|  |  |  |  |
| --- | --- | --- | --- |
| NPRR Number | [1010](http://www.ercot.com/mktrules/issues/nprr1010) | NPRR Title | RTC – NP 6: Adjustment Period and Real-Time Operations |
| Date Posted | | March 25, 2020 | |
|  | |  | |
| Requested Resolution | | Normal | |
| Nodal Protocol Sections Requiring Revision | | 6.1, Introduction  6.3, Adjustment Period and Real-Time Operations Timeline  6.3.1, Activities for the Adjustment Period  6.3.2, Activities for Real-Time Operations  6.4.2.3, Output Schedule Criteria  6.4.3.1, RTM Energy Bids  6.4.3.1.1, RTM Energy Bid Criteria  6.4.4, Energy Offer Curve  6.4.4.1, Energy Offer Curve for On-Line Non-Spinning Reserve Capacity (delete)  6.4.4.2, Energy Offer Curve for RUC-Committed Switchable Generation Resources  6.4.5, Incremental and Decremental Energy Offer Curves  6.4.6, Resource Status  6.4.7, QSE-Requested Decommitment of Resources and Changes to Ancillary Service Resource Responsibility of Resources  6.4.7.1, QSE Request to Decommit Resources in the Operating Period  6.4.9, Ancillary Services Capacity During the Adjustment Period and in Real-Time  6.4.9.1, Evaluation and Maintenance of Ancillary Service Capacity Sufficiency  6.4.9.1.1, ERCOT Increases to the Ancillary Services Plan  6.4.9.1.2, Replacement of Infeasible Ancillary Service Due to Transmission Constraints (delete)  6.4.9.1.2, Changes to Operating Day Ancillary Service Plan (new)  6.4.9.1.3, Replacement of Ancillary Service Due to Failure to Provide (delete)  6.4.9.2, Supplemental Ancillary Services Market (delete)  6.4.9.2.1, Resubmitting Offers for Ancillary Services in the Adjustment Period (delete)  6.4.9.2.2, SASM Clearing Process (delete)  6.4.9.2.3, Communication of SASM Results (delete)  6.5.1.1, ERCOT Control Area Authority  6.5.1.2, Centralized Dispatch  6.5.5.2, Operational Data Requirements  6.5.7, Energy Dispatch Methodology  6.5.7.1.12, Resource Limits  6.5.7.1.13, Data Inputs and Outputs for the Real-Time Sequence and SCED  6.5.7.2, Resource Limit Calculator  6.5.7.3, Security Constrained Economic Dispatch  6.5.7.3.1, Determination of Real-Time On-Line Reliability Deployment Price Adder  6.5.7.4.1, Updated Desired Set Points (new)  6.5.7.5, Ancillary Services Capacity Monitor  6.5.7.6.1, LFC Process Description  6.5.7.6.2, LFC Deployment  6.5.7.6.2.1, Deployment of Regulation Service  6.5.7.6.2.2, Deployment of Responsive Reserve (RRS)  6.5.7.6.2.3, Non-Spinning Reserve Service Deployment  6.5.9.2, Failure of the SCED Process  6.5.9.3.3, Watch  6.5.9.3.4, Emergency Notice  6.5.9.4, Energy Emergency Alert  6.5.9.4.2, EEA Levels  6.6.1, Real-Time Settlement Point Prices  6.6.1.1, Real-Time Settlement Point Price for a Resource Node  6.6.1.2, Real-Time Settlement Point Price for a Load Zone  6.6.1.6, Real-Time Market Clearing Prices for Ancillary Services (new)  6.6.1.7, Real-Time Reliability Deployment Prices for Ancillary Services  6.6.3.1, Real-Time Energy Imbalance Payment or Charge at a Resource Node  6.6.3.7, Real-Time High Dispatch Limit Override Energy Payment  6.6.3.9, Real-Time Payment or Charge for Energy from a Settlement Only Distribution Generator (SODG) or a Settlement Only Transmission Generator (SOTG)  6.6.5.1, Resource Base Point Deviation Charge  6.6.5.1.1.1, Base Point Deviation Charge for Over Generation  6.6.5.1.1.2, Base Point Deviation Charge for Under Generation  6.6.5.2, IRR Generation Resource Base Point Deviation Charge  6.6.9, Emergency Operations Settlement  6.6.12.1, Switchable Generation Make-Whole Payment  6.7.1, Payments for Ancillary Service Capacity Sold in a Supplemental Ancillary Services Market (SASM) or Reconfiguration Supplemental Ancillary Services Market (RSASM) (delete)  6.7.2, Payments for Ancillary Service Capacity Assigned in Real-Time Operations (delete)  6.7.2.1, Charges for Infeasible Ancillary Service Capacity Due to Transmission Constraints (delete)  6.7.2.2, Real-Time Adjustments to Day-Ahead Make Whole Payments due to Ancillary Services Infeasibility Charges (delete)  6.7.3, Charges for Ancillary Service Capacity Replaced Due to Failure to Provide (delete)  6.7.4, Adjustments to Cost Allocations for Ancillary Services Procurement  6.7.5.1, Real-Time Ancillary Service Imbalance Payment or Charge (new)  6.7.5.2, Regulation Up Service Payments and Charges (new)  6.7.5.3, Regulation Down Service Payments and Charges (new)  6.7.5.4, Responsive Reserve Payments and Charges (new)  6.7.5.5, Non-Spinning Reserve Payments and Charges (new)  6.7.5.6, ERCOT Contingency Reserve Service Payments and Charges (new)  6.7.5.7, Real-Time Derated Ancillary Service Capability Payment (new)  6.7.5.8, Real-Time Derated Ancillary Service Capability Charge (new)  6.7.6, Real-Time Ancillary Service Imbalance Revenue Neutrality Allocation  6.7.7, Adjustments to Net Cost Allocations for Real-Time Ancillary Services (delete) | |
| 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 Programs  Nodal Protocol Revision Request (NPRR) 1007, RTC – NP 3: Management Activities for the ERCOT System  NPRR1008, RTC – NP 4: Day-Ahead Operations  NPRR1009, RTC - NP 5: Transmission Security Analysis and Reliability Unit Commitment  NPRR1011, RTC - NP 8: Performance Monitoring  NPRR1012, RTC - NP 9: Settlement and Billing  NPRR1013, RTC - NP 1, 2, 16, and 25: Overview, Definitions and Acronyms, Registration and Qualification of Market Participants, and Market Suspension and Restart  Other Binding Document Revision Request (OBDRR) 020, RTC - Methodology for Setting Maximum Shadow Prices for Network and Power Balance Constraints | |
| Revision Description | | This Nodal Protocol Revision Request (NPRR) updates the Adjustment Period and Real-Time Operations in the Protocols to address changes associated with the implementation of Real-Time Co-optimization (RTC) of energy and Ancillary Services. Specifically, this NPRR addresses the following Key Principles:   * KP1.1– Ancillary Service Demand Curves and Current Market Price Adders * KP1.2 – System-Wide Offer Cap and Power Balance Penalty Curve * KP1.3 – Offering and Awarding of Ancillary Services in Real-Time * KP1.4 – Systems/Applications that Provide Input into the Real-Time Optimization Engine * KP1.5 – Process for Deploying Ancillary Services * KP1.6 – Ancillary Service Imbalance Settlement * 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 the Adjustment Period and Real-Time Operations with the upcoming RTC terminology and operating environment. | |

|  |  |
| --- | --- |
| Sponsor | |
| Name | Dave Maggio |
| E-mail Address | [David.Maggio@ercot.com](mailto: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](mailto:Cory.Phillips@ercot.com) |
| **Phone Number** | 512-248-6464 |

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

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

* NPRR947, Clarification to Ancillary Service Supply Responsibility Definition and Improvements to Determining and Charging for Ancillary Service Failed Quantities
  + Section 6.4.9.1.3
  + Section 6.7.3
* NPRR987, BESTF-3 Energy Storage Resource Contribution to Physical Responsive Capability and Real-Time On-Line Reserve Capacity Calculations
  + Section 6.5.7.5
* NPRR995, RTF-6 Create Definition and Terms for Settlement Only Energy Storage
  + Section 6.3.2
  + Section 6.6.3.9
* NPRR998, ERS Deployment and Recall Messages
  + Section 6.5.9.4.2
* NPRR1000, Elimination of Dynamically Scheduled Resources
  + Section 6.3
  + Section 6.3.1
  + Section 6.3.2
  + Section 6.4.2.3
  + Section 6.4.5
  + Section 6.5.7.3
  + Section 6.5.7.6.2.3
* NPRR1001, Clarification of Definitions of Operating Condition Notice, Advisory, Watch, Emergency Notice, and Related Clarifications
  + Section 6.1
  + Section 6.5.9.3.3
  + Section 6.5.9.3.4
  + Section 6.5.9.4
* NPRR1002, BESTF-5 Energy Storage Resource Single Model Registration and Charging Restrictions in Emergency Conditions
  + Section 6.5.9.3.4
  + Section 6.5.9.4.2
* NPRR1006, Update Emergency Response Service (ERS) Restoration Assumption for Reliability Deployment Price Adder to Match Actual Data
  + Section 6.5.7.3.1

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

**6.1 Introduction**

(1) This Section addresses the following components: the Adjustment Period and Real-Time Operations, including Emergency Operations.

(2) The Adjustment Period provides each Qualified Scheduling Entity (QSE) the opportunity to adjust its trades, Self-Schedules, and Resource commitments as more accurate information becomes available under Section 6.4, Adjustment Period. During the Adjustment Period, ERCOT continues to evaluate system sufficiency and security by use of Hour-Ahead Reliability Unit Commitment (RUC) processes, as described in Section 5, Transmission Security Analysis and Reliability Unit Commitment.

(3) During Real-Time operations,ERCOT dispatches Resources under normal system conditions and behavior based on economics and reliability to match system Load with On-Line generation while observing Resource and transmission constraints. The Security-Constrained Economic Dispatch (SCED) process produces Base Points and Ancillary Service awards for Resources. ERCOT uses the Base Points from the SCED process and uses the deployment of Regulation Up (Reg-Up), Regulation Down (Reg-Down), Responsive Reserve (RRS), and Non-Spinning Reserve (Non-Spin) to control frequency and solve potential reliability issues.

|  |
| --- |
| ***[NPRR863: Replace paragraph (3) above with the following upon system implementation:]***  (3) During Real-Time operations,ERCOT dispatches Resources under normal system conditions and behavior based on economics and reliability to match system Load with On-Line generation while observing Resource and transmission constraints. The Security-Constrained Economic Dispatch (SCED) process produces Base Points and Ancillary Service awards for Resources. ERCOT uses the Base Points from the SCED process and uses the deployment of Regulation Up (Reg-Up), Regulation Down (Reg-Down), ERCOT Contingency Reserve Service (ECRS), Responsive Reserve (RRS), and Non-Spinning Reserve (Non-Spin) to control frequency and solve potential reliability issues. |

(4) Under Emergency Conditions, as described in Section 6.5.9, Emergency Operations, ERCOT may implement manual procedures and must keep the Market Participants informed of the status of the system.

(5) Real-Time energy settlements use Real-Time Settlement Point Prices that are calculated for Resource Nodes, Load Zones, and Hubs for a 15-minute Settlement Interval, using the Locational Marginal Prices (LMPs) from all of the executions of SCED in the Settlement Interval. Similarly, Real-Time Ancillary Service Settlements use Real-Time Market Clearing Prices for Capacity (MCPCs) for a 15-minute Settlement Interval, using the MCPCs from all of the executions of SCED in the Settlement Interval. In contrast, the Day-Ahead Market (DAM) energy settlements will use DAM Settlement Point Prices that are calculated for Resource Nodes, Load Zones, and Hubs for a one-hour Settlement Interval, and DAM Ancillary Service Settlements will use DAM MCPCs for a one-hour Settlement Interval.

(6) To the extent that the ERCOT CEO or designee determines that Market Participant activities have produced an outcome inconsistent with the efficient operation of the ERCOT-administered markets as defined in subsection (c)(2) of P.U.C. Subst. R. 25.503, Oversight of Wholesale Market Participants, ERCOT may prohibit the activity by Notice for a period beginning on the date of the Notice and ending no later than 45 days after the date of the Notice. ERCOT may issue subsequent Notices on the same activity. The ERCOT CEO may deem any Nodal Protocol Revision Request (NPRR) designed to correct the activity or issues affecting the activity as Urgent pursuant to Section 21.5, Urgent and Board Priority Nodal Protocol Revision Requests and System Change Requests.

**6.3 Adjustment Period and Real-Time Operations Timeline**

(1) The figure below highlights the major activities that occur in the Adjustment Period and Real-Time operations:

**Preparation for**

**Real**

**-**

**Time Ops**

**Adj Period**

**18:00**

**(D**

**–**

**1)**

**60 Minutes**

**Prior to**

**Op Hour**

**QSE Deadline:**

**Update Energy Bids and Offers**

**Update Output Schedules**

**Update Inc/Dec Offers for**

**DSRs**

**ERCOT Activity:**

**LFC Process every 4 secs**

**Execute SCED every 5**

**mins**

**Communicate Instructions,**

**Awards & Prices**

**ERCOT Activity:**

**Snapshot Inputs &**

**Execute HRUC**

**Operating Period**

**Operating Hour**

**Clock**

**Hour**

**T**

**Adjustment Period & Real**

**-**

**Time Operations**

**Real**

**-**

**Time**

**Operations**

**QSE Deadline:**

**Update Output Schedules for DSRs**

**Update AS Offers**

**Provide SCADA Telemetry**

**ERCOT Activity:**

**Communicate**

**HRUC Commitments**

(2) Activities for the Adjustment Period begin at 1800 in the Day-Ahead and end one full hour before the start of the Operating Hour. The figure above is intended to be only a general guide and not controlling language, and any conflict between this figure and another section of the Protocols is controlled by the other section.

(3) ERCOT shall monitor Real-Time Locational Marginal Prices (LMPs), Real-Time Market Clearing Prices for Capacity (MCPCs), and Real-Time Settlement Point Prices, including Real-Time prices for energy metered, Real-Time Reliability Deployment Price Adders for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service, for errors and if there are conditions that cause the price to be questionable, as soon as practicable, ERCOT shall notify all Market Participants that the Real-Time LMPs, Real-Time MCPCs, and Real-Time Settlement Point Prices are under investigation.

(4) ERCOT shall correct prices when: (i) a market solution is determined to be invalid, (ii) invalid prices are identified in an otherwise valid market solution, (iii) the Base Points or Ancillary Service awards received by Market Participants are inconsistent with the Base Points or Ancillary Service awards of a valid market solution, unless accurate prices cannot be determined, or (iv) the Security-Constrained Economic Dispatch (SCED) process experiences a failure as described in Section 6.5.9.2, Failure of the SCED Process. The following are some reasons that may cause these conditions.

(a) Data Input error: Missing, incomplete, stale, or incorrect versions of one or more data elements input to the market applications may result in an invalid market solution and/or prices.

(b) Data Output error: These include: (i) incorrect or incomplete data transfer, (ii) price recalculation error in post-processing, and (iii) Base Points inconsistent with prices due to the Emergency Base Point flag remaining activated even when the SCED solution is valid.

(c) Hardware/Software error: These include unpredicted hardware or software failures, planned market system or database outages, planned application or database upgrades, software implementation errors, and failure of the market run to complete.

(d) Inconsistency with the Protocols or Public Utility Commission of Texas (PUCT) Substantive Rules: Pricing errors may occur when specific circumstances result in prices that are in conflict with such Protocol language or the PUCT Substantive Rules.

(5) If it is determined that any Real-Time Settlement Point Prices, Settlement Point LMPs, Electrical Bus LMPs, Real-Time prices for energy metered, Real-Time Reliability Deployment Price Adders for Energy, Real-Time MCPCs, Real-Time Reliability Deployment Price Adders for Ancillary Service, and/or constraint Shadow Prices are erroneous, ERCOT shall correct the prices before the prices are considered final in paragraph (6) below. Specifically:

(a) If it is determined that correcting the Real-Time Settlement Point Prices will not affect the Base Points, and/or correcting Real-Time MCPCs will not affect Ancillary Service awards, then ERCOT shall correct the prices before the prices are considered final in paragraph (6) below.

(b) If it is determined that correcting the Real-Time Settlement Point Prices will affect the Base Points, and/or correcting Real-Time MCPCs will affect Ancillary Service awards, then ERCOT shall correct the prices before the prices are considered final and settle the SCED executions as failed in accordance with Section 6.5.9.2.

(c) For Settlement purposes, if the Base Points are inconsistent with the Real-Time Settlement Point Prices, reduced by the Real-Time Reliability Deployment Price Adder for Energy, or Ancillary Service awards are inconsistent with the Real-Time MCPCs, reduced by the Real-Time Reliability Deployment Price Adder for Ancillary Service, averaged over the 15-minute Settlement Interval, then ERCOT shall consider the relevant Settlement Interval(s) in accordance with Section 6.6.9, Emergency Operations Settlement.

(6) All Real-Time LMPs, Real-Time Settlement Point Prices, Real-Time prices for energy metered, Real-Time Reliability Deployment Price Adders for Energy, Real-Time MCPCs, and Real-Time Reliability Deployment Price Adders for Ancillary Service are final at 1600 of the second Business Day after the Operating Day.

(a) However, after Real-Time LMPs, Real-Time Settlement Point Prices, Real-Time prices for energy metered, Real-Time Reliability Deployment Price Adders for Energy, Real-Time MCPCs, and Real-Time Reliability Deployment Price Adders for Ancillary Service are final, if ERCOT determines that prices are in need of correction and seeks ERCOT Board review of such prices, it shall notify Market Participants and describe the need for such correction as soon as practicable but no later than 30 days after the Operating Day. Failure to notify Market Participants within this timeline precludes the ERCOT Board from reviewing such prices. However, nothing in this section shall be understood to limit or otherwise inhibit any of the following:

(i) ERCOT’s duty to inform the PUCT of potential or actual violations of the ERCOT Protocols or PUCT Rules and its right to request that the PUCT authorize correction of any prices that may have been affected by such potential or actual violations;

(ii) The PUCT’s authority to order price corrections when permitted to do so under other law; or

(iii) ERCOT’s authority to grant relief to a Market Participant pursuant to the timelines specified in Section 20, Alternative Dispute Resolution Procedure.

(b) The ERCOT Board may review and change Real-Time LMPs, Real-Time Settlement Point Prices, Real-Time prices for energy metered, Real-Time Reliability Deployment Price Adders for Energy, Real-Time MCPCs, and Real-Time Reliability Deployment Price Adders for Ancillary Service if ERCOT gave timely notice to Market Participants and the ERCOT Board finds that such prices are significantly affected by an error.

(c) In review of Real-Time LMPs, Real-Time Settlement Point Prices, Real-Time prices for energy metered, Real-Time Reliability Deployment Price Adders for Energy, Real-Time MCPCs, and Real-Time Reliability Deployment Price Adders for Ancillary Service, the ERCOT Board may rely on the same reasons identified in paragraph (4) above to find that the prices are significantly affected by an error.

***6.3.1 Activities for the Adjustment Period***

(1) The following table summarizes the timeline for the Adjustment Period and the activities of QSEs and ERCOT. 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:

| **Adjustment Period** | **QSE Activities** | **ERCOT Activities** |
| --- | --- | --- |
| Time = From 1800 in the Day-Ahead up to one hour before the start of the Operating Hour | Submit and update Energy Trades, Capacity Trades, Self-Schedules, and Ancillary Service Trades  Submit and update Output Schedules  Submit and update Incremental and Decremental Energy Offer Curves for Dynamically Scheduled Resources (DSRs)  Submit and update Energy Offer Curves and/or Real-Time Market (RTM) Energy Bids  Update Current Operating Plan (COP)  Request Resource decommitments  Submit Three-Part Supply Offers for Off-Line Generation Resources  Submit and update Ancillary Service Offers  Communicate Resource Forced Outages | Post shift schedules on the Market Information System (MIS) Secure Area  Validate Energy Trades, Capacity Trades, Self-Schedules, and Ancillary Service Trades and identify invalid or mismatched trades  Validate Output Schedules  Validate Incremental and Decremental Energy Offer Curves  Validate Energy Offer Curves and/or RTM Energy Bids  Validate COP including validation of the deliverability of Ancillary Services from Resources for the next Operating Period  Review and approve or reject Resource decommitments  Validate Three-Part Supply Offers  Publish Notice of Need to Procure Additional Ancillary Service capacity if required and update the Ancillary Service Plan for the affected hours  Validate Ancillary Service Offers  At the end of the Adjustment Period snap-shot the net capacity credits for Hourly Reliability Unit Commitment (HRUC) Settlement  Update Short-Term Wind Power Forecast (STWPF)  Update Short-Term PhotoVoltaic Power Forecast (STPPF)  Execute the Hour-Ahead Sequence  Notify the QSE via the MIS Certified Area that an Energy Offer Curve, RTM Energy Bid or Output Schedule has not yet been submitted for a Resource as a reminder that one of the three must be submitted by the end of the Adjustment Period  Notify the QSE via the MIS Certified Area that an Ancillary Service Offer has not yet been submitted for a Resource by the end of the Adjustment Period |

***6.3.2 Activities for Real-Time Operations***

(1) Activities for Real-Time operations begin at the end of the Adjustment Period and conclude at the close of the Operating Hour.

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

| **Operating Period** | **QSE Activities** | **ERCOT Activities** |
| --- | --- | --- |
| During the first hour of the Operating Period |  | Execute the Hour-Ahead Sequence, including HRUC, beginning with the second hour of the Operating Period  Review the list of Off-Line Available Resources with a start-up time of one hour or less  Review and communicate HRUC commitments and Direct Current Tie (DC Tie) Schedule curtailments  Snapshot the Scheduled Power Consumption for Controllable Load Resources |
| Before the start of each SCED run | Update Output Schedules for DSRs | Validate Output Schedules for DSRs  Execute Real-Time Sequence |
| SCED run |  | Execute SCED and pricing run to determine impact of reliability deployments on energy and Ancillary Service prices |
| During the Operating Hour | Acknowledge receipt of Dispatch Instructions  Comply with Dispatch Instruction    Review Resource Status to assure current state of the Resources is properly telemetered  Update COP and telemetry with actual Resource Status and limits and Ancillary Service capabilities  Communicate Resource Forced Outages to ERCOT | Communicate all binding Base Points, Ancillary Service awards, Dispatch Instructions, and LMPs for energy and 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 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, Real-Time Reliability Deployment Price Adder for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service using Inter-Control Center Communications Protocol (ICCP) or Verbal Dispatch Instructions (VDIs). In communicating Ancillary Service awards, the awards shall be broken out by Ancillary Service sub-type, where applicable.   |  | | --- | | ***[NPRR904: Replace the paragraph above with the following upon system implementation:]***  Communicate all binding Base Points, Ancillary Service awards, Dispatch Instructions, LMPs for energy, 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 Emergency Response Service (ERS) MW deployed that is added to the Demand, total ERCOT-directed DC Tie MW that is added to or subtracted from the Demand, total Block Load Transfer (BLT) MW that is added to or subtracted from the Demand Real-Time Reliability Deployment Price Adder for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service using Inter-Control Center Communications Protocol (ICCP) or Verbal Dispatch Instructions (VDIs). In communicating Ancillary Service awards, the awards shall be broken out by Ancillary Service sub-type, where applicable. |   Monitor Resource Status and identify discrepancies between COP and telemetered Resource Status  Restart Real-Time Sequence on major change of Resource or Transmission Element Status  Monitor ERCOT total system capacity providing Ancillary Services  Validate COP information  Monitor ERCOT control performance  Distribute by ICCP, and post on the MIS Public Area, System Lambda and the LMPs for each Resource Node, Load Zone and Hub, 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 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, 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   |  | | --- | | ***[NPRR904: Replace the paragraph above with the following upon system implementation:]***  Distribute by ICCP, and post on the MIS Public Area, System Lambda and the LMPs for each Resource Node, Load Zone and Hub, and 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 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 from SCED with the time stamp the prices are effective |  |  | | --- | | ***[NPRR917: Insert the paragraph below upon system implementation:]***  Post on the MIS Public Area the nodal prices for Settlement Only Distribution Generators (SODGs) and Settlement Only Transmission Generator (SOTGs). 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 effective |   Post LMPs for each Electrical Bus on the MIS Public Area. These prices shall be posted immediately subsequent to deployment of Base Points from each binding SCED with the time stamp the prices are effective   |  | | --- | | ***[NPRR829: Insert paragraph below upon system implementation:]***  Post every 15 minutes on the MIS Public Area the aggregate net injection from Settlement Only Generators (SOGs) that provide Real-Time telemetry to ERCOT, consistent with paragraph (12) of Section 6.5.5.2, Operational Data Requirements. This data shall not be displayed if less than five QSEs or less than 750 megawatts of net injection utilize the option to telemeter Real-Time output for use in the calculation of Real-Time Liability (RTL) as described in Section 16.11.4.3.2, Real-Time Liability Estimate. |   Post on the MIS Public Area the projected non-binding LMPs for each Resource Node, and 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 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 is added to the DemandReal-Time Reliability Deployment Price Adder for Energy, Real-Time Reliability Deployment Price Adders for Ancillary Service, and the projected Hub LMPs and Load Zone LMPs. These projected prices shall be posted at a frequency of every five minutes from SCED for at least 15 minutes in the future with the time stamp of the SCED process that produced the projections   |  | | --- | | ***[NPRR904: Replace the paragraph above with the following upon system implementation:]***  Post on the MIS Public Area the projected non-binding LMPs for each Resource Node and MCPCs for each Ancillary Service created by each SCED processand 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 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 Reliability Deployment Price Adders for Ancillary Service, and the projected Hub LMPs and Load Zone LMPs. These projected prices shall be posted at a frequency of every five minutes from SCED for at least 15 minutes in the future with the time stamp of the SCED process that produced the projections |   Post on the MIS Certified Area the projected non-binding Base Points and Ancillary Service awards for each Resource created by each SCED process. These projected non-binding Base Points shall be posted at a frequency of every five minutes from SCED for at least 15 minutes in the future with the time stamp of the SCED process that produced the projections. In posting Ancillary Service awards, the awards shall be broken out by Ancillary Service sub-type, where applicable.  Post each hour on the MIS Public Area binding SCED Shadow Prices and active binding transmission constraints by Transmission Element name (contingency /overloaded element pairs)  Post Settlement Point Prices for each Settlement Point, and Settlement Interval MCPCs for Ancillary Services immediately following the end of each Settlement Interval   |  | | --- | | ***[NPRR917: Replace the paragraph above with the following upon system implementation:]***  Post on the MIS Public Area, the Settlement Point Prices for each Settlement Point and the Real-Time price for each SODG and SOTG immediately following the end of each Settlement Interval |   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. |

(3) At the beginning of each hour, ERCOT shall post on the MIS Public Area 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 MIS Public Area 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 MIS Public Area 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.

