADJ *q, i* | MW | *RUC Ancillary Service Shortfall at End of Adjustment Period* —The QSE *q’s* Ancillary Service capacity shortfall at the end of the Adjustment Period for the 15-minute Settlement Interval *i*. |
| ASONPOSADJ *q ,i* | MW | *Ancillary Service On-Line Position at End of Adjustment Period –* The QSE *q’s* total On-Line Ancillary Service position at the end of the Adjustment Periodfor the 15-minute Settlement Interval *i.* |
| RUPOSADJ *q, h* | MW | *Regulation Up Position at End of Adjustment Period* ⎯The QSE *q’s* Reg-Up Ancillary Service Position at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. |
| RRPOSADJ *q, h* | MW | *Responsive Reserve Service Position at End of Adjustment Period* ⎯The QSE *q’s* RRS Ancillary Service Position at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. |
| ECRPOSADJ *q, h* | MW | *ERCOT Contingency Reserve Service Position at End of Adjustment Period* ⎯The QSE *q’s* ECRS Ancillary Service Position at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. |
| NSPOSADJ *q, h* | MW | *Non-Spin Reserve Service Position at End of Adjustment Period* ⎯The QSE *q’s* Non-Spin Ancillary Service Position at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. |
| RDPOSADJ *q, h* | MW | *Regulation Down Position at End of Adjustment Period* ⎯The QSE *q’s*  Reg-Down Ancillary Service Position at the end of the Adjustment period for the hour *h* that includes the 15-minute Settlement Interval. |
| ASOFFOFRADJ *q, r, h* | MW | *Ancillary Service Offline Offers at End of Adjustment Period –*The capacity represented by validated Ancillary Service Offers for ECRS and Non-Spin for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFRLRADJ *q, r, h* | MW | *Ancillary Service Offer per Load Resource at End of Adjustment Period –* The capacity represented by validated Ancillary Service Offers for Reg-Up, Non-Spin, RRS, and ECRS for the Load Resource *r*  represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h.* |
| ASCAP1ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 1 at End of Adjustment Period* ⎯The net capacity at the end of the Adjustment Period for Reg-Up for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASCAP2ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 2 at End of Adjustment Period* ⎯The net capacity at the end of the Adjustment Period for RRS for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASCAP3ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 3 at End of Adjustment Period* ⎯The net capacity at the end of the Adjustment Period for Reg-Up and RRS for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASCAP4ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 4 at End of Adjustment Period* ⎯The net capacity at the end of the Adjustment Period for Reg-Up, RRS, and ECRS for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASCAP5ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 5 at End of Adjustment Period* ⎯The net capacity at the end of the Adjustment Period for Reg-Up, RRS, ECRS, and Non-Spin for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASCAP6ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 6 at End of Adjustment Period* ⎯ The net capacity at the end of the Adjustment Period for Reg-Down for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASOFR1ADJ *q, r, h* | MW | *Ancillary Service Offer Level 1 at End of Adjustment Period –* The capacity represented by validated Reg-Up Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR2ADJ *q, r, h* | MW | *Ancillary Service Offer Level 2 at End of Adjustment Period –* The capacity represented by validated RRS Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR3ADJ *q, r, h* | MW | *Ancillary Service Offer Level 3 at End of Adjustment Period –* The capacity represented by validated Reg-Up and RRS Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR4ADJ *q, r, h* | MW | *Ancillary Service Offer Level 4 at End of Adjustment Period –* The capacity represented by validated Reg-Up, RRS, and ECRS Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR5ADJ *q, r, h* | MW | *Ancillary Service Offer Level 5 at End of Adjustment Period–* The capacity represented by validated Reg-Up, RRS, ECRS, and Non-Spin Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR6ADJ *q, r, h* | MW | *Ancillary Service Offer Level 6 at End of Adjustment Period –* The capacity represented by validated Reg-Down Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| RTAML *q, p, i* | MWh | *Real-Time Adjusted Metered Load*—The QSE *q*’s Adjusted Metered Load (AML) at the Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| RUCCAPSNAP *ruc, q, i* | MW | *RUC Capacity Snapshot at time of RUC*—The amount of the QSE *q*’s calculated capacity in the RUC Snapshot for the RUC process *ruc* for a 15-minute Settlement Interval *i*.  |