**6.4.2.3 Output Schedule Criteria**

(1) An Output Schedule submitted by a QSE for a Resource must include the following:

(a) The name of the Entity submitting the Output Schedule for the Resource;

(b) The name of the Resource;

(c) The desired MW output level for each five-minute interval for the Resource for all of the remaining five-minute intervals in the Operating Day for which an Energy Offer Curve has not been submitted.

(2) ERCOT must reject an Output Schedule for a Resource if an Energy Offer Curve corresponding to any period in the Output Schedule exists;

(3) For a QSE representing one or more DSRs, the sum of all Output Schedules (excluding Ancillary Services energy deployments, energy deployed through Dispatch Instructions, and Energy Trades) for the QSE must be within 15% or 15 MW (whichever is greater) of the aggregate telemetered DSR Load;

(4) The MW difference between Output Schedules for any two consecutive five-minute intervals must be less than ten times the Normal Ramp Rate up for schedules showing an increase from the prior period and the Normal Ramp Rate down for schedules showing a decrease from the prior period.

(5) The Output Schedule for each interval in the Operating Period must be less than or equal to the Resource’s High Sustained Limit (HSL) and must be greater than or equal to the Resource’s Low Sustained Limit (LSL) for the corresponding hour.

**6.4.3.1 RTM Energy Bids**

(1) A QSE may submit Controllable Load Resource-specific Real-Time Market (RTM) Energy Bids by the end of the Adjustment Period on behalf of a Load Serving Entity (LSE) representing a Controllable Load Resource.

(2) An RTM Energy Bid represents the willingness to buy energy at or below a certain price, not to exceed the Real-Time System-Wide Offer Cap (RTSWCAP), for the Demand response capability of a Controllable Load Resource in the RTM.

(3) RTM Energy Bids remain active for the offered period until either:

(a) Selected by ERCOT; or

(b) Automatically inactivated at the offer expiration time specified in the RTM Energy Bid.

(4) For any Operating Hour, the QSE may submit or change an RTM Energy Bid in the Adjustment Period. If, by the end of the Adjustment Period, the QSE has not submitted a valid RTM Energy Bid, ERCOT shall create a proxy RTM Energy Bid for the entire Demand response capability of that Load Resource with a not-to-exceed price at the RTSWCAP.

(5) The QSE may remove the Controllable Load Resource from SCED Dispatch by changing the Load Resource’s telemetered Resource Status or ramp rates appropriately. The QSE will update the COP Resource Status accordingly as soon as practicable.

|  |
| --- |
| [NPRR986: Insert paragraph (6) below upon system implementation:]  (6) Notwithstanding any other provisions in this subsection, a QSE representing an Energy Storage Resource (ESR) may submit or update its RTM Energy Bid for that ESR at any time prior to SCED execution, and SCED will use the latest updated RTM Energy Bid available in the system. If a new RTM Energy Bid is not deemed to be valid, then the most recent valid RTM Energy Bid available in the system at the time of SCED execution will be used and ERCOT will notify the QSE that the invalid RTM Energy Bid was rejected. Once an Operating Hour ends, an RTM Energy Bid for that hour cannot be submitted, updated, or canceled. |

***6.4.3.1.1 RTM Energy Bid Criteria***

(1) Each RTM Energy Bid submitted by a QSE must include the following information:

(a) The QSE;

(b) The relevant Load Resource;

(c) A bid curve with no more than ten price/quantity pairs with monotonically non-increasing not-to-exceed prices (in $/MWh) and with increasing quantities ranging from zero to the Load Resource’s maximum demand response capability (in MW) represented by the difference between the Load Resource’s telemetered Maximum Power Consumption (MPC) and Low Power Consumption (LPC);

(d) The first and last hour of the bid; and

(e) The expiration time and date of the bid.

(2) The software systems must be able to provide ERCOT with the ability to enter Resource-specific RTM Energy Bid floors and caps.

(3) The minimum amount per Load Resource for each RTM Energy Bid that may be submitted is one-tenth (0.1) MW.

(4) If a Controllable Load Resource is offering to provide an Ancillary Service, its RTM Energy Bid must be priced no higher than the RTSWCAP.

***6.4.4 Energy Offer Curve***

(1) A detailed description of Energy Offer Curve and validations performed by ERCOT is in Section 4.4.9, Energy Offers and Bids.

(2) For an On-Line RMR Unit, ERCOT shall submit an Energy Offer Curve considering contractual constraints on the Resource and any other adverse effects on, or implications arising from, the RMR Agreement, that may occur as the result of the Dispatch of the RMR Unit. The RMR Unit’s Energy Offer Curve must price all energy at the RTSWCAP in $/MWh.

(3) For Generation Resources with a Resource Status other than ONTEST, STARTUP, or SHUTDOWN, if a valid Energy Offer Curve or an Output Schedule does not exist for a Resource that has a status of On-Line at the end of the Adjustment Period, then ERCOT shall notify the QSE. Except for IRRs, QF Resources, and DSRs, ERCOT shall create an Output Schedule equal to the then-current telemetered output of the Resource until an Output Schedule or Energy Offer Curve is submitted in a subsequent Adjustment Period.

**6.4.4.2 Energy Offer Curve for RUC-Committed Switchable Generation Resources**

(1) Prior to the end of the Adjustment Period for an Operating Hour during which a Switchable Generation Resource (SWGR) has been committed by ERCOT as part of the Reliability Unit Commitment (RUC) process to address an actual or anticipated Energy Emergency Alert (EEA) event, ERCOT shall administratively set an Energy Offer Curve that prices all energy from LSL to HSL at or above $4,500 per MWh, or at the effective Value of Lost Load (VOLL), whichever is lower, for the Operating Hours in the RUC commitment period.

***6.4.5 Incremental and Decremental Energy Offer Curves***

(1) A QSE for a DSR may submit an Incremental Energy Offer Curve and a Decremental Energy Offer Curve in addition to the Output Schedule for the DSR. The Incremental and Decremental Energy Offer Curves prices must be within the range of -$250.00 per MWh and the RTSWCAP in dollars per MWh with the quantity within the range of the High Reasonability Limit (HRL) and Low Reasonability Limit (LRL), which are described in the Resource Registration Glossary and provided in Resource Registration data. The first price/quantity pair for both the Incremental and Decremental Energy Offer Curves must provide an energy price at LRL and the last price/quantity pair must provide a price at HRL. At every MW value of the curves, the price of the Incremental Energy Offer Curve must be greater than the Decremental Energy Offer Curve. Incremental and Decremental Energy Offer Curves are subject to the same requirements for the same criteria and validations performed by ERCOT as provided in Section 4.4.9, Energy Offers and Bids.

***6.4.6 Resource Status***

(1) ERCOT shall use the telemetered Resource Status for all applications requiring status of Resources during the Operating Hour, including SCED and Load Frequency Control (LFC). QSEs shall provide ERCOT with accurate telemetry of the current capability of each Resource including the Resource Status, Ancillary Service capability for each Ancillary Service, Ramp Rates, HSL, and LSL.

(2) ERCOT shall perform the following validations during the Operating Period:

(a) Each QSE shall provide the Real-Time operating status of each Resource to ERCOT by telemetry using the status codes in the COP for Real-Time as described in Section 3.9, Current Operating Plan (COP); and

(b) Five minutes before the end of each hour, ERCOT shall identify inconsistencies between the telemetered Resource Status and the Resource Status stated in the COP for that Resource in the next hour. On detecting an inconsistency, ERCOT shall provide a notice of inconsistent Resource Status to the QSE using the Messaging System.

***6.4.7 QSE-Requested Decommitment of Resources***

(1) A Resource must remain committed during any Reliability Unit Commitment (RUC)-Committed Interval or RUC Buy-Back Hour unless the Resource has a Forced Outage.

(2) In the Operating Period, a QSE may request to decommit a Resource other than a Quick Start Generation Resource (QSGR) for any interval that is not a RUC-Committed Interval or RUC Buy-Back Hour by verbally requesting ERCOT to consider its request.

(3) In the Operating Period, a QSE may decommit a QSGR without any request for any interval that is neither a RUC-Committed Interval, a RUC Buy-Back Hour, nor an interval in which a manual override by the ERCOT Operator has been given.

(4) In the Adjustment Period, a QSE may request to decommit a Resource for any interval that is not a RUC-Committed Interval or RUC Buy-Back Hour by indicating a change in unit status in the QSE’s COP, unless the Resource received a Weekly Reliability Unit Commitment (WRUC) instruction for the hour. A QSE may request to decommit a Resource for any interval that is a WRUC-instructed Interval and that is not a RUC-Committed Interval or RUC Buy-Back Hour by verbally requesting ERCOT to consider its request.

**6.4.7.1 QSE Request to Decommit Resources in the Operating Period**

(1) For a request made during the Operating Period to decommit a Resource, ERCOT may perform a study using Real-Time conditions to determine if ERCOT will remain n-1 secure with that Resource Off-Line. ERCOT may grant the request provided the analysis indicates the Resource Outage contingency results in no additional active constraints for SCED. ERCOT may only approve requests that do not have a reliability impact.

(2) If more units are requesting decommitment than can be accommodated, ERCOT shall review the requests in order of receipt.

***6.4.9 Real-Time Ancillary Service Offers and Awards***

**6.4.9.1 Ancillary Service Offers**(1) A detailed description of the Ancillary Service Offers and validations performed by ERCOT is in Section 4.4.7.2, Ancillary Service Offers.

(2) QSEs may update their Ancillary Service Offers in Real-Time. SCED shall use the latest updated Ancillary Service Offers available to it at the time of the SCED execution.

***6.4.9.1.1 Ancillary Service Awards***(1) Ancillary Service awards will be based on to Resource capability (qualification, operating limits, Ancillary Service limits, ramp rates, 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 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 MIS Public Area 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 Market Clearing Prices for Capacity (MCPCs) are immediately binding upon the completion of a SCED run.

**6.4.9.1.2 Changes to Operating Day Ancillary Service Plan**

(1) Any time during the Adjustment Period or Operating Period, if ERCOT determines that additional Ancillary Services are needed, ERCOT will publish an operations message of ERCOT’s need to procure additional Ancillary Service. ERCOT will also update the Ancillary Service Plan, as described in Section 4.2.1, Ancillary Service Plan and Ancillary Service Obligation and update and post ASDCs accordingly. (2) Upon publishing the operations message regarding ERCOT’s need to procure additional Ancillary Service, ERCOT will update ASDCs for each impacted Ancillary Service product.











**6.5.1.1 ERCOT Control Area Authority**

(1) ERCOT, as Control Area Operator (CAO), is authorized to perform the following actions for the limited purpose of securely operating the ERCOT Transmission Grid under the standards specified in North American Electric Reliability Corporation (NERC) Standards, the Operating Guides and these Protocols,including:

(a) Direct the physical operation of the ERCOT Transmission Grid, including circuit breakers, switches, voltage control equipment, and Load-shedding equipment;

(b) Dispatch Resources that have been awarded Ancillary Services;

(c) Direct changes in the operation of voltage control equipment;

(d) Direct the implementation of Reliability Must-Run (RMR) Service, Remedial Action Plans (RAPs), Automatic Mitigation Plans (AMPs), Remedial Action Schemes (RASs), and transmission switching to prevent the violation of ERCOT Transmission Grid security limits; and

(e) Perform additional actions required to prevent an imminent Emergency Condition or to restore the ERCOT Transmission Grid to a secure state in the event of an ERCOT Transmission Grid Emergency Condition.

(2) Consistent with paragraph (1)(e) above, if ERCOT seeks to exercise its authority to prevent an anticipated Emergency Condition relating to serving Load in the current or next Season by procuring existing capacity that may be used to maintain ERCOT System reliability in a manner not otherwise delineated in these Protocols and the Operating Guides, ERCOT shall take the following actions:

(a) Upon determination by ERCOT that additional capacity is needed to prevent an Emergency Condition and prior to any procurement activity associated with such additional capacity, ERCOT shall issue a Notice as soon as practicable with the following information:

(i) A detailed description of the reliability condition and need for additional capacity as determined by ERCOT and the timing of the proposed procurement;

(ii) Justification for the quantity of additional capacity to be requested;

(iii) Identification of potential Generation Resources or Load providing capacity considered by ERCOT to be acceptable for providing the additional capacity. Load capacity may be provided by Entities who, at ERCOT’s direction, would interrupt consumption of electric power and remain interrupted until released by ERCOT; and

(iv) A schedule of activities associated with the proposed procurement.

(b) If ERCOT identifies a specific Entity with which it will negotiate the terms for procurement of additional capacity, then ERCOT shall issue a Notice as soon as practicable that includes the Entity name and, as applicable, the Resource mnemonic, the Resource MW rating by Season, the name of the Resource Entity, and the potential duration of any contract, including anticipated start and end dates.

(c) ERCOT shall, to the fullest extent practicable, ensure that any actions taken to procure additional capacity meet the following criteria:

(i) Any capacity procured pursuant to this paragraph will be procured using an open process, and the terms of the procurement between ERCOT and the Entity will be memorialized in contracts that will be publicly available for inspection on the ERCOT website.

(ii) Each contract will include specified financial terms and termination dates. For purposes of Settlement, any contract associated with a Generation Resource will include substantially the same terms and conditions as an RMR Unit under a RMR Agreement, including the Eligible Cost budgeting process.

(iii) ERCOT shall provide notice to the ERCOT Board, at the next ERCOT Board meeting after ERCOT has signed the contract, that the actions required prior to execution of the contract, pursuant to paragraphs (2)(a) through (c) above, were completed by ERCOT before the contract was executed.

(iv) Any information submitted by the Entity to ERCOT through the procurement process may be designated as Protected Information and treated in accordance with the provisions of Section 1.3, Confidentiality, provided that final contract terms must be made available for public inspection.

(d) A Generation Resource that has received capital contributions from ERCOT pursuant to a contract executed under this paragraph (2) may not participate in the energy or Ancillary Services markets until such capital contributions have been refunded to ERCOT. For the purposes of this Section, capital contributions are defined as improvements with an asset life greater than one year under the applicable federal tax rules. The Resource Entity’s refund of capital contributions shall be a lump sum payment calculated as follows:

(i) If the Generation Resource chooses to participate in the energy or Ancillary Service markets after the termination date of the contract executed under this paragraph (2), the Qualified Scheduling Entity (QSE) representing the Resource Entity shall repay, in a lump sum payment, 100% of the book value of the capitalized equipment and all installation charges leading to turn key, one-time startup based on a linear depreciation over the estimated life of the capitalized component(s) in accordance with Generally Accepted Accounting Principles (GAAP) standards for electric utility equipment. The estimated life shall be based on documentation provided by the manufacturer; if installing used equipment, the estimated life may be based on an approximation agreed to by the Resource Entity and ERCOT.

(ii) If the Generation Resource chooses to participate in the energy or Ancillary Services markets as contemplated in item (2)(d)(i) above, and its participation requires a lump sum payment of capital contributions, ERCOT will issue a notice to all registered Market Participants announcing the Generation Resource’s decision to participate in the market(s) and identifying the amount of the lump sum payment due pursuant to item (2)(d)(i) above. ERCOT will also issue a notice to all registered Market Participants after completion of the collection and disbursement of the capital contributions, as described in item (2)(d)(iii) below, and after resolution of any disputes related to these capital contributions.

(iii) After ERCOT receives a Notification of Change of Generation Resource Designation (Section 22, Attachment H, Notification of Change of Generation Resource Designation) changing the Resource designation to “operational” at a future date, ERCOT shall charge the QSE representing the Resource Entity for capital expenditures incurred and previously paid to the Resource Entity as a result of the Resource’s return to service pursuant to this Section.

(A) For months in the contract term where notice is received more than five Business Days prior to True-Up Settlement of the first Operating Day of that month, ERCOT shall claw back any payments made for the capital expenditure associated with that month and subsequent months of the term, on the next practical Settlement but no later than the True-Up Settlement.

(B) For months in the contract term where notice is received five Business Days or less prior to True-Up Settlement of the first Operating Day of that month, ERCOT shall claw back any payments made for the capital expenditures within 45 days of receipt of the notice.

(C) ERCOT shall distribute the repayment to QSEs representing Load on the same basis used to collect the monthly capital expenditures, using a monthly Load Ratio Share (LRS). A QSE’s monthly LRS shall be the QSE’s total Real-Time Adjusted Metered Load (AML) for the month divided by the total ERCOT Real-Time AML for the same month.

(e) ERCOT shall endeavor to minimize the deployment of capacity procured pursuant to this paragraph with the goal of reducing the potential distortion of markets. Resources and Loads deployed to alleviate imminent Emergency Conditions will not be offered into the Day-Ahead Market (DAM). Rather, ERCOT will determine whether to use the capacity as part of the Hourly Reliability Unit Commitment (HRUC) process based on system conditions and the ability to meet Demand. In the event Generation Resources are committed and On-Line, ERCOT systems will generate a proxy offer for the Generation Resource at the Real-Time System-Wide Offer Cap (RTSWCAP). The default offer will place the Generation Resources among the last for economic Dispatch, so as not to displace Generation Resources that are On-Line and offering into the market. To the extent practicable, the capacity deployed to alleviate imminent Emergency Conditions will not be used solely for the purpose of reducing local congestion.

(f) An Entity cannot be compelled to enter into a contract under this paragraph.

**6.5.1.2 Centralized Dispatch**

(1) ERCOT shall centrally Dispatch Resources and Transmission Facilities under these Protocols, including deploying energy by establishing Base Points, and Emergency Base Points, and by deploying Regulation Service, Responsive Reserve (RRS) service, and Non-Spinning Reserve (Non-Spin) service to ensure operational security.

|  |
| --- |
| ***[NPRR863: Replace paragraph (1) above with the following upon system implementation:]***  (1) ERCOT shall centrally Dispatch Resources and Transmission Facilities under these Protocols, including deploying energy by establishing Base Points, and Emergency Base Points, and by deploying Regulation Service, ERCOT Contingency Reserve Service (ECRS), and Non-Spinning Reserve (Non-Spin) service to ensure operational security. Responsive Reserve (RRS) shall be self-deployed in response to frequency deviations or as specified in Nodal Operating Guide Section 4.8, Responsive Reserve Service During Scarcity Conditions. |

(2) ERCOT shall verify that either an Energy Offer Curve providing prices for the Resource between its High Sustained Limit (HSL) and Low Sustained Limit (LSL) or an Output Schedule has been submitted for each On-Line Resource an hour before the end of the Adjustment Period for the upcoming Operating Hour. ERCOT shall notify QSEs that have not submitted an Output Schedule or Energy Offer Curve through the Market Information System (MIS) Certified Area.

(3) If a Resource is scheduled to be On-Line and available to provide an Ancillary Service, but does not have any Ancillary Service Offers for which the Resource is qualified to provide, then at the end of the Adjustment Period, ERCOT shall notify the Resource’s QSE through the MIS Certified Area.

(4) ERCOT may only issue Dispatch Instructions for the Real-Time operation of Transmission Facilities to a Transmission Service Provider (TSP), for the Real-Time operation of distribution facilities to a Distribution Service Provider (DSP), or for a Resource to the QSE that represents it.

|  |
| --- |
| ***[NPRR857: Replace paragraph (4) above with the following upon system implementation:]***  (4) In Real-Time operations, ERCOT may only issue Dispatch Instructions for Direct Current Ties (DC Ties) to the appropriate Direct Current Tie Operator (DCTO), for Transmission Facilities to a Transmission Service Provider (TSP), for distribution facilities to a Distribution Service Provider (DSP), or for a Resource to the QSE that represents it. |

(5) ERCOT shall post shift schedules on the MIS Secure Area.

**6.5.5.2 Operational Data Requirements**

(1) ERCOT shall use Operating Period data to monitor and control the reliability of the ERCOT Transmission Grid and shall use it in network analysis software to predict the short-term reliability of the ERCOT Transmission Grid. Each TSP, at its own expense, may obtain that Operating Period data from ERCOT or directly from QSEs.

(2) A QSE representing a Generation Resource connected to Transmission Facilities or distribution facilities shall provide the following Real-Time telemetry data to ERCOT for each Generation Resource. ERCOT shall make that data available, in accordance with ERCOT Protocols, NERC Reliability Standards, and Governmental Authority requirements, to requesting TSPs and DSPs operating within ERCOT. Such data must be provided to the requesting TSP or DSP at the requesting TSP’s or DSP’s expense, including:

(a) Net real power (in MW) as measured by installed power metering or as calculated in accordance with the Operating Guides based on metered gross real power and conversion constants determined by the Resource Entity and provided to ERCOT through the Resource Registration process. Net real power represents the actual generation of a Resource for all real power dispatch purposes, including use in Security-Constrained Economic Dispatch (SCED), High Dispatch Limit (HDL), and Low Dispatch Limit (LDL), and is consistent with telemetered HSL, LSL and Frequency Responsive Capacity (FRC);

(b) Gross real power (in MW) as measured by installed power metering or as calculated in accordance with the Operating Guides based on metered real power, which may include Supervisory Control and Data Acquisition (SCADA) metering, and conversions constants determined by the Resource Entity and provided to ERCOT through the Resource Registration process;

(c) Gross Reactive Power (in Megavolt-Amperes reactive (MVAr));

(d) Net Reactive Power (in MVAr);

(e) Power to standby transformers serving plant auxiliary Load;

(f) Status of switching devices in the plant switchyard not monitored by the TSP or DSP affecting flows on the ERCOT Transmission Grid;

(g) Any data mutually agreed to by ERCOT and the QSE to adequately manage system reliability;

(h) Generation Resource breaker and switch status;

(i) HSL (Combined Cycle Generation Resources) shall:

(i) Submit the HSL of the current operating configuration; and

(ii) When providing RRS, update the HSL as needed, to be consistent with Resource performance limitations of RRS provision;

|  |
| --- |
| ***[NPRR863: Replace item (ii) above with the following upon system implementation:]***  (ii) When providing ECRS, update the HSL as needed, to be consistent with Resource performance limitations of ECRS provision; |

(j) For Resources that have capacity that is not capable of providing Primary Frequency Response (PFR), the current Frequency Responsive Capacity (FRC) of the Resource;

(k) High Emergency Limit (HEL), under Section 6.5.9.2, Failure of the SCED Process;

(l) Low Emergency Limit (LEL), under Section 6.5.9.2;

(m) LSL;

(n) Configuration identification for Combined Cycle Generation Resources;

(o) For Resources that have capacity that is not capable of providing PFR, the high and low limits in MW of the Resource’s capacity that is frequency responsive;

(p) For RRS, including any sub-categories of RRS, the physical capability (in MW) of the Resource to provide RRS;

(q) For Ancillary Services other than RRS, a blended Normal Ramp Rate (in MW/min) that reflects the physical capability of the Resource to provide that specific type of Ancillary Service;

(r) Five-minute blended Normal Ramp Rates (up and down); and







(s) The designated Master QSE of a Generation Resource that has been split to function as two or more Split Generation Resources shall provide Real-Time telemetry for items (a), (b), (c), (d), (e), (g), and (h) above, PSS and AVR status for the total Generation Resource in addition to the Split Generation Resource the Master QSE represents.

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

(4) For each Aggregate Generation Resource (AGR), the QSE shall telemeter the number of its generators online.

(5) A QSE representing a Load Resource connected to Transmission Facilities or distribution facilities shall provide the following Real-Time data to ERCOT for each Load Resource and ERCOT shall make the data available, in accordance with ERCOT Protocols, NERC standards and policies, and Governmental Authority requirements, to the Load Resource’s host TSP or DSP at the TSP’s or DSP’s expense. The Load Resource’s net real power consumption, Low Power Consumption (LPC) and Maximum Power Consumption (MPC) shall be telemetered to ERCOT using a positive (+) sign convention:

(a) Load Resource net real power consumption (in MW);

(b) Any data mutually agreed to by ERCOT and the QSE to adequately manage system reliability;

(c) Load Resource breaker status;

(d) LPC (in MW);

(e) MPC (in MW);

(f) The Load Resource’s Ancillary Service self provision (in MW) for RRS and/or ECRS provided via under-frequency relay;







(g) The status of the high-set under-frequency relay, if required for qualification;

(h) For a Controllable Load Resource providing Non-Spin, the Scheduled Power Consumption that represents zero Ancillary Service deployments;

(i) For a single-site Controllable Load Resource with registered maximum Demand response capacity of ten MW or greater, net Reactive Power (in MVAr);

(j) Resource Status;

(k) For a Controllable Load Resource providing Non-Spin, the “Scheduled Power Consumption Plus Two Hours,” representing the QSE’s forecast of the Controllable Load Resource’s instantaneous power consumption for a point two hours in the future;

(l) For RRS, including any sub-categories of RRS, the current physical capability (in MW) of the Resource to provide RRS;

(m) For Ancillary Service products other than RRS, a blended Normal Ramp Rate (in MW/min) that reflects the current physical capability of the Resource’s ability to provide a particular Ancillary Service product; and

(n) For a Controllable Load Resource, 5-minute blended Normal Ramp Rates (up and down).

(6) A QSE with Resources used in SCED shall provide communications equipment to receive ERCOT-telemetered control deployments.

(7) A QSE providing any Regulation Service shall provide telemetry indicating the appropriate status of Resources providing Reg-Up or Reg-Down, including status indicating whether the Resource is temporarily blocked from receiving Reg-Up and/or Reg-Down deployments from the QSE. This temporary blocking will be indicated by the enabling of the Raise Block Status and/or Lower Block Status telemetry points.

(a) Raise Block Status and Lower Block Status are telemetry points used in transient unit conditions to communicate to ERCOT that a Resource’s ability to adjust its output has been unexpectedly impaired.

(b) When one or both of the telemetry points are enabled for a Resource, ERCOT will cease using the regulation capacity assigned to that Resource for Ancillary Service deployment.

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

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

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

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

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

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

(a) Combustion turbine inlet air cooling methods;

(b) Duct firing;

(c) Other ways of temporarily increasing the output of Combined Cycle Generation Resources; and

(d) For Qualifying Facilities (QFs), an LSL that represents the minimum energy available for Dispatch by SCED, in MW, from the Combined Cycle Generation Resource based on the minimum stable steam delivery to the thermal host plus a justifiable reliability margin that accounts for changes in ambient conditions.

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

(12) A QSE representing an Energy Storage Resource (ESR) shall provide the following Real-Time telemetry data to ERCOT for each ESR:

(a) Maximum Operating State of Charge, in MWh;

(b) Minimum Operating State of Charge, in MWh;

(c) State of Charge, in MWh;

(d) Maximum Operating Discharge Power Limit, in MW; and

(e) Maximum Operating Charge Power Limit, in MW.

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

|  |
| --- |
| ***[NPRR829: Insert paragraph (14) below upon system implementation:]***  (14) A QSE representing a Settlement Only Generator (SOG) that elects to include the net generation of the SOG in the estimate of Real-Time Liability (RTL) shall provide ERCOT Real-Time telemetry of the net generation of the SOG. |

|  |
| --- |
| ***[NPRR885: Insert paragraph (15) below upon system implementation:]***  (15) A QSE representing a Must-Run Alternative (MRA) shall telemeter the MRA MW currently available (unloaded) and not included in the HSL. |

***6.5.7 Real-Time Sequence Methodology***

(1) This Section outlines the programmatic and manual processes employed by ERCOT to simultaneously achieve power balance (minimizing the use of Regulation Service), determine Ancillary Service awards, and manage congestion while operating within the constraints of the system at economically optimized cost. The Real-Time Sequence describes the key system components and inputs that are required to support the SCED process, which produces the Locational Marginal Prices (LMPs), Base Points, Ancillary Service MCPCs, and Ancillary Service awards while meeting transmission system constraints. Section 6.5.7.3, Security Constrained Economic Dispatch, provides further details regarding additional components and inputs and ex-ante mitigation.

***6.5.7.1.12 Resource Limits***

(1) The following Generation Resource limits are calculated by ERCOT and used as inputs by the SCED process:

(a) Normal Ramp Rate based on the values telemetered by the QSE to ERCOT, which represents the current ability of the Resource to follow a Base Point instruction;

(b) Emergency Ramp Rate based on the values telemetered by the QSE to ERCOT;

(c) HDL, which represents a dynamically calculated MW upper limit on a Resource that describes the maximum capability of the Resource’s SCED dispatch and limits the amount of Reg-Up that can be awarded to the Resource for the next five minutes (the Resource’s Real-Time generation plus the product of the Normal Ramp Rate, as telemetered by the QSE, multiplied by five), restricted by HSL; and

(d) LDL, which represents a dynamically calculated MW lower limit on a Resource that describes the minimum capability of the Resource’s SCED dispatch and limits the amount of Reg-Down that can be awarded to the Resource for the next five minutes (the Resource’s Real-Time generation minus the product of the Normal Ramp Rate, as telemetered by the QSE, multiplied by five), restricted by LSL.

(2) The following Load Resource limits are calculated by ERCOT for Controllable Load Resources qualified to be dispatched by SCED and used in other calculations and as information for ERCOT Operators:

(a) Normal Ramp Rate based on the values telemetered by the QSE to ERCOT, which represents the current ability of the Resource to follow a SCED Base Point instruction;

(b) Emergency Ramp Rate based on the values telemetered by the QSE to ERCOT;

(c) HDL, which represents a dynamically calculated MW upper limit on a Resource that describes the maximum capability of the Resource SCED dispatch and limits the amount of Reg-Down that can be awarded to the Resource for the next five minutes (the Resource’s Real-Time consumption plus the product of the Normal Ramp Rate, as telemetered by the QSE, multiplied by five), restricted by HSL; and

(d) LDL, which represents a dynamically calculated MW lower limit on a Resource that describes the minimum capability of the Resource SCED dispatch and limits the amount of Reg-Up that can be awarded to the Resource for the next five minutes (the Resource’s Real-Time consumption minus the product of the Normal Ramp Rate, as telemetered by the QSE, multiplied by five), restricted by LSL.

(3) For a more detailed explanation of all the Resource limits calculated by ERCOT, please reference Section 6.5.7.2, Resource Limit Calculator.

***6.5.7.1.13 Data Inputs and Outputs for the Real-Time Sequence and SCED***

(1) Inputs: The following information must be provided as inputs to the Real-Time Sequence and SCED. ERCOT may require additional information as required, including:

(a) Real-Time data from TSPs including status indication for each point if that data element is stale for more than 20 seconds;

|  |
| --- |
| ***[NPRR857: Replace paragraph (a) above with the following upon system implementation:]***  (a) Real-Time data from TSPs and DCTOs including status indication for each point if that data element is stale for more than 20 seconds; |

(i) Transmission Electrical Bus voltages;

(ii) MW and MVAr pairs for all transmission lines, transformers, and reactors;

(iii) Actual breaker and switch status for all modeled devices; and

(iv) Tap position for auto-transformers;

(b) State Estimator results (MW and MVAr pairs and calculated MVA) for all modeled Transmission Elements;

(c) Transmission Element ratings from TSPs;

|  |
| --- |
| ***[NPRR857: Replace paragraph (c) above with the following upon system implementation:]***  (c) Transmission Element ratings from TSPs and DCTOs; |

(i) Data from the Network Operations Model:

(A) Transmission lines – Normal, Emergency, and 15-Minute Ratings (MVA); and

(B) Transformers and Auto-transformers – Normal, Emergency, and 15-Minute Ratings (MVA) and tap position limits;

(ii) Data from QSEs:

(A) Generator Step-Up (GSU) transformers tap position;

(B) Resource HSL (from telemetry); and

(C) Resource LSL (from telemetry); and

(d) Real-Time weather, from Wind-powered Generation Resources (WGRs), and where available from TSPs or other sources. ERCOT may elect to obtain other sources of weather data and may utilize such information to calculate the dynamic limit of any Transmission Element.

|  |
| --- |
| ***[NPRR857: Replace paragraph (d) above with the following upon system implementation:]***  (d) Real-Time weather, from Wind-powered Generation Resources (WGRs), and where available from TSPs, DCTOs, or other sources. ERCOT may elect to obtain other sources of weather data and may utilize such information to calculate the dynamic limit of any Transmission Element. |

(2) Outputs for ERCOT Operator information and possible action include:

(a) Operator notification of any change in status of any breaker or switch;

(b) Lists of all breakers and switches not in their normal position;

(c) Operator notification of all Transmission Element overloads detected from telemetered or State-Estimated data;

(d) Operator notification of all Transmission Element security violations; and

(e) Operator summary displays:

(i) Transmission system status changes;

(ii) Overloads;

(iii) System security violations; and

(iv) Base Points.

(3) Every hour, ERCOT shall post on the MIS Secure Area the following information:

(a) Status of all breakers and switches used in the NSA except breakers and switches connecting Resources to the ERCOT Transmission Grid;

(b) All binding transmission constraints and the contingency or overloaded element pairs that caused such constraint; and

(c) Shift Factors, including Private Use Network Settlement Points, by Resource Node, Hub, Load Zone, and DC Tie.

(4) Sixty days after the applicable Operating Day, ERCOT shall post on the MIS Secure Area, the following information:

(a) Hourly transmission line flows and voltages from the State Estimator, excluding transmission line flows and voltages for Private Use Networks; and

(b) Hourly transformer flows, voltages and tap positions from the State Estimator, excluding transformer flows, voltages, and tap positions for Private Use Networks.

(5) Notwithstanding paragraph (4) above, ERCOT, in its sole discretion, shall release relevant State Estimator data less than 60 days after the Operating Day if it determines the release is necessary to provide complete and timely explanation and analysis of unexpected market operations and results or system events including, but not limited to, pricing anomalies, recurring transmission congestion, and system disturbances. ERCOT’s release of data under this paragraph shall be limited to intervals associated with the unexpected market or system event as determined by ERCOT. The data release shall be made available simultaneously to all Market Participants.

(6) Every hour, ERCOT shall post on the MIS Public Area, the sum of ERCOT generation, and flow on the DC Ties, all from the State Estimator.

(7) After every SCED run, ERCOT shall post to the MIS Public Area the sum of the HDL and the sum of the LDL for all Generation Resources On-Line and Dispatched by SCED.

(8) Sixty days after the applicable Operating Day, ERCOT shall post to the MIS Public Area the summary LDL and HDL report from paragraph (7) above and include instances of manual overrides of HDL or LDL, including the name of the Generation Resource and the type of override.

(9) No sooner than sixty days after the applicable Operating Day, ERCOT shall provide to the appropriate TAC subcommittee instances of manual overrides of HDL or LDL, including the name of the Generation Resource, the reason for the override, and, as applicable, the cost as calculated in Section 6.6.3.7, Real-Time High Dispatch Limit Override Energy Payment.

(10) After every SCED run, ERCOT shall post to the MIS Certified Area, for any QSE, instances of a manual override of the HDL or LDL for a Generation Resource, including the original and overridden HDL or LDL.

**6.5.7.2 Resource Limit Calculator**

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























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

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

**HDL = POWERTELEM – (NORMRAMPDN \* 5)**

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

**HDL = Min (POWERTELEM + (NORMRAMPUP\* 5),HSL)**

|  |  |
| --- | --- |
| **Variable** | **Description** |
| HDL | High Dispatch Limit. |
| POWERTELEM | Gross or net real power provided via telemetry. |
| NORMRAMPDN | 5-minute blended Normal Ramp Rate down, as telemetered by the QSE. |
| NORMRAMPUP | 5-minute blended Normal Ramp Rate up, as telemetered by the QSE. |
| HSLTELEM | High Sustained Limit (HSL) provided via telemetry – per Section 6.5.5.2.   |  | | --- | | ***[NPRR879: Replace the description above with the following upon system implementation:]***  For IRRs qualified to provide an Ancillary Service and telemetering a non-zero capability to provide that Ancillary Service, and all IRRs within an IRR Group where any IRR within the IRR Group is qualified to provide an Ancillary Service and telemetering a non-zero capability to provide that Ancillary Service, HSLTELEM shall be the five-minute intra-hour forecast for the Resource. For all other Resources, HSLTELEM shall be the Resource’s HSL provided to ERCOT via telemetry, in accordance with Section 6.5.5.2. | |

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

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

**LDL = POWERTELEM + (NORMRAMPUP\* 5)**

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

**LDL = Max (POWERTELEM - (NORMRAMPDN \* 5),LSL)**

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



























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

**HDL = Min (POWERTELEM + (NORMRAMPDN \* 5),HSL)**

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

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

**LDL = Max (POWERTELEM - (NORMRAMPUP \* 5),LSL)**

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

**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 MCPCs approximately every five minutes, or more frequently if required. 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, 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. An RTM Energy Bid represents the bid for energy distributed across all nodes in the Load Zone in which the Controllable Load Resource is located.

|  |
| --- |
| [NPRR986: Replace paragraph (1) above with the following upon system implementation:]  (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 MCPCs approximately every five minutes, or more frequently if required. 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, 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. |

(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 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 | RTSWCAP |
| Output Schedule MW plus 1 MW | RTSWCAP 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 | $1,500 |
| Zero | $1,500 |

(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 $1,500 or price associated with the highest MW in QSE submitted Energy Offer Curve |
| Energy Offer Curve | Greater of $1,500 or the QSE submitted Energy Offer Curve |
| Zero | Greater of $1,500 or the first price point of the QSE submitted Energy Offer Curve |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR930: Insert paragraph (iii) below upon system implementation:]***  (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. | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR884: Insert paragraphs (iv) and (v) below upon system implementation:]***  (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 | $1,500 | | Zero | $1,500 |   (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 $1,500 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 $1,500 or the QSE submitted Energy Offer Curve | | HSL of QSE-committed configuration (if more than highest MW in Energy Offer Curve) | Greater of $1,500 or 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 Energy Storage Resources, 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 MIS Public Area.

(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 $1,500/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) $1,500/MWh.

(6) 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 or proxy Ancillary Service Offer.

(7) 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 |

(8) 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.

(9) A Controllable Load Resource with a telemetered status of OUTL 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.

|  |
| --- |
| [NPRR986: Replace paragraph (9) above with the following upon system implementation:]  (9) 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 Energy Storage Resources (ESRs). |

(10) 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.

(11) 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.

(12) 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 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, 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 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;

|  |
| --- |
| [NPRR986: Replace paragraph (ii) above with the following upon system implementation:]  (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; |

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

(iv) 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.

(13) For each SCED process, in addition to the binding Base Points, Ancillary Service awards, 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 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)(l) 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, Ancillary Service MCPCs, Real-Time Reliability Deployment Price Adders, Hub LMPs and Load Zone LMPs on the MIS Public Area pursuant to Section 6.3.2, Activities for Real-Time Operations.

(14) 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.

|  |
| --- |
| [NPRR986: Insert paragraph (15) below upon system implementation:]  (15) 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. |

**6.5.7.3.1Determination of Real-Time Reliability Deployment Price Adders**

(1) The following categories of reliability deployments are considered in the determination of the Real-Time Reliability Deployment Price Adder for Energy, and the Real-Time Reliability Deployment Price Adders for Ancillary Services:

(a) RUC-committed Resources, except for those whose QSEs have opted out of RUC Settlement in accordance with paragraph (12) of Section 5.5.2, Reliability Unit Commitment (RUC) Process;

(b) RMR Resources that are On-Line, including capacity secured to prevent an Emergency Condition pursuant to paragraph (2) of Section 6.5.1.1, ERCOT Control Area Authority;

(c) Deployed Load Resources other than Controllable Load Resources;

(d) Deployed Emergency Response Service (ERS);

(e) Real-Time DC Tie imports during an EEA where the total adjustment shall not exceed 1,250 MW in a single interval;

(f) Real-Time DC Tie exports to address emergency conditions in the receiving electric grid;

|  |
| --- |
| ***[NPRR904: Replace items (e) and (f) above with the following upon system implementation and renumber accordingly:]***  (e) ERCOT-directed DC Tie imports during an EEA or transmission emergency where the total adjustment shall not exceed 1,250 MW in a single interval;  (f) ERCOT-directed curtailment of DC Tie imports below the higher of DC Tie advisory import limit as of 0600 in the Day-Ahead or subsequent advisory import limit to address local transmission system limitations where the total adjustment shall not exceed 1,250 MW in a single interval;  (g) ERCOT-directed curtailment of DC Tie imports below the higher of DC Tie advisory import limit as of 0600 in the Day-Ahead or subsequent advisory import limit due to an emergency action by a neighboring system operator during an emergency that is accommodated by ERCOT where the total adjustment shall not exceed 1,250 MW in a single interval;  (h) ERCOT-directed DC Tie exports to address emergency conditions in the receiving electric grid where the total adjustment shall not exceed 1,250 MW in a single interval;  (i) ERCOT-directed curtailment of DC Tie exports below the DC Tie advisory export limit as of 0600 in the Day-Ahead or subsequent advisory export limit during EEA, a transmission emergency, or to address local transmission system limitations where the total adjustment shall not exceed 1,250 MW in a single interval; |

(g) Energy delivered to ERCOT through registered Block Load Transfers (BLTs) during an EEA; and

(h) Energy delivered from ERCOT to another power pool through registered BLTs during emergency conditions in the receiving electric grid.

(2) The Real-Time Reliability Deployment Price Adder for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Services are estimations of the impact to energy prices and MCPCs due to the above categories of reliability deployments. For intervals where there are reliability deployments as described in paragraph (1) above, the Real-Time Reliability Deployment Price Adder for Energy and Real-Time Reliability Deployment Price Adders for Ancillary Services are determined as follows:

(a) For RUC-committed Resources with a telemetered Resource Status of ONRUC and for RMR Resources that are On-Line:

(i) Set the LSL and LDL to zero;

(ii) Remove all Ancillary Service Offers; and

(iii) For the first step of SCED, administratively set the Energy Offer Curve for the Resource at a value equal to the Power Balance Penalty Price (PBPP) for all capacity between 0 MW and the HSL of the Resource.

|  |
| --- |
| ***[NPRR884: Insert paragraph (b) below upon system implementation and renumber accordingly:]***  (b) Notwithstanding item (a) above, for RUC-committed Combined Cycle Generation Resources with a telemetered Resource Status of ONRUC that were instructed by ERCOT to transition to a different configuration to provide additional capacity:  (i) Set the LSL and LDL equal to the minimum of their current value and the COP HSL of the QSE-committed configuration for the RUC hour at the snapshot time of the RUC instruction;  (ii) Set the maximum Ancillary Service capabilities of the Resource equal to the minimum of their current value and COP Ancillary Service capabilities of the QSE-committed configuration for the RUC hour at the snapshot time of the RUC instruction; and  (iii) For the first step of SCED, administratively set the Energy Offer Curve for the Resource at a value equal to the Power Balance Penalty Price (PBPP) for the additional capacity of the Resource, defined as the positive difference between the Resource’s current telemetered HSL and the COP HSL of the QSE-committed configuration for the RUC hour at the snapshot time of the RUC instruction. |

(b) For all other Generation Resources excluding ones with a telemetered status of ONRUC, ONTEST, STARTUP, SHUTDOWN, and also excluding RMR Resources that are On-Line and excluding Generation Resources with a telemetered output less than 95% of LSL:

(i) Set LDL to the greater of Aggregated Resource Output - (60 minutes \* Normal Ramp Rate down), or LSL; and

(ii) Set HDL to the lesser of Aggregated Resource Output + (60 minutes\*Normal Ramp Rate up), or HSL.

|  |
| --- |
| ***[NPRR904: Replace paragraph (b) above with the following upon system implementation:]***  (b) For all other Generation Resources excluding ones with a telemetered status of ONRUC, ONTEST, STARTUP, SHUTDOWN, and also excluding RMR Resources that are On-Line and excluding Generation Resources with a telemetered output less than 95% of LSL:  (i) If the Generation Resource SCED Base Point is not at LDL, set LDL to the greater of Aggregated Resource Output - (60 minutes \* Normal Ramp Rate down), or LSL; and  (ii) If the Generation Resource SCED Base Point is not at HDL, set HDL to the lesser of Aggregated Resource Output + (60 minutes \* Normal Ramp Rate up), or HSL. |

(c) For all Controllable Load Resources excluding ones with a telemetered status of OUTL:

(i) Set LDL to the greater of Aggregated Resource Output - (60 minutes \* Normal Ramp Rate up), or LSL; and

(ii) Set HDL to the lesser of Aggregated Resource Output + (60 minutes\*Normal Ramp Rate down), or HSL.

|  |
| --- |
| ***[NPRR904: Replace paragraph (c) above with the following upon system implementation:]***  (c) For all Controllable Load Resources excluding ones with a telemetered status of OUTL:  (i) If the Controllable Load Resource SCED Base Point is not at LDL, set LDL to the greater of Aggregated Resource Output - (60 minutes \* Normal Ramp Rate up), or LSL; and  (ii) If the Controllable Load Resource SCED Base Point is not at HDL, set HDL to the lesser of Aggregated Resource Output + (60 minutes \* Normal Ramp Rate down), or HSL. |

(d) Add the deployed MW from Load Resources other than Controllable Load Resources to GTBD linearly ramped over the 10-minute ramp period. The amount of deployed MW is calculated from the Resource telemetry and from applicable deployment instructions in Extensible Markup Language (XML) messages. ERCOT shall generate a linear bid curve defined by a price/quantity pair of $300/MWh for the first MW of Load Resources deployed and a price/quantity pair of $700/MWh for the last MW of Load Resources deployed in each SCED execution. After recall instruction, the amount of MW added to GTBD during the restoration period will be determined by validated telemetry. The TAC shall review the validity of the prices for the bid curve at least annually.

(e) Add the deployed MW from ERS to GTBD. The amount of deployed MW is determined from the XML messages and ERS contracts. After recall, an approximation of the amount of un-restored ERS shall be used. After ERCOT recalls each group, GTBD shall be adjusted to reflect the restoration of load using a linear curve over the ten hour restoration period. The restoration period shall be reviewed by TAC at least annually, and ERCOT may recommend a new restoration period to reflect observed historical restoration patterns.

(f) Add the MW from Real-Time DC Tie imports during an EEA to GTBD. The amount of MW is determined from the Dispatch Instruction and should continue over the duration of time specified by the ERCOT Operator.

(g) Subtract the MW from Real-Time DC Tie exports to address emergency conditions in the receiving electric grid from GTBD. The amount of MW is determined from the Dispatch Instruction and should continue over the duration of time specified by the receiving grid operator.

|  |
| --- |
| ***[NPRR904: Replace paragraphs (f) and (g) above with the following upon system implementation and renumber accordingly:]***  (f) Add the MW from DC Tie imports during an EEA or transmission emergency, to address local transmission system limitations, or due to an emergency action by a neighboring system operator during an emergency that is accommodated by ERCOT to GTBD. The amount of MW is determined from the Dispatch Instruction and should continue over the duration of time specified by the ERCOT Operator.  (g) Add the MW from DC Tie export curtailments during an EEA or transmission emergency, to address local transmission system limitations, or due to an emergency action by a neighboring system operator during an emergency that is accommodated by ERCOT to GTBD. The amount of MW is determined from the Dispatch Instruction and should continue over the duration of time specified by the ERCOT Operator. The MW added to GTBD associated with any individual DC Tie shall not exceed the higher of DC Tie advisory limit for exports on that tie as of 0600 in the Day-Ahead or subsequent advisory export limit minus the aggregate export on the DC Tie that remained scheduled following the Dispatch Instruction from the ERCOT Operator.  (h) Subtract the MW from DC Tie exports to address emergency conditions in the receiving electric grid from GTBD. The amount of MW is determined from the Dispatch Instruction and should continue over the duration of time specified by the receiving grid operator.  (i) Subtract the MW from DC Tie import curtailments to address local transmission system limitations or emergency conditions in the receiving electric grid from GTBD. The amount of MW is determined from the Dispatch Instruction and should continue over the duration of time specified by the receiving grid operator. The MW subtracted from GTBD associated with any individual DC Tie shall not exceed the higher of DC Tie advisory limit for imports on that tie as of 0600 in the Day-Ahead or subsequent advisory import limit minus the aggregate import on the DC Tie that remained scheduled following the Dispatch Instruction from the ERCOT Operator. |

(h) Add the MW from energy delivered to ERCOT through registered BLTs during an EEA to GTBD. The amount of MW is determined from the Dispatch Instruction and should continue over the duration of time specified by the ERCOT Operator.

(i) Subtract the MW from energy delivered from ERCOT to another power pool through registered BLTs during emergency conditions in the receiving electric grid from GTBD. The amount of MW is determined from the Dispatch Instruction and should continue over the duration of time specified by the receiving grid operator.

(j) Perform a SCED with changes to the inputs in items (a) through (i) above, considering only Competitive Constraints and the non-mitigated Energy Offer Curves.

(k) Perform mitigation on the submitted Energy Offer Curves using the LMPs from the previous step as the reference LMP.

(l) Perform a SCED with the changes to the inputs in items (a) through (i) above, considering both Competitive and Non-Competitive Constraints and the mitigated Energy offer Curves.

(m) The Real-Time Reliability Deployment Price Adder for Energy is equal to the positive difference between the System Lambda from (2)(l) above and the System Lambda of the second step in the two-step SCED process described in paragraph (10)(b) of Section 6.5.7.3, Security Constrained Economic Dispatch.

(n) For each individual Ancillary Service, the Real-Time Reliability Deployment Price Adder for Ancillary Service is equal to the positive difference between the MCPC for that Ancillary Service from (2)(l) above and the MCPC for that Ancillary Service.

**6.5.7.4.1 Updated Desired Set Points**

(1) Each QSE with a Resource shall follow ERCOT-issued Updated Desired Set Points (UDSPs).

(2) A UDSP is the sum of a calculated MW value representing the expected MW output of a Resource ramping to a SCED Base Point and the Resource-specific Regulation Service instruction from ERCOT.

(3) LFC shall send Resource-specific UDSP to QSEs every four seconds.

(4) Resources, excluding non-Controllable Load Resources, that have been awarded RRS as FFR-capable Load Resources or are telemetering a Resource Status of ONSC, will all have manual deployment instructions included in the UDSP value provided to the QSE for the Resource.

(5) When ERCOT System frequency experiences a 0.05 Hz or greater deviation from 60 Hz, and a Resource is ramping to a SCED Base Point in a manner directionally opposite system frequency, the MW value representing the Resource’s expected MW output during its ramp to a SCED Base Point will be suspended and flagged accordingly.

**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 and posting on the MIS Public Area, updates of calculations every five minutes, which show the Real-Time total system amount of:

(a) RRS capability from:

(i) Generation Resources, in the form 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; and

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

(b) Ancillary Service Resource awards for RRS to:

(i) Generation Resources 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) RRS manually deployed by Resources with a Resource Status of ONSC and Load Resources providing FFR;

|  |
| --- |
| ***[NPRR863: Replace item (c) above with the following upon system implementation and renumber accordingly:]***  (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 awards for ECRS to:  (i) Generation Resources;  (ii) Load Resources excluding Controllable Load Resources; and  (iii) Controllable Load Resources; and  (iv) QSGRs;  (e) ECRS manually deployed by Resources with a Resource Status of ONSC and Load Resources; |

(d) 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;

(e) 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); and

(v) QSGRs;

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

(g) Ancillary Service Resource awards for Reg-Up and Reg-Down;

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

(i) 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 and RRS from Load Resources and the Net Power Consumption minus the Low Power Consumption from Load Resources with a validated Real-Time RRS awards;

|  |
| --- |
| ***[NPRR863: Replace item (vii) above with the following upon system implementation:]***  (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) 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;

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

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

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

(m) 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 Generation

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

with a telemetered status of ONTEST, 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 = ((Hydro-synchronous condenser output)i as qualified by item (8) of Operating Guide Section 2.3.1.2, Additional Operational Details for Responsive Reserve Providers))**

|  |
| --- |
| ***[NPRR863: Replace the formula “PRC3“ above with the following upon system implementation:]***  **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), RRS Ancillary Service Resource award \* 1.5) from all Load Resources controlled by high-set under-frequency relays with an RRS Ancillary Service Resource award)i**





***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

|  |
| --- |
| ***[NPRR863: Replace the formula “PRC4“ above with the following upon system implementation:]***      ***resources***  ***load***  ***online***  ***All***  ***resource***  ***load***  ***online***  ***i***  **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**

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





***resources***

***FFR***

***online***

***All***

***resource***

***FFR***

***online***

***i***

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

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 | Hydro-synchronous condenser output   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  Synchronous condenser output | |
| PRC4 | MW | Capacity from Load Resources controlled by high-set under-frequency relays with an RRS Ancillary Service Resource award   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  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 |
| PRC | MW | Physical Responsive Capability |
| 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 |

(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 MIS Public Area no later than three Business Days after approval.