| RCAPSNAP *ruc, q, r, h* | MW | *Resource Capacity at Snapshot*—The available capacity of Generation Resource or ESR *r* represented by the QSE *q*, according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. For ESRs and Generation Resources that are not IRRs, the available capacity shall be equal to HSL. For WGRs and PVGRs, the available capacity shall be equal to the WGRPP and the PVGRPP, respectively. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.  |
|  |  |  |
| RTDCEXP *q, p, i* | MW | *Real-Time DC Export*—The aggregated DC Tie Schedule through DC Tie *p* submitted by QSE *q* that is under the Oklaunion Exemption as an exporter from the ERCOT Region, for the 15-minute Settlement Interval *i*. |
| DCIMPADJ *q, p, i* | MW | *DC Import at End of Adjustment Period*—The approved aggregated DC Tie Schedule submitted by QSE *q* as an importer into the ERCOT System through DC Tie *p* at the end of the Adjustment Period, for the 15-minute Settlement Interval *i*. |
| DCIMPSNAP *ruc, q, p, i* | MW | *DC Import at Snapshot*—The approved aggregated DC Tie Schedule submitted by QSE *q* as an importer into the ERCOT System through DC Tie *p*, according to the RUC Snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| RUCCPSNAP *ruc, q, h* | MW | *RUC Capacity Purchase at Snapshot*—The QSE *q*’s capacity purchase, according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| RUCCSSNAP *ruc, q, h* | MW | *RUC Capacity Sale at Snapshot*—The QSE *q*’s capacity sale, according to the RUC Snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| RUCCAPADJ *q, i* | MW | *RUC Capacity at End of Adjustment Period*—The amount of the QSE *q*’s calculated capacity, excluding capacity for IRRs, at the end of the Adjustment Period for a 15-minute Settlement Interval *i.* |
|  |  |  |
| RCAPADJ *q, r, h* | MW | *Resource Capacity at End of Adjustment Period*—The HSL of a non-IRR Generation Resource *r* represented by the QSE *q* at the end of the Adjustment Period, for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.  |
| RUCCPADJ *q, h* | MW | *RUC Capacity Purchase at End of Adjustment Period*—The QSE *q*’s capacity purchase, at the end of Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. |
| RUCCSADJ *q, h* | MW | *RUC Capacity Sale at End of Adjustment Period*—The QSE *q*’s capacity sale, at the end of Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. |
| DAEP *q, p, h* | MW | *Day-Ahead Energy Purchase*—The QSE *q*’s energy purchased in the DAM at the Settlement Point *p* for the hour *h* that includes the 15-minute Settlement Interval. |
| DAES *q, p, h* | MW | *Day-Ahead Energy Sale*—The QSE *q*’s energy sold in the DAM at the Settlement Point *p* for the hour *h* that includes the 15-minute Settlement Interval. |
| RTQQEPSNAP *ruc, q, p, i* | MW | *Real-Time QSE-to-QSE Energy Purchase at Snapshot*—The QSE *q*’s Energy Trades in which the QSE is the buyer at the delivery Settlement Point *p* for the 15-minute Settlement Interval *i*, in the RUC Snapshot for the RUC process *ruc*. |
| RTQQESSNAP *ruc, q, p, i* | MW | *Real-Time QSE-to-QSE Energy Sale at Snapshot*—The QSE *q*’s Energy Trades in which the QSE is the seller at the delivery Settlement Point *p* for the 15-minute Settlement Interval *i*, in the RUC Snapshot for the RUC process *ruc*. |
| RTQQEPADJ *q, p, i* | MW | *Real-Time QSE-to-QSE Energy Purchase at End of Adjustment Period*—The QSE *q*’s Energy Trades in which the QSE is the buyer at the delivery Settlement Point *p* for the 15-minute Settlement Interval *i*, at the end of the Adjustment Period for that Settlement Interval. |
| RTQQESADJ *q, p, i* | MW | *Real-Time QSE-to-QSE Energy Sale at End of Adjustment Period*—The QSE *q*’s Energy Trades in which the QSE is the seller at the delivery Settlement Point *p* for the 15-minute Settlement Interval *i*, at the end of the Adjustment Period for that Settlement Interval. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |
| *r* | none | A Generation Resource, an ESR, or a Load Resource |
| *z* | none | A previous RUC process for the Operating Day. |
| *i* | none | A 15-minute Settlement Interval. |
| *h* | none | The hour that includes the Settlement Interval *i*.  |
| *ruc* | none | The RUC process for which this RUC Shortfall Ratio Share is calculated. |

**5.8 Annual RUC Reporting Requirement**

(1) ERCOT shall report to the Technical Advisory Committee (TAC), each January, an assessment of market impacts and Settlements for the aggregate Reliability Unit Commitment (RUC) activity, delineated by type of RUC instruction as follows:

(a) RUC instructions issued for irresolvable transmission system constraints;

(b) RUC instructions issued in anticipation of extreme cold weather/startup failures;

(c) RUC instructions issued for capacity;

(d) RUC instructions issued for system inertia;

(e) RUC instructions issued to Resources receiving an Outage Schedule Adjustment (OSA); and

(f) A summary of RUC Settlements;

(i) RUC charges associated with RUC Make-Whole Amount Total per RUC, as defined in Section 5.7.4.1, RUC Capacity-Short Charge; and

(ii) RUC Shortfall Total, as defined in Section 5.7.4.1.1, Capacity Shortfall Ratio Share.