***6.5.7.6.1 LFC Process Description***

(1) The LFC system corrects system frequency based on the Area Control Error (ACE) algorithm and Good Utility Practice.

(2) The ACE algorithm subtracts the actual frequency in Hz from the scheduled system frequency (normally 60 Hz), and multiplies the result by the frequency bias constant of MW/0.1 Hz. The ACE algorithm then takes that product and subtracts a configurable portion of the sum of the difference between the Updated Desired Set Point (UDSP) and Real-Time net MW output as appropriate. LFC shall ensure that the total reduction will not exceed the system-wide regulation requirement. This calculation produces an ACE value, which is a MW-equivalent correction needed to control the actual system frequency to the scheduled system frequency value.

(3) The LFC module receives inputs from Real-Time telemetry that includes Resource output and actual system frequency. The LFC uses actual Resource information calculated from SCADA to determine available Resource capacity providing Regulation and RRS services.

|  |
| --- |
| ***[NPRR863: Replace paragraph (3) above with the following upon system implementation:]***  (3) The LFC module receives inputs from Real-Time telemetry that includes Resource output and actual system frequency. The LFC uses actual Resource information calculated from SCADA to determine available Resource capacity providing Regulation Service, RRS, and ECRS. |

(4) Based on the ACE MW correction, the LFC issues a set of control signals every four seconds to each Resource providing Regulation and, if required, each Resource providing RRS. Control signals specific to each Resource are provided to the QSE using the ICCP data link. QSEs shall receive a UDSP updated every four seconds by LFC. ERCOT will provide an operations notice of any methodology change to the determination of the UDSP within 60 minutes of the change.

|  |
| --- |
| ***[NPRR863: Replace paragraph (4) above with the following upon system implementation:]***  (4) Based on the ACE MW correction, the LFC issues a set of control signals every four seconds to each Resource providing Regulation and, if required, each Resource providing RRS or ECRS. Control signals to each Resource are provided to the QSE using the ICCP data link. QSEs shall receive an UDSP updated every four seconds by LFC. ERCOT will provide an operations notice of any methodology change to the determination of the UDSP within 60 minutes of the change. |

(5) If all Reg-Up capacity has been deployed, ERCOT shall run off-cycle SCED executions or use the LFC system to deploy RRS for Resources providing FFR or Resources with a Resource Status of ONSC. Such RRS deployments by ERCOT must be deployed as specified in Section 6.5.7.6.2.2, Deployment of Responsive Reserve Service.

|  |
| --- |
| ***[NPRR863: Replace paragraph (5) above with the following upon system implementation:]***  (5) If all Reg-Up capacity has been deployed, ERCOT shall run off-cycle SCED executions or use the LFC system to deploy ECRS on Resources providing FFR or with an ONSC Resource Status. Such ECRS deployments by ERCOT must be deployed as specified in Section 6.5.7.6.2.4, Deployment and Recall of ERCOT Contingency Reserve Service. |

(6) ERCOT shall settle energy that results from LFC deployment at the Settlement Point Price for the point of injection. When a QSE deploys RRS, the QSE shall deploy units consistent with the performance criteria for RRS service in Sections 8.1.1.3.2, Responsive Reserve Capacity Monitoring Criteria, and 8.1.1.4.2, Responsive Reserve Service Energy Deployment Criteria.

|  |
| --- |
| ***[NPRR863: Replace paragraph (6) above with the following upon system implementation:]***  (6) ERCOT shall settle energy that results from LFC deployment at the Settlement Point Price for the point of injection. When a QSE deploys RRS or ECRS, the QSE shall deploy units consistent with the performance criteria in Sections 8.1.1.3.2, Responsive Reserve Capacity Monitoring Criteria, Section 8.1.1.3.4, ERCOT Contingency Reserve Service Capacity Monitoring Criteria, 8.1.1.4.2, Responsive Reserve Energy Deployment Criteria, and 8.1.1.4.4, ERCOT Contingency Reserve Service Energy Deployment Criteria. |

(7) The inputs for LFC include:

(a) Actual system frequency;

(b) Scheduled system frequency;

(c) Capacity awarded for Regulation Service to Resources;

(d) For Resources awarded Regulation Service, telemetered HSL or MPC, and LSL or LPC;

(e) Resource limits calculated by ERCOT as described Section 6.5.7.2, Resource Limit Calculator;

(f) Capacity awarded for RRS to Resources;

|  |
| --- |
| ***[NPRR863: Replace item (f) above with the following upon system implementation:]***  (f) Capacity awarded for RRS and ECRS to Resources; |

(g) ERCOT System frequency bias; and

(h) Telemetered Resource output.

***6.5.7.6.2 LFC Deployment***

(1) ERCOT may deploy Regulation Service, RRS, and Non-Spin only as prescribed by their respective specific functions to maintain frequency and system security. ERCOT may not substitute one Ancillary Service for another.

|  |
| --- |
| ***[NPRR863: Replace paragraph (1) above with the following upon system implementation:]***  (1) ERCOT may deploy Regulation Service, RRS, ECRS, and Non-Spin only as prescribed by their respective specific functions to maintain frequency and system security. ERCOT may not substitute one Ancillary Service for another. |

(2) LFC will send UDSP deployment signals for each Resource, as specified in Section 6.5.7.4.1, Updated Desired Set Points.

**6.5.7.6.2.1 Deployment of Regulation Service**

(1) ERCOT shall deploy Reg-Up and Reg-Down necessary to maintain ERCOT System frequency to meet NERC Control Area and other Control Area performance criteria as specified in these Protocols and the Operating Guides.

(2) Reg-Up is a deployment or recall of a deployment referenced to the Resource’s Base Point in response to a change (up or down) in ERCOT System frequency to maintain the target ERCOT System frequency within predetermined limits according to the Operating Guides.

(3) Reg-Down is a deployment or recall of a deployment referenced to the Resource’s Base Point in response to a change (up or down) in ERCOT System frequency to maintain the target ERCOT System frequency within predetermined limits according to the Operating Guides.

(4) These requirements also apply to the deployment or recall of a deployment of Reg-Up and Reg-Down:

(a) Deployment or recall of a deployment must be accomplished through use of an automatic signal from ERCOT to each QSE provider of Reg-Up and Reg-Down.

(b) ERCOT shall minimize Reg-Up and Reg-Down energy as much as practicable in each SCED cycle.

(c) ERCOT shall settle energy provided by Reg-Up and Reg-Down at the Resource’s Settlement Point Price.

(d) ERCOT shall integrate the control signal sent to providers of Reg-Up and shall calculate the amount of energy deployed by Reg-Up in each Settlement Interval.

(e) ERCOT shall integrate the control signal sent to providers of Reg-Down and shall calculate the amount of energy deployed by Reg-Down in each Settlement Interval.

(f) ERCOT shall calculate for each LFC cycle the amount of regulation that each Resource is expected to provide at that instant in time. The expected amount must be averaged over each SCED interval. The actual generation from telemetry must also be averaged over each SCED interval.

(5) Every day, ERCOT shall post to the MIS Secure Area the total amount of deployed Reg-Up and Reg-Down energy in each Settlement Interval of the previous day.

(6) For each Resource providing Reg-Up or Reg-Down, the implied ramp rate in MW per minute is the total amount of Regulation Service awarded divided by five.

(7) Each QSE providing Reg-Up or Reg-Down and ERCOT shall meet the deployment performance requirements specified in Section 8, Performance Monitoring.

(8) ERCOT shall issue Reg-Up and Reg-Down deployment Dispatch Instructions over ICCP. Those Dispatch Instructions must contain the change in MW output requested of the Resource.

(9) Reg-Up and Reg-Down Dispatch Instructions shall be included as a component of a Resource’s UDSP.

(10) Upon the receipt of new Base Points and Ancillary Service awards from SCED, LFC will reset Regulation Service instructions to zero.

**6.5.7.6.2.2 Deployment of Responsive Reserve (RRS)**

(1) RRS is intended to:

(a) Help restore the frequency within the first few seconds of a significant frequency deviation of the interconnected transmission system;

(b) Provide energy during the implementation of an EEA; and

(c) Provide backup Reg-Up.

|  |
| --- |
| ***[NPRR863: Delete item (c) above upon system implementation.]*** |

(2) ERCOT shall deploy RRS to meet NERC Control Performance Standards and other performance criteria as specified in these Protocols and the Operating Guides, by one or more of the following:

(a) RRS energy deployment by automatic Governor response as a result of frequency deviation;

(b) By Dispatch Instruction for deployment of RRS energy from a Load Resource, excluding Controllable Load Resources, by an electronic Messaging System;

(c) RRS energy deployment by automatic action of high-set under-frequency relays as a result of a significant frequency deviation; and

(d) By Dispatch Instruction for deployment of RRS from Resources with a Resource Status of ONSC or Load Resources providing FFR.

(3) ERCOT shall deploy RRS to respond to a frequency deviation when the power requirement to restore frequency to normal ACE in ten minutes exceeds the Reg-Up ramping capability. Deployment of RRS on Load Resources, excluding Controllable Load Resources, must be as described in Section 6.5.9.4, Energy Emergency Alert.

(4) Energy from RRS Resources may also be deployed by ERCOT under Section 6.5.9, Emergency Operations.

(5) For Load Resources providing with a Resource Status of ONSC, ERCOT shall deploy RRS as described in Section 6.5.9.4.2, EEA Levels, and Nodal Operating Guide Section 2.3.1.2, Additional Operational Details for Responsive Reserve Providers.

(6) For Resources providing RRS with FFR, ERCOT may manually deploy the FFR RRS in an attempt to recover frequency to meet NERC Performance Control Standards after utilizing Reg-Up and the SCED process.

(7) ERCOT shall use the SCED and Non-Spin as soon as practicable to minimize the prolonged use of RRS energy.

|  |
| --- |
| ***[NPRR863: Replace paragraph (7) above with the following upon system implementation:]***  (7) ERCOT shall use the SCED, ECRS, and Non-Spin as soon as practicable to minimize the prolonged use of RRS energy. |

(8) Once RRS is manually deployed, the Resource’s obligation to deliver RRS remains in effect until specifically instructed by ERCOT to stop providing RRS.

(9) Resources providing RRS and ERCOT shall meet the deployment performance requirements specified in Section 8, Performance Monitoring.

(10) ERCOT shall issue RRS deployment Dispatch Instructions over ICCP for Generation Resources awarded RRS with a Resource Status of ONSC, and Load Resources providing FFR. Dispatch Instructions must contain the MW output requested. Base Points for those Resources includes RRS energy as well as any other energy dispatched by SCED..

|  |
| --- |
| ***[NPRR863: Replace paragraph (10) above with the following upon system implementation:]***  (10) ERCOT shall issue RRS deployment Dispatch Instructions over ICCP for Generation Resources awarded RRS with a Resource Status of ONSC, and Load Resources providing FFR. Dispatch Instructions must contain the MW output requested. Base Points for those Resources includes RRS energy as well as any other energy dispatched by SCED. |

(11) ERCOT shall issue RRS deployment Dispatch Instructions, specifying the required MW output, through Extensible Markup Language (XML) for non-Controllable Load Resources.

(12) To the extent that ERCOT deploys a Load Resource that is not a Controllable Load Resource and that has chosen a block deployment option, ERCOT shall either deploy the entire award or, if only partial deployment is needed, skip the Load Resource with the block deployment option and proceed to deploy the next available Resource.

(13) RRS provided from a Generation Resource shall be responsive to frequency deviations as defined in Section 8.5.1.1, Governor in Service. Generation Resources providing RRS must have a Governor droop setting that is not greater than 5.0%.

(14) RRS provided from a Resource capable of FFR shall self-deploy their obligated response within 15 cycles after frequency drops below 59.85 Hz and must continue to provide a response until the frequency increases above that level. Resources which require recharging may do so once the frequency increases above 59.990 Hz.

(15) RRS provided by interruptible Load shall have automatic under-frequency relay setting set at no lower than 59.70 Hz

(16) ERCOT shall deploy RRS to meet NERC Control Performance Standards and other performance criteria as specified in these Protocols and the Operating Guides by one or more of the following:

(a) RRS energy deployment during an EEA;

(b) By Dispatch Instructions for deployment of RRS energy from a Load Resource, excluding Controllable Load Resources, by an electronic Messaging System; and

(c) RRS energy deployment from Load Resources and Generation Resources operating in synchronous condenser fast-response mode by automatic action of high-set under-frequency relays as a result of a significant frequency deviation.

**6.5.7.6.2.3 Non-Spinning Reserve Service Deployment**

(1) ERCOT shall deploy Non-Spin Service by operator Dispatch Instruction for the portion of On-Line Generation Resources that is only available through power augmentation and participating as Off-Line Non-Spin, Off-Line Generation Resources and Load Resources. ERCOT shall develop a procedure approved by TAC to deploy Resources providing Non-Spin Service. ERCOT Operators shall implement the deployment procedure when a specified threshold(s) in MW of capability available to SCED to increase generation is reached. ERCOT Operators may implement the deployment procedure to recover deployed RRS or when other Emergency Conditions exist. The deployment of Non-Spin must always be 100% of that awarded on an individual Resource.

|  |
| --- |
| ***[NPRR863: Replace paragraph (1) above with the following upon system implementation:]***  (1) ERCOT shall deploy Non-Spin Service by operator Dispatch Instruction for the portion of On-Line Generation Resources that is only available through power augmentation and participating as Off-Line Non-Spin, Off-Line Generation Resources and Load Resources. ERCOT shall develop a procedure approved by TAC to deploy Resources providing Non-Spin Service. ERCOT Operators shall implement the deployment procedure when a specified threshold(s) in MW of capability available to SCED to increase generation is reached. ERCOT Operators may implement the deployment procedure to recover deployed RRS, ECRS, or when other Emergency Conditions exist. The deployment of Non-Spin must always be 100% of that awarded on an individual Resource. |

(2) Once Non-Spin capacity from Off-Line Generation Resources awarded Non-Spin is deployed and the Generation Resources are On-Line, ERCOT shall use SCED to determine the amount of energy to be dispatched from those Resources.

(3) Off-Line Generation Resources offering to provide Non-Spin must provide an Energy Offer Curve for use by SCED.

(4) Controllable Load Resources awarded Non-Spin shall have an RTM Energy Bid for SCED and shall be capable of being Dispatched to its Non-Spin Ancillary Service award within 30 minutes of a deployment instruction for capacity, using the Resource’s Normal Ramp Rate curve. An Aggregate Load Resource must comply with all requirements in the document titled “Requirements for Aggregate Load Resource Participation in the ERCOT Markets.”

(5) Off-Line Generation Resources awarded Non-Spin, while Off-Line and before the receipt of any deployment instruction, shall be capable of being dispatched to their Non-Spin award within 30 minutes of a Dispatch Instruction.

(6) ERCOT may deploy Non-Spin at any time in a Settlement Interval.

(7) ERCOT’s Non-Spin deployment Dispatch Instructions must include:

(a) The Resource name;

(b) A MW level of capacity deployment for Generation Resources with Energy Offer Curve, a MW level of energy for Generation Resources with Output Schedules, and a Dispatch Instruction for Load Resources equal to their awarded Non-Spin Ancillary Service amount; and

(c) The anticipated duration of deployment.

(8) ERCOT shall provide a signal via ICCP to the QSE of a deployed Generation or Load Resource indicating that its Non-Spin capacity has been deployed.

(9) ERCOT shall, as part of its TAC-approved Non-Spin deployment procedure, provide for the recall of Non-Spin energy including descriptions of changes to Output Schedules and release of energy obligations from On-Line Resources with Output Schedules and from On-Line Resources that were previously Off-Line Resources providing Non-Spin capacity.

(10) ERCOT shall provide a notification to all QSEs via the MIS Public Area when any Non-Spin capacity is deployed on the ERCOT System showing the time, MW quantity and the anticipated duration of the deployment.

|  |
| --- |
| ***[NPRR863: Insert Section 6.5.7.6.2.4 below upon system implementation:]***  **6.5.7.6.2.4Deployment and Recall of ERCOT Contingency Reserve Service**  (1) ECRS is intended to:  (a) Help restore the frequency to 60 Hz within ten minutes of a significant frequency deviation;  (b) Provide energy to avoid or during the implementation of an EEA; and  (c) Provide backup to Reg-Up.  (2) ERCOT shall deploy ECRS to meet NERC Standards and other performance criteria as specified in these Protocols and the Operating Guides, by one or more of the following:  (a) ERCOT shall issue ECRS deployment Dispatch Instructions, specifying the required MW output, over ICCP for Resources awarded ECRS with a Resource Status of ONSC.  (b) Dispatch Instruction for deployment of Load Resources energy via electronic Messaging System.  (3) Energy from Resources providing ECRS may also be manually deployed by ERCOT pursuant to Section 6.5.9, Emergency Operations.  (4) ERCOT shall use SCED and Non-Spin as soon as practicable to recover ECRS reserves.  (5) Following an ECRS deployment, the QSE’s obligation to deliver ECRS remains in effect until ERCOT issues a recall instruction.  (6) For Generation Resources and Controllable Load Resources providing ECRS, Base Points include ECRS energy as well as any other energy dispatched by SCED. A Resource must be able to be fully dispatched by SCED to its ECRS Ancillary Service award within the ten-minute time frame according to its telemetered ramp rate that reflects the Resource’s capability of providing ECRS.  (7) Each Resource providing ECRS shall meet the deployment performance requirements specified in Section 8.1.1.4.2, Responsive Reserve Energy Deployment Criteria.  (8) ERCOT shall issue deployment instructions for Load Resources providing ECRS via XML. Such instructions shall contain the MW requested.  (9) To the extent that ERCOT deploys a Load Resource that is not a Controllable Load Resource and that has chosen a block deployment option, ERCOT shall either deploy the entire Ancillary Service award or, if only partial deployment is possible, skip the Load Resource with the block deployment option and proceed to deploy the next available Resource.  (10) ERCOT shall recall deployed ECRS capacity provided from Resource telemetering Resource Status of ONSC once system frequency recovers above 59.97 Hz.  (11) ERCOT shall recall ECRS deployment provided from Load Resource that is not a Controllable Load Resource once PRC is above a pre-defined threshold, as described in the Operating Guides. |

**6.5.9.2 Failure of the SCED Process**

(1) When the SCED process is not able to reach a solution, ERCOT shall issue a Watch.

(2) For intervals that the SCED process fails to reach a solution, then the LMPs, MCPCs, Real-Time Reliability Deployment Price Adders for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service for the interval for which no solution was reached are equal to the LMPs, MCPCs, Real-Time Reliability Deployment Price Adders for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service in the most recently solved interval. For Settlement Intervals that the Real-Time Settlement Point Prices are identified as erroneous, and ERCOT sets the SCED intervals as failed in accordance with Section 6.3, Adjustment Period and Real-Time Operations Timeline, then the LMPs, MCPCs, Real-Time Reliability Deployment Price Adders for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service, for the failed SCED intervals are equal to the LMPs, MCPCs, Real-Time Reliability Deployment Price Adders for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service, in the most recently solved SCED interval that is not set as failed. ERCOT shall notify the market of the failure by posting on the MIS Public Area. For intervals covering the first 15 minutes of SCED process execution following a failure, ERCOT shall set the LMPs, MCPCs, Real-Time Reliability Deployment Price Adders for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service, equal to the LMPs, MCPCs, Real-Time Reliability Deployment Price Adders for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Service, in the most recently solved SCED interval prior to the SCED process failure. ERCOT shall notify the market of this price correction by posting on the MIS Public Area.

(3) In the event that a Market Suspension is declared in accordance with Section 25, Market Suspension and Restart, upon the effective date and time of the Market Suspension, the Market Suspension Settlement methodology set forth in Section 25.5, Market Suspension and Market Restart Settlement, will supersede the provisions set forth in paragraph (2) above.

(4) Once ERCOT issues a Watch for a SCED process failure, ERCOT may use any of the following measures:

(a) ERCOT may direct the SCED process to relax the active transmission constraints if sufficient supply exists to manage total system needs;

(b) ERCOT may issue Emergency Base Points for Resources;

(c) ERCOT may manually issue Emergency Base Points for a Resource and must communicate the Resource name, MW output requested, and start time and duration of the Dispatch Instruction to the QSE representing the Resource;

(d) ERCOT may issue an instruction to hold the previous interval; and

(e) A QF, a hydro Generation Resource, or a nuclear-powered Resource may be instructed by ERCOT to operate below its LSL only after all other Resource options have been exhausted.

(5) The Watch continues until the SCED process can reach a solution without using the measures in paragraph (4) above.

***6.5.9.3.3 Watch***

(1) A Watch is the third of four levels of communication issued by ERCOT in anticipation of a possible Emergency Condition.

(2) ERCOT shall issue a Watch when ERCOT determines that:

(a) Market-based congestion management techniques embedded in SCED as specified in these Protocols will not be adequate to resolve transmission security violations;

(b) Forced Outages or other abnormal operating conditions have occurred, or may occur that require operations with active violations of security criteria as defined in the Operating Guides unless a CMP exists;

(c) ERCOT varies from timing requirements or omits one or more Day-Ahead or Adjustment Period and Real-Time procedures;

(d) ERCOT varies from timing requirements or omits one or more scheduling procedures in the Real-Time process; or

(e) The SCED process fails to reach a solution, whether or not ERCOT is using one of the measures specified in paragraph (4) of Section 6.5.9.2, Failure of the SCED Process.



(3) ERCOT shall post the Watch message electronically to the MIS Public Area and shall provide verbal notice to all TSPs and QSEs via the Hotline. Corrective actions identified by ERCOT must be communicated through Dispatch Instructions to all TSPs, DSPs and QSEs required to implement the corrective action. Each QSE shall immediately notify the Market Participants that it represents of the Watch. To minimize the effects on the ERCOT System, each TSP or DSP shall identify and prepare to implement actions, including restoration of transmission lines as appropriate and preparing for Load shedding. ERCOT may instruct TSPs or DSPs to reconfigure ERCOT System elements as necessary to improve the reliability of the ERCOT System. On notice of a Watch, each QSE, TSP, and DSP shall prepare for an Emergency Condition in case conditions worsen. ERCOT may require information from QSEs representing Resources regarding the Resources’ fuel capabilities. Requests for this type of information shall be for a time period of no more than seven days from the date of the request. The specific information that may be requested shall be defined in the Operating Guides. QSEs representing Resources shall provide the requested information in a timely manner, as defined by ERCOT at the time of the request.

|  |
| --- |
| ***[NPRR857: Replace paragraph (3) above with the following upon system implementation:]***  (3) ERCOT shall post the Watch message electronically to the MIS Public Area and shall provide verbal notice to all TSPs and QSEs via the Hotline. Corrective actions identified by ERCOT must be communicated through Dispatch Instructions to all TSPs, DCTOs, DSPs and QSEs required to implement the corrective action. Each QSE shall immediately notify the Market Participants that it represents of the Watch. To minimize the effects on the ERCOT System, each TSP or DSP shall identify and prepare to implement actions, including restoration of transmission lines as appropriate and preparing for Load shedding. ERCOT may instruct DCTOs, TSPs or DSPs to reconfigure ERCOT System elements as necessary to improve the reliability of the ERCOT System. On notice of a Watch, each QSE, DCTO, TSP, and DSP shall prepare for an Emergency Condition in case conditions worsen. ERCOT may require information from QSEs representing Resources regarding the Resources’ fuel capabilities. Requests for this type of information shall be for a time period of no more than seven days from the date of the request. The specific information that may be requested shall be defined in the Operating Guides. QSEs representing Resources shall provide the requested information in a timely manner, as defined by ERCOT at the time of the request. |

***6.5.9.3.4 Emergency Notice***

(1) Emergency Notice is the fourth of four levels of communication issued by ERCOT when operating in an Emergency Condition.

(2) ERCOT shall issue an Emergency Notice for one or both of the following reasons:

(a) ERCOT cannot maintain minimum reliability standards (for reasons including fuel shortages) during the Operating Period using every Resource practicably obtainable from the market; or

(b) Immediate action cannot be taken to avoid or relieve a Transmission Element operating above its Emergency Rating.

(3) The actions ERCOT takes during an Emergency Condition depend on the nature and severity of the situation.

(4) ERCOT is considered to be in an Emergency Condition whenever ERCOT Transmission Grid status is such that a violation of security criteria, as defined in the Operating Guides, presents the threat of uncontrolled separation or cascading Outages and/or large-scale service disruption to Load (other than Load being served from a radial transmission line) and/or overload of a Transmission Element, and no timely solution is obtainable through SCED or CMPs.

(5) If the Emergency Condition is the result of a transmission problem, ERCOT shall act immediately to return the ERCOT System to a reliable condition, including instructing Resources to change output, curtailing any remaining DC Tie Load, and instructing TSPs or DSPs to drop Load.

**6.5.9.4 Energy Emergency Alert**

(1) At times it may be necessary to reduce ERCOT System Demand because of a temporary decrease in available electricity supply. To provide orderly, predetermined procedures for curtailing Demand during such emergencies, ERCOT shall initiate and coordinate the implementation of the EEA following the steps set forth below in Section 6.5.9.4.2, EEA Levels.

(2) The goal of the EEA is to provide for maximum possible continuity of service while maintaining the integrity of the ERCOT System to reduce the chance of cascading Outages.

(3) ERCOT’s operating procedures must meet the following goals:

(a) Use of market processes to the fullest extent practicable without jeopardizing the reliability of the ERCOT System;

(b) Use of RRS, other Ancillary Services, and Emergency Response Service (ERS) to the extent permitted by ERCOT System conditions;

|  |
| --- |
| ***[NPRR863: Replace item (b) above with the following upon system implementation:]***  (b) Use of RRS, ECRS, other Ancillary Services, and Emergency Response Service (ERS) to the extent permitted by ERCOT System conditions; |

(c) Maximum use of ERCOT System capability;

(d) Maintenance of station service for nuclear-powered Generation Resources;

(e) Securing startup power for Generation Resources;

(f) Operation of Generation Resources during loss of communication with ERCOT;

(g) Restoration of service to Loads in the manner defined in the Operating Guides; and

(h) Management of Interconnection Reliability Operating Limits (IROLs) shall not change.

(4) ERCOT is responsible for coordinating with QSEs, TSPs, and DSPs to monitor ERCOT System conditions, initiating the EEA levels, notifying all QSEs, and coordinating the implementation of the EEA levels while maintaining transmission security limits.

|  |
| --- |
| ***[NPRR857: Replace paragraph (4) above with the following upon system implementation:]***  (4) ERCOT is responsible for coordinating with QSEs, DCTOs, TSPs, and DSPs to monitor ERCOT System conditions, initiating the EEA levels, notifying all QSEs, and coordinating the implementation of the EEA levels while maintaining transmission security limits. |

(5) ERCOT, at management’s discretion, may at any time issue an ERCOT-wide appeal through the public news media for voluntary energy conservation.

(6) During the EEA, ERCOT has the authority to obtain energy from non-ERCOT Control Areas using the DC Ties or by using Block Load Transfers (BLTs) to move load to non-ERCOT Control Areas. ERCOT maintains the authority to curtail energy schedules flowing into or out of the ERCOT System across the DC Ties in accordance with NERC scheduling guidelines.

(7) Some of the EEA steps are not applicable if transmission security violations exist. There may be insufficient time to implement all EEA levels in sequence, however, to the extent practicable, ERCOT shall use Ancillary Service capabilities of Resources in the market to maintain or restore reliability.

(8) ERCOT may immediately implement EEA Level 3 any time the clock-minute average system frequency falls below 59.91 Hz for 20 consecutive minutes and shall immediately implement EEA Level 3 any time the steady-state frequency is below 59.5 Hz for any duration.

(9) Percentages for EEA Level 3 Load shedding will be based on the previous year’s TSP peak Loads, as reported to ERCOT, and must be reviewed by ERCOT and modified annually as required.

(10) During EEA Level 2 or 3, for those constraints that meet the criteria identified in paragraph (5)(a) of Section 6.5.9.3.2, Advisory, ERCOT may control the post-contingency flow to within the 15-Minute Rating in SCED. After PRC is restored to at least 3,000 MW or the emergency condition has ended, whichever is later, and ERCOT has determined that system conditions have improved such that the chance of re-entering into an EEA Level 2 or 3 is low, ERCOT shall restore control to the post-contingency flow to within the Emergency Rating for these constraints that utilized the 15-Minute Rating in SCED.

(11) During EEA Level 2 or 3, for those constraints that meet the criteria identified in paragraph (5)(b) of Section 6.5.9.3.2, ERCOT shall continue to enforce constraints associated with double-circuit contingencies throughout an EEA if the double-circuit failures are determined to be at high risk of occurring, due to system conditions. For all other double-circuit contingencies identified in paragraph (5)(b) of Section 6.5.9.3.2, ERCOT will enforce only the associated single-circuit contingencies during EEA Level 2 or 3. ERCOT shall resume enforcing such constraints as a double-circuit contingency after PRC is restored to at least 3,000 MW or the Emergency Condition has ended, whichever is later, and ERCOT has determined that system conditions have improved such that the chance of re-entering into an EEA Level 2 or 3 is low. For constraints related to stability limits that are not IROLs, ERCOT may elect not to enforce double-circuit contingencies during EEA Level 3 only.

***6.5.9.4.2 EEA Levels***

(1) ERCOT will declare an EEA Level 1 when PRC falls below 2,300 MW and is not projected to be recovered above 2,300 MW within 30 minutes without the use of the following actions that are prescribed for EEA Level 1:

(a) ERCOT shall take the following steps to maintain steady state system frequency near 60 Hz and maintain PRC above 1,750 MW:

(i) Request available Generation Resources that can perform within the expected timeframe of the emergency to come On-Line by initiating manual HRUC or through Dispatch Instructions;

(ii) Use available DC Tie import capacity that is not already being used;

(iii) Issue a Dispatch Instruction for Resources to remain On-Line which, before start of emergency, were scheduled to come Off-Line; and

(iv) At ERCOT’s discretion, deploy available contracted ERS-30 via an XML message followed by a VDI to the all-QSE Hotline. The ERS-30 ramp period shall begin at the completion of the VDI.

(A) If less than 500 MW of ERS-30 is available for deployment, ERCOT shall deploy it as a single block.

(B) If the amount of ERS-30 available for deployment equals or exceeds 500 MW, ERCOT, at its discretion, may deploy ERS-30 as a single block or by group designation. ERCOT shall develop a random selection methodology for determining how to place ERS Resources in ERS-30 into groups, and shall describe the methodology in a document posted to the MIS Public Area. Prior to the start of an ERS Contract Period for ERS-30, ERCOT shall notify QSEs representing ERS Resources in ERS-30 of their ERS Resources’ group assignments.

(C) ERS-30 may be deployed at any time in a Settlement Interval.

(D) Upon deployment, QSEs shall instruct their ERS Resources in ERS-30 to perform at contracted levels consistent with the criteria described in Section 8.1.3.1.4, Event Performance Criteria for Emergency Response Service Resources, until either ERCOT releases the ERS-30 deployment or the ERS-30 Resources have reached their maximum deployment time.

(E) ERCOT shall notify QSEs of the release of ERS-30 via an XML message followed by VDI to the all-QSE Hotline. The VDI shall represent the official notice of ERS-30 release. ERCOT may release ERS-30 as a block or by group designation.

(F) Upon release, an ERS Resource in ERS-30 shall return to a condition such that it is capable of meeting its ERS performance requirements as soon as practical, but no later than ten hours following the release.

(v) At ERCOT’s discretion, deploy, through ICCP, available RRS and ECRS capacity from Generation Resources providing RRS or ECRS that have a Resource Status of ONSC.

(b) QSEs shall:

(i) Ensure COPs and telemetered HSLs, Normal Ramp Rates, Emergency Ramp Rates, and Ancillary Service capabilities are updated and reflect all Resource delays and limitations; and

(ii) Suspend any ongoing ERCOT required Resource performance testing.

(2) ERCOT may declare an EEA Level 2 when the clock-minute average system frequency falls below 59.91 Hz for 15 consecutive minutes. ERCOT will declare an EEA Level 2 when PRC falls below 1,750 MW and is not projected to be recovered above 1,750 MW within 30 minutes without the use of the following actions that are prescribed for EEA Level 2:

(a) In addition to the measures associated with EEA Level 1, ERCOT shall take the following steps to maintain steady state system frequency at a minimum of 59.91 Hz and maintain PRC above 1,430 MW:

(i) Instruct TSPs and DSPs or their agents to reduce Customer Load by using distribution voltage reduction measures, if deemed beneficial by the TSP, DSP, or their agents.

(ii) Instruct TSPs and DSPs to implement any available Load management plans to reduce Customer Load.

(iii) Instruct QSEs to deploy available contracted ERS-10 Resources, undeployed ERS-30 and/or deploy RRS supplied from Load Resources (controlled by high-set under-frequency relays). ERCOT may deploy ERS-10, ERS-30, or RRS simultaneously or separately, and in any order. ERCOT shall issue such Dispatch Instructions in accordance with the deployment methodologies described in paragraphs (iv) and (v) below and, if deploying ERS-30, the methodologies described in paragraph (1)(a)(iv) above.

|  |
| --- |
| ***[NPRR863: Replace item (iii) above with the following upon system implementation:]***  (iii) Instruct QSEs to deploy available contracted ERS-10 Resources, undeployed ERS-30, and/or deploy ECRS or RRS (controlled by high-set under-frequency relays) supplied from Load Resources. ERCOT may deploy ERS-10, ERS-30, ECRS, or RRS simultaneously or separately, and in any order. ERCOT shall issue such Dispatch Instructions in accordance with the deployment methodologies described in paragraphs (iv) and (v) below and, if deploying ERS-30, the methodologies described in paragraph (1)(a)(iv) above. |

(iv) ERCOT shall deploy ERS-10 via an XML message followed by a VDI to the all-QSE Hotline. The ERS-10 ramp period shall begin at the completion of the VDI.

(A) If less than 500 MW of ERS-10 is available for deployment, ERCOT shall deploy all ERS-10 Resources as a single block.

(B) If the amount of ERS-10 available for deployment equals or exceeds 500 MW, ERCOT, at its discretion, may deploy ERS-10 Resources as a single block or by group designation. ERCOT shall develop a random selection methodology for determining how to place ERS-10 Resources into groups, and shall describe the methodology in a document posted to the MIS Public Area. Prior to the start of an ERS-10 Contract Period, ERCOT shall notify QSEs representing ERS-10 Resources of their ERS-10 Resources’ group assignments.

(C) ERS-10 may be deployed at any time in a Settlement Interval.

(D) Upon deployment, QSEs shall instruct ERS-10 Resources to perform at contracted levels consistent with the criteria described in Section 8.1.3.1.4 until ERCOT releases the ERS-10 deployment or the ERS-10 Resources have reached their maximum deployment times.

(E) ERCOT shall notify QSEs of the release of ERS-10 via an XML message followed by VDI to the all-QSE Hotline. The VDI shall represent the official notice of ERS-10 release. ERCOT may release ERS-10 as a block or by group designation.

(F) Upon release, an ERS-10 Resource shall return to a condition such that it is capable of meeting its ERS performance requirements as soon as practical, but no later than ten hours following the release.

(v) ERCOT shall deploy RRS capacity supplied by Load Resources (controlled by high-set under-frequency relays) in accordance with the following:

|  |
| --- |
| ***[NPRR863: Replace paragraph (v) above with the following upon system implementation:]***  (v) Load Resources providing ECRS that are not controlled by high set under-frequency relays shall be deployed prior to Group 1 deployment. ERCOT shall deploy ECRS and RRS capacity supplied by Load Resources (controlled by high set under-frequency relays) in accordance with the following: |

(A) Instruct QSEs to deploy half of the RRS that is supplied from Load Resources (controlled by high-set under-frequency relays) by instructing the QSE representing the specific Load Resource to interrupt Group 1 Load Resources providing RRS. QSEs shall deploy Load Resources according to the group designation and will be given some discretion to deploy additional Load Resources from Group 2 if Load Resource operational considerations require such. ERCOT shall issue notification of the deployment via XML message. ERCOT shall follow this XML notification with a Hotline VDI, which shall initiate the ten-minute deployment period;

|  |
| --- |
| ***[NPRR863 and NPRR939: Replace applicable portions of paragraph (A) above with the following upon system implementation:]***  (A) Instruct QSEs to deploy RRS with a Group 1 designation and all of the ECRS that is supplied from Load Resources (controlled by high-set under-frequency relays) by instructing the QSE representing the specific Load Resources to interrupt Group 1 Load Resources providing ECRS and RRS. QSEs shall deploy Load Resources according to the group designation and will be given some discretion to deploy additional Load Resources from any of the groups not designated for deployment if Load Resource operational considerations require such. ERCOT shall issue notification of the deployment via XML message. ERCOT shall follow this XML notification with a Hotline VDI, which shall initiate the ten-minute deployment period; |

(B) At the discretion of the ERCOT Operator, instruct QSEs to deploy the remaining RRS that is supplied from Load Resources (controlled by high-set under-frequency relays) by instructing the QSE representing the specific Load Resource to interrupt Group 2 Load Resources providing RRS. ERCOT shall issue notification of the deployment via XML message. ERCOT shall follow this XML notification with a Hotline VDI, which shall initiate the ten-minute deployment period;

|  |
| --- |
| ***[NPRR939: Replace paragraph (B) above with the following upon system implementation:]***  (B) At the discretion of the ERCOT Operator, instruct QSEs to deploy RRS that is supplied from Load Resources (controlled by high-set under-frequency relays) by instructing the QSE representing the specific Load Resource to interrupt additional Load Resources providing RRS based on their group designation. ERCOT shall issue notification of the deployment via XML message. ERCOT shall follow this XML notification with a Hotline VDI, which shall initiate the ten-minute deployment period; |

(C) The ERCOT Operator may deploy both of the groups of Load Resources providing RRS at the same time. ERCOT shall issue notification of the deployment via XML message. ERCOT shall follow this XML notification with a Hotline VDI, which shall initiate the ten-minute deployment period; and

|  |
| --- |
| ***[NPRR863 and NPRR939: Replace applicable portions of paragraph (C) above with the following upon system implementation:]***  (C) The ERCOT Operator may deploy Load Resources providing only ECRS (not controlled by high-set under-frequency relays) and all groups of Load Resources providing RRS and ECRS at the same time. ERCOT shall issue notification of the deployment via XML message. ERCOT shall follow this XML notification with a Hotline VDI, which shall initiate the ten-minute deployment period; and |

(D) ERCOT shall post a list of Load Resources on the MIS Certified Area immediately following the DRUC for each QSE with a Load Resource RRS award, which may be deployed to interrupt under paragraph (A), Group 1 and paragraph (B), Group 2. ERCOT shall develop a process for determining which individual Load Resource to place in Group 1 and which to place in Group 2. ERCOT procedures shall select Group 1 and Group 2 based on a random sampling of individual Load Resources. At ERCOT’s discretion, ERCOT may deploy all Load Resources at any given time during EEA Level 2.

|  |
| --- |
| ***[NPRR939: Replace paragraph (D) above with the following upon system implementation:]***  (D) ERCOT shall post a list of Load Resources on the MIS Certified Area immediately following the DRUC for each QSE with a Load Resource RRS award, which may be deployed to interrupt under paragraph (A) and paragraph (B). ERCOT shall develop a process for determining which individual Load Resource to place in each group based on a random sampling of individual Load Resources. At ERCOT’s discretion, ERCOT may deploy all Load Resources at any given time during EEA Level 2. |

(vi) Unless a media appeal is already in effect, ERCOT shall issue an appeal through the public news media for voluntary energy conservation; and

(vii) With the approval of the affected non-ERCOT Control Area, TSPs, DSPs, or their agents may implement transmission voltage level BLTs, which transfer Load from the ERCOT Control Area to non-ERCOT Control Areas in accordance with BLTs as defined in the Operating Guides.

(b) Confidentiality requirements regarding transmission operations and system capacity information will be lifted, as needed to restore reliability.

(3) ERCOT may declare an EEA Level 3 when the clock-minute average system frequency falls below 59.91 Hz for 20 consecutive minutes. ERCOT will declare an EEA Level 3 when PRC cannot be maintained above 1,430 MW or when the clock-minute average system frequency falls below 59.91 Hz for 25 consecutive minutes. Upon declaration of an EEA Level 3, ERCOT will implement any measures associated with EEA Levels 1 and 2 that have not already been implemented.

(a) When PRC falls below 1,000 MW and is not projected to be recovered above 1,000 MW within 30 minutes, or when the clock-minute average frequency falls below 59.91 Hz for 25 consecutive minutes, ERCOT shall direct all TSPs and DSPs or their agents to shed firm Load, in 100 MW blocks, distributed as documented in the Operating Guides in order to maintain a steady state system frequency at a minimum of 59.91 Hz and to recover 1,000 MW of PRC within 30 minutes.

(b) In addition to measures associated with EEA Levels 1 and 2, TSPs and DSPs or their agents will keep in mind the need to protect the safety and health of the community and the essential human needs of the citizens. Whenever possible, TSPs and DSPs or their agents shall not manually drop Load connected to under-frequency relays during the implementation of the EEA.

***6.6.1 Real-Time Settlement Point Prices***

(1) Real-Time energy Settlements use Real-Time Settlement Point Prices that are calculated for Resource Nodes, Load Zones, and Hubs. For each Security-Constrained Economic Dispatch (SCED) Locational Marginal Price (LMP) calculated at each Settlement Point in the SCED process, an administrative price floor of -$251/MWh will be applied to Real-Time Settlement Point Prices after adding the Real-Time Reliability Deployment Price Adders for Energy. ERCOT shall assign an LMP to de-energized Electrical Buses for use in the calculation of the Real-Time Settlement Point Prices by using heuristic rules applied in the following order:

(a) Use an appropriate LMP predetermined by ERCOT as applicable to a specific Electrical Bus; or if not so specified

(b) Use the following rules in order:

(i) Use average LMP for Electrical Buses within the same station having the same voltage level as the de-energized Electrical Bus, if any exist.

(ii) Use average LMP for all Electrical Buses within the same station, if any exist.

(iii) Use System Lambda.

**6.6.1.1 Real-Time Settlement Point Price for a Resource Node**

(1) The Real-Time Settlement Point Price for a Resource Node Settlement Point is the time-weighted average of the sum of the Real-Time LMPs and the Real-Time Reliability Deployment Price Adder for Energy. The Real-Time Settlement Point Price for a 15-minute Settlement Interval is calculated as follows:

**RTSPP = Max (-$251, ((RNWF *y* \* (RTLMP *y* + RTORDPA *y*))))**

Where the Resource Node weighting factor is:

**RNWF *y*= TLMP *y* / TLMP *y***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RTSPP | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Settlement Point for the 15-minute Settlement Interval. |
| RTLMP *y* | $/MWh | *Real-Time Locational Marginal Price per interval*⎯The Real-Time LMP at the Settlement Point for the SCED interval *y*. |
| RTORDPA*y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy*⎯The Real-Time price adder that captures the impact of reliability deployments on energy prices for the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |

(2) The Real-Time Settlement Point Price at the logical Resource Node for a Combined Cycle Train shall be determined in accordance with paragraph (1) above using a Real-Time LMP calculated for the logical Resource Node in each SCED Interval as follows:

(a) The Real-Time LMP for the logical Resource Node of a Combined Cycle Train for each SCED interval is calculated as follows:

For a Combined Cycle Train that is On-Line in the SCED interval:

**RTLMP *y* =** **∑*CCGR\_PhyR* RTLMP *CCGR\_PhyR, y* \* RTONCCGRWF *CCGR\_PhyR***

For a Combined Cycle Train that is Off-Line in the SCED interval:

**RTLMP *y* =** **∑*CCT\_PhyR* RTLMP *CCT\_PhyR, y* \* RTOFFCCGRWF *CCT\_PhyR***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Definition** |
| RTLMP *y* | $/MWh | *Real-Time Locational Marginal Price at a logical Resource Node for a Combined Cycle Train*⎯The Real-Time LMP at the Combined Cycle Generation Resource logical Resource Node for a SCED interval *y*. |
| RTLMP *CCGR\_PhyR, y* | $/MWh | *Real-Time Locational Marginal Price at a generation unit Resource Node designated in a Combined Cycle Train registration for the On-Line Combined Cycle Generation Resource*⎯The Real-Time LMP at the Resource Node of a generation unit designated in a Combined Cycle Train registration for the On-Line Combined Cycle Generation Resource for the SCED interval *y*. |
| RTLMP *CCT\_PhyR, y* | $/MWh | *Real-Time Locational Marginal Price at a generation unit Resource Node registered to the Combined Cycle Train*⎯The Real-Time LMP at the Resource Node of a generation unit designated in a Combined Cycle Train registration for the SCED interval *y*. |
| RTONCCGRWF *CCGR\_PhyR, y* | none | *Real-Time On-Line Combined Cycle Generation Resource Weighting Factor*⎯The Real Time Combined Cycle Generation Resource weighting factor for a generation unit designated in a Combined Cycle Train registration for the On-Line Combined Cycle Generation Resource for the SCED interval *y*. |
| RTOFFCCGRWF *CCT\_PhyR, y* | none | *Real-Time Off-Line Combined Cycle Generation Resource Weighting Factor*⎯The Real-Time Combined Cycle Generation Resource weighting factor for a generation unit designated in a Combined Cycle Train registration when the whole Combined Cycle Train is Off-Line for the SCED interval *y*. |
| *CCGR\_PhyR* | none | A generation unit designated in a Combine Cycle Train registration for the On-Line Combined Cycle Generation Resource. |
| *CCT\_PhyR* | none | A generation unit designated in a Combine Cycle Train registration |
| *c* | none | A binding transmission constraint for the SCED interval *y*. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(b) For an On-Line Combined Cycle Train, the weight factor for each generation unit registered in an On-Line Combined Cycle Generation Resource shall be the Real-Time power output telemetry in each SCED interval for each generation unit registered in the Combined Cycle Generation Resource divided by the total Real-Time power output telemetry for all of the generation units registered in the Combined Cycle Generation Resource. For an Off-Line Combined Cycle Train, the weight factor for each generation unit designated in a Combined Cycle Train registration shall be its High Reasonability Limit (HRL) divided by the total sum of the HRL for all generation units registered in the Combined Cycle Train.

Where:

**RTONCCGRWF *CCGR\_PhyR, y* = TG *CCGR\_PhyR* / ∑*CCGR\_PhyR* TG *CCGR\_PhyR***

**RTOFFCCGRWF *CCT\_PhyR, y* = HRL *CCT\_PhyR* / ∑*CCT\_PhyR* HRL *CCT\_PhyR***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Definition** |
| RTONCCGRWF *CCGR\_PhyR, y* | none | *Real-Time On-Line Combined Cycle Generation Resource Weighting Factor*⎯The Real Time Combined Cycle Generation Resource weighting factor for a generation unit designated in a Combined Cycle Train registration for the On-Line Combined Cycle Generation Resource for the SCED interval *y*. |
| TG *CCGR\_PhyR, y* | MW | *Telemetered Generation for a Combined Cycle Generation Resource generation unit*⎯The telemetered Real-Time power generation for a generation unit designated in a Combined Cycle Train registration for the On-Line Combined Cycle Generation Resource at the time of State Estimator execution for the SCED interval *y*. |
| RTOFFCCGRWF *CCT\_PhyR, y* | none | *Real-Time Off-Line Combined Cycle Generation Resource Weighting Factor*⎯The Real Time Combined Cycle Generation Resource weighting factor for a generation unit designated in a Combined Cycle Train registration when the whole Combined Cycle Train is Off-Line for the SCED interval *y*. |
| HRL *CCT\_PhyR* | MW | *High Reasonability Limit*—The HRL as specified in the ERCOT-approved Resource Registration data for a generation unit designated in a Combined Cycle Train registration. |
| *CCGR\_PhyR* | none | A generation unit designated in a Combine Cycle Train registration for the On-Line Combined Cycle Generation Resource. |
| *CCT\_PhyR* | none | A generation unit designated in a Combine Cycle Train registration. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

**6.6.1.2 Real-Time Settlement Point Price for a Load Zone**

(1) The Real-Time Settlement Point Price for a Load Zone Settlement Point is based on the state-estimated Load in MW and the time-weighted average Real-Time LMPs at Electrical Buses that are included in the Load Zone. The Real-Time Settlement Point Price for a Load Zone Settlement Point for a 15-minute Settlement Interval is calculated as follows:

**RTSPP = Max (-$251, ((TLMP *y* \* LZLMP *y*) / TLMP*y*) + RTRDP)**

For all Load Zones except Direct Current Tie (DC Tie) Load Zones:

LZLMP *y* =  (RTLMP *b, y* \* SEL *b, y*) / SEL*b, y*

For a DC Tie Load Zone:

LZLMP *y* = RTLMP *b, y*

Where:

RTRDP = (RNWF *y* \* RTORDPA *y*)

RNWF *y*= TLMP *y* / TLMP *y*

(2) For all Settlement calculations in which a 15-minute Real-Time Settlement Point Price for a Load Zone is required in order to perform Settlement for a 15-minute quantity that is represented as one value (the integrated value for the 15-minute interval) but varies with each SCED interval within the 15-minute Settlement Interval, an energy-weighted Real-Time Settlement Point Price shall be used and is calculated as follows:

**RTSPPEW = Max [-$251, ((RTLMP*b, y* \* LZWF *b, y*) + RTRDP)]**

For all Load Zones except DC Tie Load Zones:

LZWF *b, y* = (SEL*b, y* \* TLMP *y*) **/** [(SEL*b, y* \* TLMP*y*)]

For a DC Tie Load Zone:

LZWF *b, y* = (SEL*b, y* \* TLMP *y*) **/** [(SEL*b, y* \* TLMP*y*)]

SEL*b, y* = 1

Where:

RTRDP = (RNWF *y* \* RTORDPA *y*)

RNWF *y* = TLMP *y* /TLMP *y*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RTSPP | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Settlement Point, for the 15-minute Settlement Interval. |
| RTSPPEW | $/MWh | *Real-Time Settlement Point Price Energy-Weighted*⎯The Real-Time Settlement Point Price at the Settlement Point *p*, for the 15-minute Settlement Interval that is weighted by the state-estimated Load of the Load Zone of each SCED interval within the 15-minute Settlement Interval. |
| RTLMP *b, y* | $/MWh | *Real-Time Locational Marginal Price at bus per interval*⎯The Real-Time LMP at Electrical Bus *b* in the Load Zone, for the SCED interval *y*. |
| RTRDP | $/MWh | *Real-Time Reliability Deployment Price for Energy*⎯The Real-Time price for the 15-minute Settlement Interval, reflecting the impact of reliability deployments on energy prices that is calculated from the Real-Time Reliability Deployment Price Adder for Energy. |
| RTORDPA*y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy* ⎯The Real-Time price adder that captures the impact of reliability deployments on energy prices for the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| LZWF *b, y* | none | *Load Zone Weighting Factor per bus per interval*⎯The weight used in the Load Zone Settlement Point Price calculation for Electrical Bus *b*, for the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| LZLMP *y* | $/MWh | *Load Zone Locational Marginal Price*⎯The Load Zone LMP for the Load Zone for the SCED Interval *y*. |
| SEL *b, y* | MW | *State Estimator Load at bus per interval*⎯The Load from State Estimator, including a calculated net Load value at each Private Use Network, excluding Wholesale Storage Load (WSL) for Electrical Bus *b* in the Load Zone, for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |
| *b* | none | An Electrical Bus in the Load Zone. The summation is over all of the Electrical Buses in the Load Zone. |

**6.6.1.6 Real-Time Market Clearing Prices for Ancillary Services**

(1) The Real-Time Market Clearing Price for Capacity (MCPC) for Reg-Up is the time-weighted average of the sum of the Real-Time MCPCs and Real-Time Reliability Deployment Price Adder for Ancillary Service for Reg-Up per SCED interval. The Real-Time MCPC for Reg-Up for a 15-minute Settlement Interval is calculated as follows:

RTMCPCRU =  (RNWF *y* \* (RTMCPCRUS *y* + RTRDPARUSy))

Where:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTMCPCRU | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Up -* The Real-Time MCPC for Reg-Up for the 15-minute Settlement Interval. |
| RTMCPCRUS *y* | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Up per SCED interval -* The Real-Time MCPC for Reg-Up for the SCED interval *y.* |
| RTRDPARUS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Reg-Up per SCED interval* - The Real-Time price adder for Reg-Up that captures the impact of reliability deployments on Reg-Up prices for the SCED interval y. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Ancillary Service Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(2) The Real-Time MCPC for Reg-Down is the time-weighted average of the sum of the Real-Time MCPCs and Real-Time Reliability Deployment Price Adder for Ancillary Service for Reg-Down per SCED interval. The Real-Time MCPC for Reg-Down for a 15-minute Settlement Interval is calculated as follows:

RTMCPCRD =  (RNWF *y* \* (RTMCPCRDS *y*+ RTRDPARDS *y*))

Where:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTMCPCRD | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Down -* The Real-Time MCPC for Reg-Down for the 15-minute Settlement Interval. |
| RTMCPCRDS *y* | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Down per SCED interval -* The Real-Time MCPC for Reg-Down for the SCED interval *y.* |
| RTRDPARDS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Reg-Down per SCED interval* - The Real-Time price adder for Reg-Down that captures the impact of reliability deployments on Reg-Down prices for the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Ancillary Service Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(3) The Real-Time MCPC for RRS is the time-weighted average of the sum of the Real-Time MCPCs and Real-Time Reliability Deployment Price Adder for Ancillary Service for RRS per SCED interval. The Real-Time MCPC for RRS for a 15-minute Settlement Interval is calculated as follows:

RTMCPCRR =  (RNWF *y* \* (RTMCPCRRS *y* + RTRDPARRS *y*))

Where:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTMCPCRR | $/MW | *Real-Time Market Clearing Price for Capacity for Responsive Reserve -* The Real-Time MCPC for RRS for the 15-minute Settlement Interval. |
| RTMCPCRRS *y* | $/MW | *Real-Time Market Clearing Price for Capacity for Responsive Reserve per SCED interval -* The Real-Time MCPC for RRS for the SCED interval *y.* |
| RTRDPARRS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Responsive Reserve per SCED interval* - The Real-Time price adder for RRS that captures the impact of reliability deployments on RRS prices for the SCED interval y. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Ancillary Service Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(4) The Real-Time MCPC for ECRS is the time-weighted average of the sum of the Real-Time MCPCs and Real-Time Reliability Deployment Price Adder for Ancillary Service for ECRS per SCED interval. The Real-Time MCPC for ECRS for a 15-minute Settlement Interval is calculated as follows:

RTMCPCECR =  (RNWF *y* \* (RTMCPCECRS *y*+ RTRDPAECRS *y*))

Where:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTMCPCECR | $/MW | *Real-Time Market Clearing Price for Capacity for ERCOT Contingency Reserve* *-* The Real-Time MCPC for ECRS for the 15-minute Settlement Interval. |
| RTMCPCECRS *y* | $/MW | *Real-Time Market Clearing Price for Capacity for ERCOT Contingency Reserve* *per SCED interval -* The Real-Time MCPC for ECRS for the SCED interval *y.* |
| RTRDPAECRS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for ECRS per SCED interval* - The Real-Time price adder for ECRS that captures the impact of reliability deployments on ECRS prices for the SCED interval y. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Ancillary Service Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(5) The Real-Time MCPC for Non-Spin is the time-weighted average of the sum of the Real-Time MCPCs and Real-Time Reliability Deployment Price Adders for Ancillary Service for Non-Spin per SCED interval. The Real-Time MCPC for Non-Spin for a 15-minute Settlement Interval is calculated as follows:

RTMCPCNS =  (RNWF *y* \* (RTMCPCNSS *y*+ RTRDPANSS *y*))

Where:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTMCPCNS | $/MW | *Real-Time Market Clearing Price for Capacity for Non-Spin* *-* The Real-Time MCPC for Non-Spin for the 15-minute Settlement Interval. |
| RTMCPCNSS *y* | $/MW | *Real-Time Market Clearing Price for Capacity for Non-Spin* *per SCED interval -* The Real-Time MCPC for Non-Spin for the SCED interval *y.* |
| RTRDPANSS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Non-Spin per SCED interval* - The Real-Time price adder for Non-Spin that captures the impact of reliability deployments on Non-Spin prices for the SCED interval y. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Ancillary Service Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

**6.6.1.7 Real-Time Reliability Deployment Prices for Ancillary Services**

(1) The Real-Time Reliability Deployment Price for Ancillary Service for Reg-Up (RTRDPRU) is the time-weighted average of the sum of the Real-Time Reliability Deployment Price Adders for Reg-Up per SCED interval. The Real-Time Reliability Deployment Price for Ancillary Service for Reg-Up for a 15-minute Settlement Interval is calculated as follows:

RTRDPRU =  (RNWF *y* \* RTRDPARUSy)

Where:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRDPRU | $/MW | *Real-Time Reliability Deployment Price for Ancillary Service for Reg-Up -* The Real-Time Reliability Deployment Price for Ancillary Service for Reg-Up for the 15-minute Settlement Interval. |
| RTRDPARUS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Reg-Up per SCED interval* - The Real-Time price adder for Reg-Up that captures the impact of reliability deployments on Reg-Up prices for the SCED interval y. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Ancillary Service Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(2) The Real-Time Reliability Deployment Price for Ancillary Service for Reg-Down (RTRDPRD) is the time-weighted average of the sum of the Real-Time Reliability Deployment Price Adders for Reg-Down per SCED interval. The Real-Time Reliability Deployment Price for Ancillary Service for Reg-Down for a 15-minute Settlement Interval is calculated as follows:

RTRDPRD =  (RNWF *y* \* RTRDPARDS *y*)

Where:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRDPRD | $/MW | *Real-Time Reliability Deployment Price for Ancillary Service for Reg-Down -* The Real-Time Reliability Deployment Price for Ancillary Service for Reg-Down for the 15-minute Settlement Interval. |
| RTRDPARDS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Reg-Down per SCED interval* - The Real-Time price adder for Reg-Down that captures the impact of reliability deployments on Reg-Down prices for the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Ancillary Service Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(3) The Real-Time Reliability Deployment Price for Ancillary Service for Responsive Reserve (RTRDPRRS) is the time-weighted average of the sum of the Real-Time Reliability Deployment Price Adders for Responsive Reserve per SCED interval. The Real-Time Reliability Deployment Price for Ancillary Service for Responsive Reserve for a 15-minute Settlement Interval is calculated as follows:

RTRDPRRS =  (RNWF *y* \* RTRDPARRS *y*)

Where:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRDPRRS | $/MW | *Real-Time Reliability Deployment Price for Ancillary Service for Responsive Reserve -* The Real-Time Reliability Deployment Price for Ancillary Service for RRS for the 15-minute Settlement Interval. |
| RTRDPARRS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Responsive Reserve per SCED interval* - The Real-Time price adder for RRS that captures the impact of reliability deployments on RRS prices for the SCED interval y. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Ancillary Service Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(4) The Real-Time Reliability Deployment Price for Ancillary Service for ERCOT Contingency Reserve (RTRDPECR) is the time-weighted average of the sum of the Real-Time Reliability Deployment Price Adders for ERCOT Contingency Reserve per SCED interval. The Real-Time Reliability Deployment Price for Ancillary Service for ERCOT Contingency Reserve for a 15-minute Settlement Interval is calculated as follows:

RTRDPECR =  (RNWF *y* \* RTRDPAECRS *y*)

Where:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRDPECR | $/MW | *Real-Time Market Clearing Price for Capacity for ERCOT Contingency Reserve* *-* The Real-Time Reliability Deployment Price for Ancillary Service for ECRS for the 15-minute Settlement Interval. |
| RTRDPAECRS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for ECRS per SCED interval* - The Real-Time price adder for ECRS that captures the impact of reliability deployments on ECRS prices for the SCED interval y. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Ancillary Service Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(5) The Real-Time Reliability Deployment Price for Ancillary Service for ERCOT Non-Spin (RTRDPNS) is the time-weighted average of the sum of the Real-Time Reliability Deployment Price Adders for Non-Spin per SCED interval. The Real-Time Reliability Deployment Price for Ancillary Service for Non-Spin for a 15-minute Settlement Interval is calculated as follows:

RTRDPNS =  (RNWF *y* \* RTRDPANSS *y*)

Where:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRDPNS | $/MW | *Real-Time Market Clearing Price for Capacity for Non-Spin* *-* The Real-Time Reliability Deployment Price for Ancillary Service for ECRS for the 15-minute Settlement Interval. |
| RTRDPANSS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Non-Spin per SCED interval* - The Real-Time price adder for Non-Spin that captures the impact of reliability deployments on Non-Spin prices for the SCED interval y. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Ancillary Service Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

**6.6.3.1 Real-Time Energy Imbalance Payment or Charge at a Resource Node**

(1) The payment or charge to each QSE for Energy Imbalance Service is calculated based on the Real-Time Settlement Point Price for the following amounts at a particular Resource Node Settlement Point:

(a) The energy produced by all its Generation Resources or consumed as WSL at the Settlement Point; plus

|  |
| --- |
| [NPRR986: Replace item (a) above with the following upon system implementation:]  (a) The energy produced by all its Generation Resources or withdrawn by all its Energy Storage Resources (ESRs) at the Settlement Point; plus |

(b) The amount of its Self-Schedules with sink specified at the Settlement Point; plus

(c) The amount of its Day-Ahead Market (DAM) Energy Bids cleared in the DAM at the Settlement Point; plus

(d) The amount of its Energy Trades at the Settlement Point where the QSE is the buyer; minus

(e) The amount of its Self-Schedules with source specified at the Settlement Point; minus

(f) The amount of its energy offers cleared in the DAM at the Settlement Point; minus

(g) The amount of its Energy Trades at the Settlement Point where the QSE is the seller.

(2) The payment or charge to each QSE for Energy Imbalance Service at a Resource Node Settlement Point for a given 15-minute Settlement Interval is calculated as follows:

**RTEIAMT *q, p* = (-1) \* {((RESREV** *q****, r, gsc, p*)) + (WSLAMTTOT *q, r, p*) + RTSPP *p* \* [(SSSK *q, p* \* ¼) + (DAEP *q, p* \* ¼) + (RTQQEP *q, p* \* ¼) – (SSSR *q, p* \* ¼) – (DAES *q, p* \* ¼) – (RTQQES *q, p* \* ¼)]}**

|  |
| --- |
| [NPRR986: Replace the formula “RTEIAMT q, p” above with the following upon system implementation:]  RTEIAMT *q, p* = (-1) \* {((RESREV *q, r, gsc, p*)) + (WSLAMTTOT *q, r, p*) + (ESRNWSLAMTTOT *q, r, p*) + RTSPP *p* \* [(SSSK *q, p* \* ¼) + (DAEP *q, p* \* ¼) + (RTQQEP *q, p* \* ¼) – (SSSR *q, p* \* ¼) – (DAES *q, p* \* ¼) – (RTQQES *q, p* \* ¼)]} |

Where:

**RESREV** *q****, r, gsc, p* = GSPLITPER** *q****, r, gsc, p* \* NMSAMTTOT *gsc***

**RESMEB** *q****, r, gsc, p* = GSPLITPER** *q****, r, gsc, p* \* NMRTETOT *gsc***

**WSLTOT *q, p*** = ** (** **MEBL** *q,r,b***)**

**RNIMBAL *q, p =* (RESMEB** *q****, r, gsc, p*) + WSLTOT *q, p* + (SSSK *q, p* \* ¼) + (DAEP *q, p* \* ¼) + (RTQQEP *q, p* \* ¼) – (SSSR *q, p* \* ¼) – (DAES *q, p* \* ¼) – (RTQQES *q, p* \* ¼)**

|  |
| --- |
| [NPRR986: Replace the formula “RNIMBAL q, p” above with the following upon system implementation:]  ESRNWSLTOT *q, p* =  ( MEBR *q, r, b*)  RNIMBAL *q, p =* (RESMEB *q, r, gsc, p*) + WSLTOT *q, p* + ESRNWSLTOT *q, p* + (SSSK *q, p* \* ¼) + (DAEP *q, p* \* ¼) + (RTQQEP *q, p* \* ¼) – (SSSR *q, p* \* ¼) – (DAES *q, p* \* ¼) – (RTQQES *q, p* \* ¼) |

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| RTEIAMT *q, p* | $ | *Real-Time Energy Imbalance Amount per QSE per Settlement Point*—The payment or charge to QSE *q* for Real-Time Energy Imbalance Service at Settlement Point *p*, for the 15-minute Settlement Interval. |
| RNIMBAL *q, p* | MWh | *Resource Node Energy Imbalance per QSE per Settlement Point*—The Resource Node volumetric imbalance for QSE *q* for Real-Time Energy Imbalance Service at Settlement Point *p*, for the 15-minute Settlement Interval. |
| RTSPP *p* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval. |
| SSSK *q, p* | MW | *Self-Schedule with Sink at Settlement Point per QSE per Settlement Point*—The QSE *q*’s Self-Schedule with sink at Settlement Point *p*, for the 15-minute Settlement Interval. |
| DAEP *q, p* | MW | *Day-Ahead Energy Purchase per QSE per Settlement Point*—The QSE *q*’s DAM Energy Bids at Settlement Point *p* cleared in the DAM, for the hour that includes the 15-minute Settlement Interval. |
| RTQQEP *q, p* | MW | *Real-Time QSE-to-QSE Energy Purchase per QSE per Settlement Point*⎯The amount of MW bought by QSE *q* through Energy Trades at Settlement Point *p*, for the 15-minute Settlement Interval. |
| SSSR *q, p* | MW | *Self-Schedule with Source at Settlement Point per QSE per Settlement Point*—The QSE *q*’s Self-Schedule with source at Settlement Point *p*, for the 15-minute Settlement Interval. |
| DAES *q, p* | MW | *Day-Ahead Energy Sale per QSE per Settlement Point*—The QSE *q*’s energy offers at Settlement Point *p* cleared in the DAM, for the hour that includes the 15-minute Settlement Interval. |
| RTQQES *q, p* | MW | *Real-Time QSE-to-QSE Energy Sale per QSE per Settlement Point*⎯The amount of MW sold by QSE *q* through Energy Trades at Settlement Point *p*, for the 15-minute Settlement Interval. |
| RESREV *q, r, gsc, p* | $ | *Resource Share Revenue Settlement Payment*—The Resource share of the total payment to the entire Facility with a net metering arrangement attributed to Resource *r* that is part of a generation site code *gsc* for the QSE *q* at Settlement Point *p*. |
| RESMEB *q, r, gsc, p* | MWh | *Resource Share Net Meter Real-Time Energy Total*—The Resource share of the net sum for all Settlement Meters attributed to Resource *r* that is part of a generation site code *gsc* for the QSE *q* at Settlement Point *p*. |
| WSLTOT *q, p* | MWh | *WSL Total*—The total WSL energy metered by the Settlement Meters which measure WSL for the QSE *q* at Settlement Point *p*. |
| |  |  |  |  | | --- | --- | --- | --- | | [NPRR986: Insert the variable “ESRNWSLTOT q, p” below upon system implementation:]   |  |  |  | | --- | --- | --- | | ESRNWSLTOT *q, p* | MWh | *ESR Non-WSL Total*—The total energy metered by the Settlement Meters which measures ESR Load that is not WSL for the QSE *q* at Settlement Point *p.* | | | | |
| MEBL *q,r,b* | MWh | *Metered Energy for Wholesale Storage Load at bus*⎯The WSL energy metered by the Settlement Meter which measures WSL for the 15-minute Settlement Interval represented as a negative value, for the QSE *q*, Resource *r*, at bus *b*. |
| |  |  |  |  | | --- | --- | --- | --- | | [NPRR986: Insert the variable “MEBR q, r, b” below upon system implementation:]   |  |  |  | | --- | --- | --- | | MEBR *q, r, b* | MWh | *Metered Energy for Energy Storage Resource Load at Bus* - The energy metered by the Settlement Meter which measures ESR Load that is not WSL for the 15-minute Settlement Interval represented as a negative value, for the QSE *q*, Resource *r*, at bus *b*. | | | | |
| NMSAMTTOT *gsc* | $ | *Net Metering Settlement*—The total payment or charge to a generation site with a net metering arrangement. |
| WSLAMTTOT*q, r, p* | $ | *Wholesale Storage Load Settlement*—The total payment or charge to QSE *q*, Resource *r*, at Settlement Point *p*, for WSL for each 15-minute Settlement Interval. |
| |  |  |  |  | | --- | --- | --- | --- | | [NPRR986: Insert the variable “ESRNWSLAMTTOT q, r, p” below upon system implementation:]   |  |  |  | | --- | --- | --- | | ESRNWSLAMTTOT*q, r, p* | $ | *Energy Storage Resource Non-WSL Settlement*—The total payment or charge to QSE *q*, Resource *r*, at Settlement Point *p*, for ESR Load that is not WSL for each 15-minute Settlement Interval. | | | | |
| NMRTETOT *gsc* | MWh | *Net Meter Real-Time Energy Total*—The net sum for all Settlement Meters included in generation site code *gsc*. A positive value indicates an injection of power to the ERCOT System. |
| GSPLITPER *q, r, gsc, p* | none | *Generation Resource SCADA Splitting Percentage*—The generation allocation percentage for Resource *r* that is part of a net metering arrangement. GSPLITPER is calculated by taking the Supervisory Control and Data Acquisition (SCADA) values (GSSPLITSCA) for a particular Generation Resource *r* that is part of a net metering configuration and dividing by the sum of all SCADA values for all Resources that are included in the net metering configuration for each interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| *q* | none | A QSE. |
| *p* | none | A Resource Node Settlement Point. |
| *r* | none | A Generation Resource or an energy storage Load Resource that is located at the Facility with net metering.   |  | | --- | | [NPRR986: Replace the Description above with the following upon system implementation:]  A Generation Resource or a Controllable Load Resource that is part of an ESR that is located at the Facility with net metering. | |
| *gsc* | none | A generation site code. |
| *b* | none | An Electrical Bus. |

(3) For a facility with Settlement Meters that measure WSL, the total payment or charge for WSL is calculated for a QSE, energy storage Load Resource, and Settlement Point for each 15-minute Settlement Interval.

The WSL is settled as follows:

**WSLAMTTOT *q, r, p* =**  **(RTRMPRWSL *b* \* MEBL** ***q, r, b*)**

Where the price for Settlement Meter is determined as follows:

**RTRMPRWSL *b* = Max [-$251, (image010(RNWFL *b, y* \* RTLMP *b, y*) + RTRDP)]**

Where the weighting factor for the Electrical Bus associated with the meter is:

**RNWFL *b, y* = [Max (0.001,** image001 **TL *r, y*)) \* TLMP *y*] /**

**[image010Max (0.001,** image001 **TL *r, y*)) \* TLMP *y*]**

Where:

RTRDP = (RNWF  *y* \* RTORDPA *y*)

RNWF *y* = TLMP *y* / TLMP *y*

The summation is over all WSL *r* associated to the individual meter. The determination of which Resources are associated to an individual meter is static and based on the normal system configuration of the generation site code, *gsc*.

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| RTLMP *b, y* | $/MWh | *Real-Time Locational Marginal Price at bus per interval*⎯The Real-Time LMP for the meter at Electrical Bus *b*, for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the SCED interval *y*. |
| RTRDP | $/MWh | *Real-Time Reliability Deployment Price for Energy*⎯The Real-Time price for the 15-minute Settlement Interval, reflecting the impact of reliability deployments on energy prices that is calculated from the Real-Time Reliability Deployment Price Adder for Energy. |
| RTORDPA*y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy* ⎯The Real-Time price adder that captures the impact of reliability deployments on energy prices for the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| MEBL*q,r,b* | MWh | *Metered Energy for Wholesale Storage Load at bus*⎯The WSL energy metered by the Settlement Meter which measures WSL for the 15-minute Settlement Interval represented as a negative value, for the QSE *q*, Resource *r*, at bus *b*. |
| WSLAMTTOT*q, r, p* | $ | *Wholesale Storage Load Settlement*—The total payment or charge to QSE *q*, Resource *r*, at Settlement Point *p*, for WSL for each 15-minute Settlement Interval. |
| RNWFL*b, y* | none | *Net meter Weighting Factor per interval for the Energy Metered as Wholesale Storage Load*The weight factor used in net meter price calculation for meters in Electrical Bus *b*, for the SCED interval *y*, for the WSL associated with an energy storage Load Resource. The weighting factor used in the net meter price calculation shall not be recalculated after the fact due to revisions in the association of Resources to Settlement Meters. |
| RTRMPRWSL*b* | $/MWh | *Real-Time Price for the Energy Metered as Wholesale Storage Load at bus*⎯The Real-Time price for the Settlement Meter which measures WSL at Electrical Bus *b*, for the 15-minute Settlement Interval. |
| TL *r, y* | MW | *Telemetered WSL charging per interval*⎯The telemetered Load associated with the energy storage Load Resource *r* for the SCED interval *y*. |
| *gsc* | none | A generation site code. |
| *r* | none | An energy storage Load Resource. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |
| *b* | none | An Electrical Bus. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR986: Replace paragraph (3) above with the following upon system implementation:]***  (3) For a facility with Settlement Meters that measure ESR Load, the total payment or charge for ESR Load is calculated for a QSE, ESR, and Settlement Point for each 15-minute Settlement Interval.  The WSL is settled as follows:  **WSLAMTTOT *q, r, p* =**  **(RTRMPRESR *b* \* MEBL** ***q, r, b*)**  The ESR Load that is not WSL is settled as follows:  **ESRNWSLAMTTOT *q, r, p* =**  **(RTRMPRESR *b* \* MEBR** ***q, r, b*)**  Where the price for Settlement Meter is determined as follows:  **RTRMPRESR *b* = Max [-$251, (image010(RNWFL *b, y* \* RTLMP *b, y*) + RTRDP)]**  Where the weighting factor for the Electrical Bus associated with the meter is:  **RNWFL *b, y* = [Max (0.001,** image001**BP *r, y*) \* TLMP *y*] /**  **[image010Max (0.001,** image001 **BP *r, y*) \* TLMP *y*]**  Where:  RTRDP = (RNWF  *y* \* RTORDPA *y*)  RNWF *y* = TLMP *y* / TLMP *y*  The summation is over all ESR Load *r* associated to the individual meter. The determination of which Resources are associated to an individual meter is static and based on the normal system configuration of the generation site code, *gsc*.  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | RTLMP *b, y* | $/MWh | *Real-Time Locational Marginal Price at bus per interval*⎯The Real-Time LMP for the meter at Electrical Bus *b*, for the SCED interval *y*. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the SCED interval *y*. | | RTRDP | $/MWh | *Real-Time Reliability Deployment Price for Energy*⎯The Real-Time price for the 15-minute Settlement Interval, reflecting the impact of reliability deployments on energy prices that is calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | RTORDPA*y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy* ⎯The Real-Time price adder that captures the impact of reliability deployments on energy prices for the SCED interval *y*. | | RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. | | MEBL*q,r,b* | MWh | *Metered Energy for Wholesale Storage Load at bus*⎯The WSL energy metered by the Settlement Meter which measures WSL for the 15-minute Settlement Interval represented as a negative value, for the QSE *q*, Resource *r*, at bus *b*. | | MEBR *q, r, b* | MWh | *Metered Energy for Energy Storage Resource Load at Bus* - The energy metered by the Settlement Meter which measures ESR Load that is not WSL for the 15-minute Settlement Interval represented as a negative value, for the QSE *q*, Resource *r*, at bus *b*. | | WSLAMTTOT*q, r, p* | $ | *Wholesale Storage Load Settlement*—The total payment or charge to QSE *q*, Resource *r*, at Settlement Point *p*, for WSL for each 15-minute Settlement Interval. | | ESRNWSLAMTTOT*q, r, p* | $ | *Energy Storage Resource Non-WSL Settlement*—The total payment or charge to QSE *q*, Resource *r*, at Settlement Point *p*, for ESR Load that is not WSL for each 15-minute Settlement Interval. | | RNWFL*b, y* | none | *Net meter Weighting Factor per interval for the Energy Metered as Energy Storage Resource Load*The weight factor used in net meter price calculation for meters in Electrical Bus *b*, for the SCED interval *y*, for the ESR Load associated with an ESR. The weighting factor used in the net meter price calculation shall not be recalculated after the fact due to revisions in the association of Resources to Settlement Meters. | | RTRMPRESR*b* | $/MWh | *Real-Time Price for the Energy Metered as Energy Storage Resource Load at bus*⎯The Real-Time price for the Settlement Meter which measures ESR Load at Electrical Bus *b*, for the 15-minute Settlement Interval. | | BP *r, y* | MW | *Base Point per Resource per interval* - The Base Point of Resource *r*, for the SCED interval *y*. | | *q* | none | A QSE. | | *gsc* | none | A generation site code. | | *r* | none | The Controllable Load Resource that is part of an ESR. | | *p* | none | A Resource Node Settlement Point. | | *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. | | *b* | none | An Electrical Bus. | |

(4) The total payment or charge to a Facility with a net metering arrangement for each 15-minute Settlement Interval shall be calculated as follows:

**NMRTETOT *gsc* = Max (0, ( (MEB *gsc, b +* MEBC *gsc, b*)))**

If NMRTETOT *gsc* = 0 for a 15-minute Settlement Interval, then

The Load that is not WSL is included in the Real-Time AML per QSE and is included in the Real-Time energy imbalance payment or charge at a Load Zone.

|  |
| --- |
| [NPRR986: Replace the language above with the following upon system implementation:]  The Load that is not WSL is included in the Real-Time AML per QSE. |

Otherwise, when NMRTETOT *gsc* **>** 0 for a 15-minute Settlement Interval, then

**NMSAMTTOT** *gsc* **=  [(RTRMPR *b* \* MEB *gsc, b*) + (RTRMPR *b* \* MEBC *gsc, b*)]**

Where the price for Settlement Meter is determined as follows**:**

**RTRMPR *b*** = **Max [-$251, (image010(RNWF *b, y* \* RTLMP *b, y*) + RTRDP)]**

Where the weighting factor for the Electrical Bus associated with the meter is:

**RNWF *b, y* = [Max (0.001,** **BP *r, y*) \* TLMP *y*] /**

**[image010Max (0.001,** **BP *r, y*) \* TLMP *y*]**

Where:

RTRDP = (RNWF  *y* \* RTORDPA *y*)

RNWF *y* = TLMP *y* / TLMP *y*

The summation is over all Resources *r* associated to the individual meter. The determination of which Resources are associated to an individual meter is static and based on the normal system configuration of the generation site code, *gsc*.

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| NMRTETOT *gsc* | MWh | *Net Meter Real-Time Energy Total*—The net sum for all Settlement Meters included in generation site code *gsc*. A positive value indicates an injection of power to the ERCOT System. |
| NMSAMTTOT*gsc* | $ | *Net Metering Settlement*—The total payment or charge to a generation site with a net metering arrangement. |
| RTRMPR *b* | $/MWh | *Real-Time Price for the Energy Metered for each Resource meter at bus*⎯The Real-Time price for the Settlement Meter at Electrical Bus *b*, for the 15-minute Settlement Interval. |
| MEB *gsc, b* | MWh | *Metered Energy at bus*⎯The metered energy by the Settlement Meter which is not upstream from another Settlement Meter which measures WSL for the 15-minute Settlement Interval. A positive value represents energy produced, and a negative value represents energy consumed.   |  | | --- | | [NPRR986: Replace the Description above with the following upon system implementation:]  *Metered Energy at bus*⎯The metered energy by the Settlement Meter which is not upstream from another Settlement Meter which measures ESR Load for the 15-minute Settlement Interval. A positive value represents energy produced, and a negative value represents energy withdrawn. | |
| RTRDP | $/MWh | *Real-Time Reliability Deployment Price for Energy*⎯The Real-Time price for the 15-minute Settlement Interval, reflecting the impact of reliability deployments on energy prices that is calculated from the Real-time Reliability Deployment Price Adder for Energy. |
| RTORDPA*y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy* ⎯The Real-Time price adder that captures the impact of reliability deployments on energy prices for the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| RTLMP *b, y* | $/MWh | *Real-Time Locational Marginal Price at bus per interval*⎯The Real-Time LMP for the meter at Electrical Bus *b*, for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the SCED interval *y*. |
| RNWF *b, y* | none | *Net meter Weighting Factor per interval*The weight factor used in net meter price calculation for meters in Electrical Bus *b*, for the SCED interval *y*. The weighting factor used in the net meter price calculation shall not be recalculated after the fact due to revisions in the association of Resources to Settlement Meters. |
| BP *r, y* | MW | *Base Point per Resource per interval*The Base Point of Resource *r,* for the SCED interval *y*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MEBC*gsc, b* | MWh | *Metered Energy at bus (Calculated)*⎯The calculated energy for the 15-minute Settlement Interval for a Settlement Meter which is upstream from another Settlement Meter which measures WSL. A positive value represents energy produced, and a negative value represents energy consumed.   |  | | --- | | [NPRR986: Replace the Description above with the following upon system implementation:]  *Metered Energy at bus (Calculated)* ⎯ The calculated energy for the 15-minute Settlement Interval for a Settlement Meter which is upstream from another Settlement Meter which measures ESR Load. A positive value represents energy produced, and a negative value represents energy withdrawn. | |
| *gsc* | none | A generation site code. |
| *r* | none | A Generation Resource that is located at the Facility with net metering. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |
| *b* | none | An Electrical Bus. |

(5) The Generation Resource SCADA Splitting Percentage for each Resource within a net metering arrangement for the 15-minute Settlement Interval is calculated as follows:

**GSPLITPER *q, r, gsc, p* = GSSPLITSCA *r* /** **GSSPLITSCA *r***

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| GSPLITPER *q, r, gsc, p* | none | *Generation Resource SCADA Splitting Percentage*—The generation allocation percentage for Resource *r* that is part of a generation site code *gsc* for the QSE *q* at Settlement Point *p*. GSPLITPER is calculated by taking the SCADA values (GSSPLITSCA) for a particular Generation Resource *r* that is part of a net metering configuration and dividing by the sum of all SCADA values for all Resources that are included in the net metering configuration for each interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| GSSPLITSCA *r* | MWh | *Generation Resource SCADA Net Real Power provided via Telemetry*—The net real power provided via telemetry per Resource within the net metering arrangement, integrated for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| *gsc* | none | A generation site code. |
| *r* | none | A Generation Resource that is located at the Facility with net metering. |
| *q* | none | A QSE. |
| *p* | none | A Resource Node Settlement Point. |

(6) The total net payments and charges to each QSE for Energy Imbalance Service at all Resource Node Settlement Points for the 15-minute Settlement Interval is calculated as follows:

**RTEIAMTQSETOT *q* =  RTEIAMT *q, p***

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| RTEIAMTQSETOT *q* | $ | *Real-Time Energy Imbalance Amount QSE Total per QSE*⎯The total net payments and charges to QSE *q* for Real-Time Energy Imbalance Service at all Resource Node Settlement Points for the 15-minute Settlement Interval. |
| RTEIAMT *q, p* | $ | *Real-Time Energy Imbalance Amount per QSE per Settlement Point*—The payment or charge to QSE *q* for Real-Time Energy Imbalance Service at Settlement Point *p*, for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |
| *p* | none | A Resource Node Settlement Point. |

**6.6.3.7 Real-Time High Dispatch Limit Override Energy Payment**

(1) If ERCOT directs a reduction in a Generation Resource’s real power output by employing a manual High Dispatch Limit (HDL) override and the reduction causes the QSE to suffer a demonstrable financial loss, the QSE may be eligible for a Real-Time High Dispatch Limit Override Energy Payment, as calculated below, upon providing documented proof of that loss. In order to qualify for this payment the QSE must:

(a) Have complied with ERCOT Dispatch Instructions to reduce real power output;

(b) Have received a SCED Base Point equal to the Resource’s HDL override, during the 15-minute Settlement Interval;

(c) Have incurred a demonstrable financial loss associated with variable cost components of DAM obligations or energy purchase or sale provisions of bilateral contracts (as opposed to lost opportunity costs), in consequence of the HDL override; and

(d) File a timely Settlement and billing dispute, including the following items:

(i) An attestation signed by an officer or executive with authority to bind the QSE;

(ii) The dollar amount and calculation of the financial loss by Settlement Interval;

(iii) An explanation of the nature of the loss and how it was attributable to the HDL override; and

(iv) Sufficient documentation to support the QSE’s calculation of the amount of the financial loss.

(2) ERCOT may request additional supporting documentation or explanation with respect to the submitted materials within 15 Business Days of receipt. Additional information requested by ERCOT must be provided by the QSE within 15 business days of ERCOT’s request. ERCOT will provide Notice of its acceptance or rejection of the claim for the High Dispatch Limit Override Energy Payment within 15 Business Days of the updated submission.

(3) The Energy Offer Curve used to calculate the Real-Time High Dispatch Limit Override Energy Payment will be the most recent valid Energy Offer Curve received by ERCOT that was effective for the disputed interval(s) when the HDL override was issued. If no curve exists for the interval being disputed, ERCOT will use the most recent valid Energy Offer Curve received before the HDL override was issued for an interval prior to the disputed interval(s).

(4) The amount recoverable under this section shall be offset by any Ancillary Service Imbalance revenues received by the QSE that the QSE would not have earned had ERCOT not issued an HDL override.

The payment shall be calculated as follows:

**HDLOEAMT *q, r, p, i* = (-1) \* Min {HDLOAL *q, r, p, i*, Max(0, ((RTSPP*p, i* – RTRDP *i* – HDLOAIEC*q, r, p, i* ) \* HDLOQTY *q, r, p, i* ))}**

|  |
| --- |
| [NPRR971: Replace the formula “HDLOEAMT q, r, p, i” above with the following upon system implementation:]  **HDLOEAMT *q, r, p, i* = (-1) \* Min {HDLOAL *q, r, p, i*, Max(0, ((RTSPP*p, i* – RTRDP *i* – RTEOCOST *q, r, i* ) \* HDLOQTY *q, r, p, i* ))}** |

Where:

HDLOQTY *q, r, p, i* = Max(0, (¼ (HDLOBRKP *q, r, p, i* – AVGHDL *q, r, p, i*)))

HDLOBRKP *q, r, p, i* = Min(AVGHSL *q, r, p, i* , HDLOBRKPCP *q, r, p, i* )

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| HDLOAL ***q, r, p, i*** | $ | *High Dispatch Limit override attested losses -* The financial loss to the QSE due to the HDL override as attested by the QSE in accordance with paragraph (1)(d) above. |
| HDLOEAMT ***q, r, p, i*** | $ | *High Dispatch Limit override energy amount per QSE per Generation Resource*—The payment to QSE *q* for an ERCOT-issued HDL override for Generation Resource *r* at Settlement Point *p* for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. |
| HDLOBRKP***q, r, p, i*** | MW | *High Dispatch Limit override break point per QSE per Resource*—The point on the Energy Offer Curve corresponding to the lesser of the AVGHSL or the interception between the RTSPP of the Generation Resource *r* represented by QSE *q* minus the Real-Time Reliability Deployment Price for Energy and the Energy Offer Curve of Generation Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. |
| AVGHDL***q, r, p, i*** | MW | *Average High Dispatch Limit per QSE per Settlement Point per Resource*—The time-weighted average of all 4-second HDL values calculated by the Resource Limit Calculator, subject to the manual HDL override, for the Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* within the 15-minute Settlement Interval *i*.  For a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| AVGHSL ***q, r, p, i*** | MW | *Average High Sustained Limit per QSE per Settlement Point per Resource*—The time-weighted average High Sustained Limit (HSL) for the Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* within the 15-minute Settlement Interval *i*.  For a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| HDLOBRKPCP*q, r, p, i* | MW | *High Dispatch Limit override break point at clearing price per QSE per Resource*—The MW value on the Energy Offer Curve corresponding to the Real-Time Settlement Point Price of Generation Resource *r* represented by QSE *q* at Settlement Point *p* minus the Real-Time Reliability Deployment Price for Energy. For a combined cycle Resource, *r* is a Combined Cycle Train. |
| HDLOAIEC *q, r, p, i* | $/MWh | *High Dispatch Limit override Average Incremental Energy Cost per QSE per Resource—*The average incremental cost (not subject to the cost cap) to operate the Generation Resource *r* represented by QSE *q* at Settlement Point *p* from its AVGHDL to its HDLOBRKP for the 15-minute Settlement Interval *i* and as described in Section 4.6.5, Calculation of “Average Incremental Energy Cost” (AIEC). For a combined cycle Resource, *r* is a Combined Cycle Generation Resource. |
| |  |  |  |  | | --- | --- | --- | --- | | [NPRR971: Replace the formula “HDLOAIEC q, r, p, 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 Low Sustained Limit (LSL) for the Settlement Interval *i*. See Section 4.4.9.3.3, Energy Offer Curve Cost Caps. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. | | | | |
| HDLOQTY *q, r, p, i* | MWh | *High Dispatch Limit override quantity per QSE per Generation Resource—* The difference between the HDLOBRKP and the AVGHDL due to an ERCOT-issued HDL override for Generation Resource *r* represented by QSE *q* at Settlement Point *p* for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. |
| RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. |
| RTRDP *i* | $/MWh | *Real-Time Reliability Deployment Price* *for Energy*⎯The Real-Time price for the 15-minute Settlement Interval *i*, reflecting the impact of reliability deployments on energy prices that is calculated from the Real-Time Reliability Deployment Price Adder for Energy. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |
| *p* | none | A Resource Node Settlement Point. |
| *i* | none | A 15-minute Settlement Interval. |

(2) The total compensation to each QSE for an HDL override for the 15-minute Settlement Interval is calculated as follows:

**HDLOEAMTQSETOT *q, i*  = HDLOEAMT *q, r, p, i***

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| HDLOEAMT *q, r, p, i* | $ | *High Dispatch Limit override energy amount per QSE per Generation Resource*—The payment to QSE *q* for an ERCOT-issued HDL override for Generation Resource *r* at Settlement Point *p* for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. |
| HDLOEAMTQSETOT *q, i* | $ | *High Dispatch Limit override energy amount QSE total per QSE*—The total of the energy payments to QSE *q* as compensation for HDL overrides for this QSE for the 15-minute Settlement Interval *i*. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |
| *p* | none | A Resource Node Settlement Point. |
| *i* | none | A 15-minute Settlement Interval. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR917: Insert Section 6.6.3.9 below upon system implementation:]***  **6.6.3.9 Real-Time Payment or Charge for Energy from a Settlement Only Distribution Generator (SODG) or a Settlement Only Transmission Generator (SOTG)**  (1) Except for a SODG or SOTG that has opted out of nodal pricing as described in paragraph (5) below, the payment or charge to each QSE for energy from an SODG or an SOTG shall be based on an identified nodal energy price, RTESOGPR, as described in this subsection.  (2) For an SODG, the price used as the basis for the 15-minute Real-Time price calculation is the time-weighted price at the Electrical Bus associated with this mapped Load in the Network Operations Model. For an SOTG, the price used as the basis for the 15-minute Real-Time price calculation is the time-weighted price at the Electrical Bus as determined by ERCOT in review of the meter location of the SOTG in the Network Operations Model. The outflow of energy into the grid as measured by each Settlement Meter for the 15-minute Settlement Interval shall be priced at the nodal energy price (RTESOGPR, as defined in paragraph (3) below), and the inflow of energy is treated as Load and shall be settled accordingly at the zonal energy price (the Load Zone Settlement Point Price). SODG and SOTG sites will be represented as a single unit in the ERCOT Settlement system.  (3) For an SODG or an SOTG, the total payment or charge for each 15-minute Settlement Interval shall be calculated as follows:  **RTESOGSAMT *q,* *gsc* = (-1) \* [( RTESOGPR *b* \* OFSOG *q, gsc, b*)]**  **Where the price for the SOTG or SODG is determined as follows:**  **RTESOGPR *b* = Max [-$251, ((SDWF *y* \* RTLMP *b, y*) + RTRDP)]**  Where:    RTRDP = (SDWF *y* \* RTORDPA *y*)  SDWF *y* = TLMP *y* / TLMP *y*  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | RTESOGSAMT*q,**gsc* | $ | *Real-Time Energy for SODG and SOTG Site Amount* —The total payment or charge to QSE *q* for SODG or SOTG site *gsc* for the 15-minute Settlement Interval. | | RTESOGPR *b* | $/MWh | *Real-Time Price for the Energy Metered for each SODG or SOTG Site* ⎯The Real-Time price at Electrical Bus *b* for the Settlement Meter for the SODG or SOTG site for the 15-minute Settlement Interval. | | OFSOG *q,* *gsc, b* | MWh | *Outflow as Measured for an SODG or SOTG Site* ⎯The outflow as measured by the Settlement Meter(s) at Electrical Bus *b* for SODG or SOTG site *gsc* represented by QSE *q*. | | RTRDP | $/MWh | *Real-Time Reliability Deployment Price for Energy* ⎯The Real-Time price for the 15-minute Settlement Interval, reflecting the impact of reliability deployments on energy prices that is calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | RTORDPA*y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy* ⎯The Real-Time price adder that captures the impact of reliability deployments on energy prices for the SCED interval *y*. | | SDWF *y* | None | *SCED Duration Weighting Factor per interval*⎯The weight used in the SODG or SOTG price calculation for the portion of the SCED interval *y* within the Settlement Interval. | | RTLMP *b, y* | $/MWh | *Real-Time Locational Marginal Price at bus per interval*⎯The Real-Time LMP at Electrical Bus *b*, for the SCED interval *y*. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the SCED interval *y* within the Settlement Interval. | | *gsc* | none | A generation site code. | | *b* | none | An Electrical Bus. | | *y* | None | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |   (4) The total net payments and charges to each QSE for energy from SODGs and SOTGs for the 15-minute Settlement Interval is calculated as follows:  **RTESOGAMTQSETOT *q* = RTESOGSAMT *q, gsc***  The above variables are defined as follows:   | **Variable** | **Unit** | **Definition** | | --- | --- | --- | | RTESOGAMTQSETOT *q* | $ | *Real-Time Energy Payment or Charge per QSE for Energy from SODGs and SOTGs* —The payment or charge to QSE *q* for Real-Time energy from SODGs and SOTGs, for the 15-minute Settlement Interval. | | RTESOGSAMT *q, gsc* | $ | *Real-Time Energy for SODG and SOTG Site Amount* —The total payment or charge to QSE *q* for an SODG or SOTG site *gsc* for the 15-minute Settlement Interval. | | *q* | none | A QSE. | | *gsc* | none | A generation site code. |   (5) Notwithstanding anything else in this Section except paragraphs (6) and (7) below, a Resource Entity may opt out of nodal pricing and continue Load Zone Settlement for any SODG or SOTG if, by January 1, 2019, the SODG or SOTG was operational or was subject to a Power Purchase or Tolling Agreement (PPA) or Transmission and/or Distribution Service Provider (TDSP) interconnection agreement, or had an executed agreement with a developer. By December 31, 2019, the Resource Entity must submit a properly completed Section 23, Form N, Pricing Election for Settlement Only Distribution Generators and Settlement Only Transmission Generators. Any SODG or SOTG relying on a PPA or TDSP interconnection agreement or agreement with a developer must also have achieved Initial Synchronization for the full Resource capacity before June 1, 2020 to be eligible to opt out of nodal pricing. A Resource Entity must provide ERCOT documented proof of any PPA, TDSP interconnection agreement, or developer agreement that it relies on as a basis for any election under this paragraph. This election is valid through the earlier of December 31, 2029 or the date on which the election is revoked pursuant to paragraph (8) of this Section. On January 1, 2030, all SODGs and SOTGs will be subject to nodal pricing.  (6) For any SODG or SOTG for which the applicable Resource Entity has elected to opt out of nodal pricing, ERCOT shall settle the output of the SODG or SOTG using the Load Zone Settlement Point Price for the duration of the opt-out period so long as the SODG or SOTG is not physically modified for any purpose, including to increase the capacity of the unit or change the fuel type of the unit, except as necessary for routine maintenance or repairs to address normal wear and tear.  (7) If at any time ERCOT determines that the SODG or SOTG fails to meet the opt-out conditions in paragraph (6) above, ERCOT shall settle the output of the SODG or SOTG at the applicable nodal price as soon as practicable after providing written notice to the affected Resource Entity.  (8) A Resource Entity that has opted out of nodal pricing for one or more SODGs or SOTGs pursuant to paragraph (5) of this Section may withdraw that election and begin receiving applicable nodal pricing for one or more such generators by submitting a properly completed election form (Section 23, Form N). An election of nodal pricing is irrevocable. ERCOT will effectuate the transition of an SODG or SOTG to nodal pricing in ERCOT Settlement systems as soon as practicable. |

**6.6.5.1 Resource Base Point Deviation Charge**

(1) A QSE for a Generation Resource or Controllable Load Resource shall pay a Base Point Deviation Charge if the Resource did not follow Dispatch Instructions and Ancillary Service deployments within defined tolerances, except when the Dispatch Instructions and Ancillary Service deployments violate the Resource Parameters. The Base Point Deviation Charge does not apply to Generation Resources when Adjusted Aggregated Base Point (AABP) is less than the Resource’s average telemetered LSL, the QSE’s Generation Resources are operating in Constant Frequency Control (CFC) mode, or any time during the Settlement Interval when the telemetered Resource Status is set to ONTEST or STARTUP. The Base Point Deviation Charge does not apply to a Controllable Load Resource if the computed Base Point is equal to the snapshot of its telemetered power consumption for all SCED runs during the Settlement Interval or any time during the Settlement Interval when the telemetered Resource Status is set to OUTL. The desired output from a Generation Resource or desired consumption from a Controllable Load Resource during a 15-minute Settlement Interval is calculated as follows:

AABP*q, r, p, i* =  (AVGSP5M *q, r, p, i, y*) / 3

The above variables are defined as follows:

| Variable | Unit | Definition |
| --- | --- | --- |
| AABP *q, r, p, i* | MW | *Adjusted Aggregated Base Point per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Ancillary Service deployments of Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, AABP is calculated for the Combined Cycle Train considering all SCED Dispatch Instructions to any Combined Cycle Generation Resources within the Combined Cycle Train. |
| AVGSP5M *q, r, p, i, y* | MW | *Average five minute clock interval Set Point per QSE per Settlement Point per Resource –*The time-weighted average of the sum of a linearly ramped Base Point (Base Ramp) and Regulation Dispatch Instruction that Resource *r*  for QSE *q* at Settlement Point *p* should have produced, for the five-minute clock interval *y* within the 15-minute Settlement Interval *i*. The Base Ramp is calculated every four seconds such that it ramps from its initial value to the SCED Base Point over a four-minute period. The initial value of the Base Ramp will be the expected output of the Resource using the previous Base Point and the last Resource-specific Regulation Dispatch Instruction from LFC before new Base Points were input to LFC (i.e., the expected output based on these two components). AVGSP5M is equal to the ASP value calculated for use in Generation Resource Energy Deployment Performance (GREDP) or Controllable Load Resource Energy Deployment Performance (CLREDP), as described in Section 8.1.1.4.1, Regulation Service and Generation Resource/Controllable Load Resource Energy Deployment Performance. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |
| *r* | none | A Generation Resource or Controllable Load Resource. |
| *i* | None | A 15-minute Settlement Interval |
| *y* | none | A five-minute clock interval in the Settlement Interval. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [NPRR963: Replace Section 6.6.5.1 above with the following upon system implementation:]  **6.6.5.1 Resource Base Point Deviation Charge**  (1) A QSE for a Generation Resource or Controllable Load Resource shall pay a Base Point Deviation Charge if the Resource did not follow Dispatch Instructions and Regulation Up Service (Reg-Up) and Regulation Down Service (Reg-Down) deployments within defined tolerances, except when the Dispatch In structions and Reg-Up and Reg-Down deployments violate the Resource Parameters.  (2) The desired output from a Generation Resource during a 15-minute Settlement Interval is calculated as follows:  **AABP*q, r, p, i* =  (AVGSP5M *q, r, p, i, y*) / 3**  (3) The desired consumption from a Controllable Load Resource during a 15-minute Settlement Interval is calculated as follows:  **AABPCLR*q, r, p, i* =  (AVGSP5M *q, r, p, i, y*) / 3**  The above variables are defined as follows:   | Variable | Unit | Definition | | --- | --- | --- | | AABP *q, r, p, i* | MW | *Adjusted Aggregated Base Point per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Reg-Up and Reg-Down deployments of Generation Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, AABP is calculated for the Combined Cycle Train considering all SCED Dispatch Instructions to any Combined Cycle Generation Resources within the Combined Cycle Train. | | AABPCLR *q, r, p, i* | MW | *Adjusted Aggregated Base Point for the Controllable Load Resource per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Reg-Up and Reg-Down deployments of Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | | AVGSP5M *q, r, p, i, y* | MW | *Average five minute clock interval Set Point per QSE per Settlement Point per Resource –*The time-weighted average of the sum of a linearly ramped Base Point (Base Ramp) and Regulation Dispatch Instruction that Resource *r*  for QSE *q* at Settlement Point *p* should have produced, for the five-minute clock interval *y* within the 15-minute Settlement Interval *i*. The Base Ramp is calculated every four seconds such that it ramps from its initial value to the SCED Base Point over a four-minute period. The initial value of the Base Ramp will be the expected output of the Resource using the previous Base Point and the last Resource-specific Regulation Dispatch Instruction from LFC before new Base Points were input to LFC (i.e., the expected output based on these two components). AVGSP5M is equal to the ASP value calculated for use in Generation Resource Energy Deployment Performance (GREDP), the ASP value calculated for use in the Controllable Load Resource Energy Deployment Performance (CLREDP), or the GENASP and CLRASP values calculated for use in the Energy Storage Resource Energy Deployment Performance (ESREDP), as described in Section 8.1.1.4.1, Regulation Service and Generation Resource/Controllable Load Resource/Energy Storage Resource Energy Deployment Performance. | | *q* | none | A QSE. | | *p* | none | A Settlement Point. | | *r* | none | A Generation Resource or Controllable Load Resource. | | *i* | None | A 15-minute Settlement Interval | | *y* | none | A five-minute clock interval in the Settlement Interval. | |

**6.6.5.1.1.1 Base Point Deviation Charge for Over Generation**

(1) ERCOT shall charge a QSE for a Generation Resource for over-generation that exceeds the following tolerance. The tolerance is the greater of:

(a) 5% of the average of the Base Points in the Settlement Interval adjusted for any Ancillary Service deployments; or

(b) Five MW for metered generation above the average of the Base Points in the Settlement Interval adjusted for any Ancillary Service deployments.

(2) The over-generation charge to each QSE for each Generation Resource at each Resource Node Settlement Point is calculated as follows:

**BPDAMT *q, r, p, i*  = Max (PR1, RTSPP *p, i*) \* OGEN *q, r, p, i***

Where:

OGEN *q, r, p, i*  = Max [0, (TWTG *q, r, p, i*  – ¼ \* Max (((1 + K1) \* AABP *q, r, p, i*), (AABP *q, r, p, i* + Q1)))]

TWTG *q, r, p, i =* ( (AVGTG5M *q, r, p, i, y*) / 3) \* ¼

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| BPDAMT *q, r, p, i* | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. The Base Point Deviation Charge is charged to the Combined Cycle Train for all Combined Cycle Generation Resources. |
| RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. |
| TWTG *q, r, p, i* | MWh | *Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| AABP *q, r, p, i* | MW | *Adjusted Aggregated Base Point per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Ancillary Service deployments, of Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p,* for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, AABP is calculated for the Combined Cycle Train considering all SCED Dispatch Instructions to any Combined Cycle Generation Resources within the Combined Cycle Train. |
| AVGTG5M *q, r, p, i, y* | MW | *Average Telemetered Generation for the 5 Minutes*—The average telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the five-minute clock interval *y*, within the 15-minute Settlement Interval *i*. |
| OGEN *q, r, p, i* | MWh | *Over Generation Volumes per QSE per Settlement Point per Resource*—The amount over-generated by the Generation Resource *r* represented by QSE *q* at Resource Node *p* for the 15- minute Settlement Interval *i*. |
| PR1 | $/MWh | The price to use for the Base Point Deviation Charge for over-generation when RTSPP is less than $20/MWh, $20/MWh. |
| K1 | none | The percentage tolerance for over-generation, 5%. |
| Q1 | MW | The MW tolerance for over-generation, five MW. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |
| *r* | none | A non-exempt, non-Intermittent Renewable Resource (IRR). |
| *y* | none | A five-minute clock interval in the Settlement Interval. |
| *i* | none | A 15-minute Settlement Interval. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [NPRR879 and NPRR963: Replace applicable portions of Section 6.6.5.1.1.1 above with the following upon system implementation and renumber accordingly:]  6.6.5.2 Base Point Deviation Charge for Over Generation  (1) For Generation Resources that are not Energy Storage Resources (ESRs), ERCOT shall charge a QSE for a Generation Resource, including an Intermittent Renewable Resource (IRR) with an Ancillary Service award for at least one SCED interval within the 15-minute Settlement Interval, for over-generation that exceeds the following tolerance. The tolerance is the greater of:  (a) 5% of the Adjusted Aggregated Base Point in the Settlement Interval; or  (b) Five MW above the Adjusted Aggregated Base Point in the Settlement Interval.  (2) For instances in which an IRR has not received an Ancillary Service award or is not part of an IRR Group in which an IRR receives an Ancillary Service award for any SCED interval within the 15-minute Settlement Interval, Base Point Deviation Charges will be determined per Section 6.6.5.4, IRR Generation Resource Base Point Deviation Charge.  (3) The over-generation charge to each QSE for each Generation Resource, that is not part of an IRR Group or an ESR, at each Resource Node Settlement Point is calculated as follows:  BPDAMT *q, r, p, i*  = Max (PR1, RTSPP *p, i*) \* OGEN *q, r, p, i*  Where:  OGEN *q, r, p, i*  = Max [0, (TWTG *q, r, p, i*  – ¼ \* Max (((1 + K1) \* AABP *q, r, p, i*), (AABP *q, r, p, i* + Q1)))]  TWTG *q, r, p, i =* ( (AVGTG5M *q, r, p, i, y*) / 3) \* ¼  (4) If any IRR in an IRR Group is awarded Ancillary Services for at least one SCED interval within the 15-minute Settlement Interval, then the deviation penalty is determined for the IRR Group and evenly allocated and charged to each IRR within that IRR Group as follows:  BPDAMT *q, r, p, i* = Max (PR1, RTSPP *p, i*) \* OGEN *q, r, p, i*  Where:  OGEN *q, r, p, i*  = Max [0, (TWTG *q, wg, p, i*  – ¼ \* Max (((1 + K1) \* AABP *q, wg, p, i*),  (AABP *q, wg, p, i* + Q1)))] / N  TWTG *q, wg, p, i* =  ( (AVGTG5M *q, r, p, i, y*) / 3) \* ¼  AABP *q, wg, p, i* = (AABP *q, r, p, i*)  The above variables are defined as follows:   | Variable | Unit | Definition | | --- | --- | --- | | BPDAMT *q, r, p, i* | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. The Base Point Deviation Charge is charged to the Combined Cycle Train for all Combined Cycle Generation Resources. | | RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | | TWTG *q, r, p, i* | MWh | *Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. | | AABP *q, r, p, i* | MW | *Adjusted Aggregated Base Point per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Reg-Up and Reg-Down deployments, of Generation Resource *r* represented by QSE *q* at Settlement Point *p,* for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, AABP is calculated for the Combined Cycle Train considering all SCED Dispatch Instructions to any Combined Cycle Generation Resources within the Combined Cycle Train. | | AVGTG5M *q, r, p, i, y* | MW | *Average Telemetered Generation for the 5 Minutes*—The average telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the five-minute clock interval *y*, within the 15-minute Settlement Interval *i*. | | OGEN *q, r, p, i* | MWh | *Over Generation Volumes per QSE per Settlement Point per Resource*—The amount over-generated by the Generation Resource *r* represented by QSE *q* at Resource Node *p* for the 15- minute Settlement Interval *i*. | | PR1 | $/MWh | The price to use for the Base Point Deviation Charge for over-generation when RTSPP is less than $20/MWh, $20/MWh. | | K1 | none | The percentage tolerance for over-generation, 5%. | | Q1 | MW | The MW tolerance for over-generation, five MW. | | N | none | The number of IRRs within an IRR Group. | | *q* | none | A QSE. | | *p* | none | A Settlement Point. | | *r* | none | A non-exempt Resource. | | *y* | none | A five-minute clock interval in the Settlement Interval. | | *i* | none | A 15-minute Settlement Interval. | | *wg* | none | An IRR Group. | |

**6.6.5.1.1.2 Base Point Deviation Charge for Under Generation**

(1) ERCOT shall charge a QSE for a Generation Resource for under generation if the metered generation is below the lesser of:

(a) 95% of the average of the Base Points in the Settlement Interval adjusted for any Ancillary Service deployments; or

(b) The average of the Base Points in the Settlement Interval adjusted for any Ancillary Service deployments minus five MW.

(2) The under-generation charge to each QSE for each Generation Resource at each Resource Node Settlement Point for a given 15-minute Settlement Interval is calculated as follows:

**BPDAMT *q, r, p, i* = -1 \* Min (PR2, RTSPP *p, i*) \* Min (1, KP) \* UGEN *q, r, p, i***

Where:

UGEN *q, r, p, i* = Max [0, [Min ((1- K2) \* ¼\* AABP *q, r, p, i* ,

¼ \* (AABP *q, r, p, i* - Q2)) - TWTG *q, r, p, i*]]

TWTG *q, r, p, i =* ( (AVGTG5M *q, r, p, i, y*) / 3) \* ¼

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Definition** |
| BPDAMT *q, r, p, i* | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. A Base Point Deviation Charge is charged to the Combined Cycle Train for all Combined Cycle Generation Resources. |
| RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. |
| TWTG *q, r, p, i* | MWh | *Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| AABP*q, r, p, i* | MW | *Adjusted Aggregated Base Point*—The aggregated Base Point adjusted for Ancillary Service deployments of Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, AABP is calculated for the Combined Cycle Train considering all SCED Dispatch Instructions to any Combined Cycle Generation Resources within the Combined Cycle Train. |
| AVGTG5M *q, r, p, i, y* | MW | *Average Telemetered Generation for the 5 Minutes* —The average telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the five-minute clock interval *y*, within the 15-minute Settlement Interval *i*. |
| UGEN *q, r, p, i* | MWh | *Under Generation Volumes per QSE per Settlement Point per Resource*—The amount under-generated by the Generation Resource *r* represented by QSE *q* at Resource Node *p* for the 15-minute Settlement Interval *i*. |
| KP | none | The coefficient applied to the Settlement Point Price for under-generation charge, 1.0. |
| PR2 | $/MWh | The price to use for the Base Point Deviation Charge for under-generation calculation when RTSPP is greater than -$20/MWh, -$20/MWh. |
| K2 | none | The percentage tolerance for under-generation, 5%. |
| Q2 | MW | The MW tolerance for under-generation, five MW. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |
| *r* | none | A non-exempt, non-IRR. |
| *y* | none | A five-minute clock interval in the Settlement Interval. |
| *i* | none | A 15-minute Settlement Interval. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [NPRR879 and NPRR963: Replace applicable portions of Section 6.6.5.1.1.2 above with the following upon system implementation:]  **6.6.5.2.1 Base Point Deviation Charge for Under Generation**  (1) For Generation Resources that are not ESRs, ERCOT shall charge a QSE for a Generation Resource, including an IRR awarded Ancillary Service for at least one SCED interval within the 15-minute Settlement Interval, for under-generation if the telemetered generation is below the lesser of:  (a) 95% of the Adjusted Aggregated Base Point in the Settlement Interval; or  (b) The Adjusted Aggregated Base Point in the Settlement Interval minus five MW.  (2) For instances in which an IRR is not awarded Ancillary Service or is not part of an IRR Group in which an IRR is awarded Ancillary Service for any SCED interval within the 15-minute Settlement Interval, Base Point Deviation Charges will be determined per Section 6.6.5.4, IRR Generation Resource Base Point Deviation Charge.  (3) The under-generation charge to each QSE for each Generation Resource, that is not part of an IRR Group or an ESR, at each Resource Node Settlement Point for a given 15-minute Settlement Interval is calculated as follows:  **BPDAMT *q, r, p, i* = -1 \* Min (PR2, RTSPP *p, i*) \* Min (1, KP) \* UGEN *q, r, p, i***  Where:  UGEN *q, r, p, i* = Max [0, [Min ((1- K2) \* ¼\* AABP *q, r, p, i* ,  ¼ \* (AABP *q, r, p, i* - Q2)) - TWTG *q, r, p, i*]]  TWTG *q, r, p, i =* ( (AVGTG5M *q, r, p, i, y*) / 3) \* ¼  (4) If any IRR in an IRR Group is awarded Ancillary Service for at least one SCED interval within the 15-minute Settlement Interval, then the deviation penalty is determined for the IRR Group and evenly allocated and charged to each IRR within that IRR Group as follows:  **BPDAMT *q, r, p, i*  = -1 \* Min (PR2, RTSPP *p, i*) \* Min (1, KP) \* UGEN *q, r, p, i***  Where:  UGEN *q, r, p, i*  = Max [0, [Min ((1 - K2) \* ¼\* AABP *q, wg, p, i* ,  ¼ \* (AABP *q, wg, p, i* - Q2)) - TWTG *q, wg, p, i*]] / N  TWTG *q, wg, p, i* = ( (AVGTG5M *q, r, p, i, y*) / 3) \* ¼  AABP *q, wg, p, i* = (AABP *q, r, p, i*)  The above variables are defined as follows:   |  |  |  | | --- | --- | --- | | Variable | Unit | Definition | | BPDAMT *q, r, p, i* | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. A Base Point Deviation Charge is charged to the Combined Cycle Train for all Combined Cycle Generation Resources. | | RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | | TWTG *q, r, p, i* | MWh | *Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. | | AABP*q, r, p, i* | MW | *Adjusted Aggregated Base Point*—The aggregated Base Point adjusted for Reg-Up and Reg-Down deployments of Generation Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, AABP is calculated for the Combined Cycle Train considering all SCED Dispatch Instructions to any Combined Cycle Generation Resources within the Combined Cycle Train. | | AVGTG5M *q, r, p, i, y* | MW | *Average Telemetered Generation for the 5 Minutes* —The average telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the five-minute clock interval *y*, within the 15-minute Settlement Interval *i*. | | UGEN *q, r, p, i* | MWh | *Under-Generation Volumes per QSE per Settlement Point per Resource*—The amount under-generated by the Generation Resource *r* represented by QSE *q* at Resource Node *p* for the 15-minute Settlement Interval *i*. | | KP | none | The coefficient applied to the Settlement Point Price for under-generation charge, 1.0. | | PR2 | $/MWh | The price to use for the Base Point Deviation Charge for under-generation calculation when RTSPP is greater than -$20/MWh, -$20/MWh. | | K2 | none | The percentage tolerance for under-generation, 5%. | | Q2 | MW | The MW tolerance for under-generation, five MW. | | N | none | The number of IRRs within an IRR Group. | | *q* | none | A QSE. | | *p* | none | A Settlement Point. | | *r* | none | A non-exempt Resource. | | *y* | none | A five-minute clock interval in the Settlement Interval. | | *i* | none | A 15-minute Settlement Interval. | | *wg* | none | An IRR Group. | |

**6.6.5.2 IRR Generation Resource Base Point Deviation Charge**

(1) ERCOT shall charge a QSE for an IRR a Base Point Deviation Charge if the IRR metered generation is more than 10% above its Adjusted Aggregated Base Point and the flag signifying that the IRR has received a Base Point below the HDL used by SCED has been received.

(2) The charge to each QSE for non-excused over-generation of each IRR that is not included in an IRR Group at each Resource Node Settlement Point during a 15-minute Settlement Interval, is calculated as follows:

If the flag signifying that the IRR has received a Base Point below the HDL used by SCED is not set in all SCED intervals within the 15-minute Settlement Interval:

**BPDAMT *q, r, p, i* = 0**

Otherwise, if the flag signifying that the IRR has received a Base Point below the HDL used by SCED is set in all SCED intervals within the 15-minute Settlement Interval:

**BPDAMT *q, r, p, i* = Max (PR1, RTSPP *p, i*) \* OGENIRR*q, r, p, i***

Where:

OGENIRR *q, r, p, i*  = Max [0, TWTG *q, r, p, i*  – ¼ \* AABP *q, r, p, i \**  (1 + KIRR)]

TWTG *q, r, p, i =*  ( (AVGTG5M *q, r, p, i, y*) / 3) \* ¼

(3) The charge to each QSE for non-excused over-generation of each IRR that is included in an IRR Group, at each Resource Node Settlement Point, if the Real-Time metered generation is greater than the upper tolerance during a 15-minute Settlement Interval, is calculated as follows:

If the flag signifying that the IRR has received a Base Point below the HDL used by SCED is not set in all SCED intervals within the 15-minute Settlement Interval for any of the IRRs within an IRR Group, then for all IRRs within an IRR Group:

**BPDAMT *q, r, p* = 0**

If the flag signifying that the IRR has received a Base Point below the HDL used by SCED is set in all SCED intervals within the 15-minute Settlement Interval for any of the IRRs within an IRR Group, then the deviation penalty is determined for the IRR Group and evenly allocated and charged to each IRR within that IRR Group:

**BPDAMT *q, r, p* = [Max (PR1, RTSPP *p*) \* OGENIRR *q, wg, i* ] / N**

Where:

OGENIRR *q, wg, i*  = Max [0, TWTG *q, wg, i*  – ¼ \* AABP *q, wg, i \**  (1 + KIRR)]

TWTG *q, wg, i =*  (TWTG *q, r, p, i*)

AABP *q, wg, i* = (AABP *q, r, p, i*)

The above variables are defined as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Unit** | **Definition** | |
| BPDAMT *q, r, p, i* | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. | |
| RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Resource Node *p*, for the 15-minute Settlement Interval *i*. | |
| TWTG *q, r, p, i* | MWh | *Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval *i.* |
| AABP *q, r, p, i* | MW | *Adjusted Aggregated Base Point Generation per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Ancillary Service deployments, of Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i.* |
| AVGTG5M *q, r, p, i, y* | MW | *Average Telemetered Generation for the 5 Minutes*—The average telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the five-minute clock interval *y*, within the 15-minute Settlement Interval *i*. | |
| OGENIRR *q, r, p, i* | MWh | *Over Generation Volumes per QSE per Settlement Point per IRR Generation Resource*—The amount over generated by the IRR *r* represented by QSE *q* at Resource Node *p* for the 15-minute Settlement Interval *i*. | |
| PR1 | $/MWh | The price to use for the charge calculation when RTSPP is less than $20/MWh, $20/MWh. | |
| KIRR | none | The percentage tolerance for over-generation of an IRR, 10%. | |
| N | none | The number of IRRs within an IRR Group. | |
| *q* | none | A QSE. | |
| *p* | none | A Settlement Point. | |
| *r* | none | An IRR Generation Resource or an IRR within an IRR Group. | |
| *i* | none | A 15-minute Settlement Interval. | |
| *y* | none | A five-minute clock interval in the Settlement Interval. | |
| *wg* | none | An IRR Group. | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [NPRR879 and NPRR963: Replace applicable portions of Section 6.6.5.2 above with the following upon system implementation and renumber accordingly:]  **6.6.5.4 IRR Generation Resource Base Point Deviation Charge**  (1) ERCOT shall charge a QSE for an IRR a Base Point Deviation Charge if the IRR telemetered generation is more than 10% above its Adjusted Aggregated Base Point, the flag signifying that the IRR has received a Base Point below the HDL used by SCED has been received, and the IRR is not awarded Ancillary Service and is not part of an IRR Group in which at least one IRR is awarded Ancillary Service for at least one SCED interval within the 15-minute Settlement Interval.  (2) For instances in which an IRR is awarded Ancillary Service or is part of an IRR Group in which at least one IRR is awarded Ancillary Service for at least one SCED interval within the 15-minute Settlement Interval, Base Point Deviation Charges will be determined per Section 6.6.5.2, Base Point Deviation Charge for Over Generation, and Section 6.6.5.2.1, Base Point Deviation Charge for Under Generation.  (3) The charge to each QSE for non-excused over-generation of each IRR that is not included in an IRR Group at each Resource Node Settlement Point during a 15-minute Settlement Interval, is calculated as follows:  If the flag signifying that the IRR has received a Base Point below the HDL used by SCED is not set in all SCED intervals within the 15-minute Settlement Interval:  BPDAMT *q, r, p, i* = 0  Otherwise, if the flag signifying that the IRR has received a Base Point below the HDL used by SCED is set in all SCED intervals within the 15-minute Settlement Interval:  BPDAMT *q, r, p, i* = Max (PR1, RTSPP *p, i*) \* OGENIRR*q, r, p, i*  Where:  OGENIRR *q, r, p, i*  = Max [0, TWTG *q, r, p, i*  – ¼ \* AABP *q, r, p, i \**  (1 + KIRR)]  TWTG *q, r, p, i =*  ( (AVGTG5M *q, r, p, i, y*) / 3) \* ¼  (4) The charge to each QSE for non-excused over-generation of each IRR that is included in an IRR Group, at each Resource Node Settlement Point, if the telemetered generation is greater than the upper tolerance during a 15-minute Settlement Interval, is calculated as follows:  If the flag signifying that the IRR has received a Base Point below the HDL used by SCED is not set in all SCED intervals within the 15-minute Settlement Interval for any of the IRRs within an IRR Group, then for all IRRs within an IRR Group:  **BPDAMT *q, r, p* = 0**  If the flag signifying that the IRR has received a Base Point below the HDL used by SCED is set in all SCED intervals within the 15-minute Settlement Interval for any of the IRRs within an IRR Group, then the deviation penalty is determined for the IRR Group and evenly allocated and charged to each IRR within that IRR Group:  **BPDAMT *q, r, p* = Max (PR1, RTSPP *p*) \* OGENIRR *q, r, i***  Where:  OGENIRR *q, r, i*  = Max [0, TWTG *q, wg, i*  – ¼ \* AABP *q, wg, i \**  (1 + KIRR)] / N  TWTG *q, wg, i =*  (TWTG *q, r, p, i*)  AABP *q, wg, i* = (AABP *q, r, p, i*)  The above variables are defined as follows:   |  |  |  |  | | --- | --- | --- | --- | | Variable | Unit | Definition | | | BPDAMT *q, r, p, i* | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. | | | RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Resource Node *p*, for the 15-minute Settlement Interval *i*. | | | TWTG *q, r, p, i* | MWh | *Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval *i.* | | AABP *q, r, p, i* | MW | *Adjusted Aggregated Base Point Generation per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Reg-Up and Reg-Down deployments, of Generation Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i.* | | AVGTG5M *q, r, p, i, y* | MW | *Average Telemetered Generation for the 5 Minutes*—The average telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the five-minute clock interval *y*, within the 15-minute Settlement Interval *i*. | | | OGENIRR *q, r, p, i* | MWh | *Over Generation Volumes per QSE per Settlement Point per IRR Generation Resource*—The amount over generated by the IRR *r* represented by QSE *q* at Resource Node *p* for the 15-minute Settlement Interval *i*. | | | PR1 | $/MWh | The price to use for the charge calculation when RTSPP is less than $20/MWh, $20/MWh. | | | KIRR | none | The percentage tolerance for over-generation of an IRR, 10%. | | | N | none | The number of IRRs within an IRR Group. | | | *q* | none | A QSE. | | | *p* | none | A Settlement Point. | | | *r* | none | An IRR Generation Resource not awarded Ancillary Service or an IRR within an IRR Group where no member of the IRR Group was awarded Ancillary Service. | | | *i* | none | A 15-minute Settlement Interval. | | | *y* | none | A five-minute clock interval in the Settlement Interval. | | | *wg* | none | An IRR Group. | | |

***6.6.9 Emergency Operations Settlement***

(1) Due to Emergency Conditions or Watches, additional compensation for each Generation Resource for which ERCOT provides an Emergency Base Point may be awarded to the QSE representing the Generation Resource. If the Emergency Base Point is higher than the SCED Base Point immediately before the Emergency Condition or Watch and the Settlement Point Price at the Resource Node is lower than the Generation Resource’s Energy Offer Curve price at the Emergency Base Point, ERCOT shall pay the QSE additional compensation for the additional energy above the SCED Base Point.

(2) In accordance with paragraph (8) of Section 8.1.1.2, General Capacity Testing Requirements, QSEs that receive a VDI to operate the designated Generation Resource for an unannounced Generation Resource test may be considered for additional compensation utilizing the formula as stated in Section 6.6.9.1, Payment for Emergency Power Increase Directed by ERCOT. If the test period SCED Base Point is higher than the SCED Base Point immediately before the test period and the Settlement Point Price at the Resource Node is lower than the Generation Resource’s Energy Offer Curve price, or MOC if no offer exists, at the test Base Point, and the test was not a retest requested by the QSE, ERCOT shall pay the QSE additional compensation for the additional energy above the pre-test SCED Base Point. For the purpose of this Settlement, and limited to Settlement Intervals inclusive of the unannounced Generation Resource test, SCED Base Points will be used in place of the Emergency Base Point.

(3) A QSE that represents a QSGR that comes On-Line as a result of a Base Point greater than zero shall be considered for additional compensation using the formula in Section 6.6.9.1 when the Base Point is less than or equal to its applicable Seasonal net minimum sustainable rating provided in the Resource Registration data. If the Resource Settlement Point Price at the QSGR’s Resource Node is lower than the Energy Offer Curve price, capped per the MOC pursuant to Section 4.4.9.4.1, Mitigated Offer Cap, at the aggregated Base Point during the 15-minute Settlement Interval, ERCOT shall pay the QSE additional compensation for the amount of energy from the Off-Line zero Base Point to the aggregated output level. For the purpose of this Settlement, inclusive of the first Settlement Interval in which the QSGR is deployed by SCED from a current SCED Base Point equal to zero MW to a Base Point greater than zero, SCED Base Points will be used in place of the Emergency Base Point. The compensation specified in this paragraph continues over all applicable Intervals until SCED no longer needs the QSGR to generate energy pursuant to Section 3.8.3.1, Quick Start Generation Resource Decommitment Decision Process, and there is no manual Low Dispatch Limit (LDL) override in place on the QSGR.

(4) QSEs that received Base Points that are inconsistent with Real-Time Settlement Point Prices and QSEs that receive a manual override from the ERCOT Operator shall be considered for additional compensation using the formula in Section 6.6.9.1. If the Resource Settlement Point Price at the Resource Node is lower than the Energy Offer Curve price, capped per the MOC pursuant to Section 4.4.9.4.1, at the held Base Point during the 15-minute Settlement Interval, ERCOT shall pay the QSE additional compensation for the amount of energy from a zero Base Point to the held Base Point. The held Base Point is the Base Point that the QSE received due to a manual override by ERCOT Operator or the Base Point received by the QSE that ERCOT identified as inconsistent with Real-Time Settlement Point Prices. For the purpose of this Settlement, and limited to the held Settlement Intervals inclusive of the manual override or Base Points identified as inconsistent with prices, SCED Base Points will be used in place of the Emergency Base Point.

(5) In accordance with Section 6.3, Adjustment Period and Real-Time Operations Timeline, if ERCOT sets any SCED interval as failed, then QSEs shall be considered for additional compensation using the formula in Section 6.6.9.1. For the purpose of this Settlement, and limited to the failed SCED interval, SCED Base Points will be used in place of the Emergency Base Point.

(6) For each 15-minute Settlement Interval, a QSGR that receives a manual override from the ERCOT Operator shall only be considered for compensation under paragraph (4) above.

(7) For a QSGR, the MOC curve used to cap the Energy Offer Curve shall not include the variable Operations and Maintenance (O&M) adjustment cost to start the Resource from first fire to LSL, including the startup fuel described in paragraph (1)(d) of Section 4.4.9.4.1 for all emergency operations Settlement calculations with the exception of paragraph (3) above.

(8) QSEs that receive a VDI to operate its Resources for an unannounced CFC test, as described in the ERCOT Operating Guides, or have been instructed to operate in CFC mode, may be considered for additional compensation utilizing the formula in Section 6.6.9.1. If the Resource Settlement Point Price at the Resource Node is lower than the Energy Offer Curve price, capped per the MOC pursuant to Section 4.4.9.4.1, at the Emergency Base Point during the CFC period, ERCOT shall pay the QSE additional compensation for the amount of energy from a zero Base Point to the Emergency Base Point for each Resource that provided CFC. Compensation for a CFC test will not be provided if the test was a retest requested by the QSE. For the purpose of this Settlement, and limited to Settlement Intervals inclusive of the CFC period, the Emergency Base Point shall be set to the Average Telemetered Generation for the 5 Minutes (AVGTG5M). Only Resources that moved in the direction to correct frequency are eligible to receive compensation for providing CFC.

(9) If Emergency Base Points or SCED Base Points are unavailable, corrupted or otherwise unusable for Settlement purposes due to system conditions, hardware failure, or software failure, the Real-Time Metered Generation (RTMG) will be used to create proxy Base Points pursuant to Section 6.6.9.1. If the RTMG is not available the most accurate available generation data as determined by ERCOT will be used to create proxy Base Points pursuant to Section 6.6.9.1. ERCOT shall issue a Market Notice stating the Operating Day and Settlement Intervals that were impacted and the generation data that was used to create proxy Base Points.

**6.6.12.1 Switchable Generation Make-Whole Payment**

(1) To compensate QSEs representing SWGRs that switch to the ERCOT Control Area from a non-ERCOT Control Area pursuant to an ERCOT RUC instruction for an actual or anticipated EEA condition, ERCOT shall calculate a Switchable Generation Make-Whole Payment (SWMWAMT) for an Operating Day, allocated to each instructed Operating Hour as follows:

**SWMWAMT *q, r* = (-1) \* Max (0, (SWCG *q, r, d* – SWRTREV *q, r, d*)) / SWIHR *q, r, d***

Where:

SWCG *q, r, d* = SWSUC *q, r, d* + SWMEC *q, r, d* + SWOC *q, r, d* + SWAC *q, r, d*

SWRTREV *q, r, d* = Max [0, (RTSPP*p, i* \* RTMG*q, r, i* + (-1) \* (EMREAMT *q, r, p, i*  + VSSVARAMT *q, r, i*+ VSSEAMT *q, r, i*) + RTRUREV *q, r* + RTRDREV *q, r  +* RTRRREV *q, r  +* RTNSREV *q, r  +* RTECRREV *q, r* )]

SWAC *q, r, d* = SWFC *q, r, d* + SWNEC *q, r, d* + SWNASC *q, r, d* + SWMWDC *q, r, d* + SWFIPC *q, r, d*

If ERCOT has approved verifiable costs for the SWGR:

SWSUC *q, r, d* =  [SWSF \* (DAFCRS *r, s* \* (GASPERSU *r, s* \* FIP + OILPERSU *r, s* \* FOP + SFPERSU *r, s* \* SFP) + VOMS *r, s*)] + ADJSWSUC *q, r, d*

SWMEC *q, r, d* = ((AHR *r, i* \* (GASPERME *r* \* FIP + OILPERME *r* \* FOP + SFPERME *r*\* SFP) + VOMLSL *r*) \* Min (LSL *q, r, i* \* (¼), RTMG *q, r, i*))

SWOC *q, r, d* = [(AHR *r, i* \* ((GASPEROL *r* \* FIP + OILPEROL *r* \* FOP + SFPEROL *r* \* SFP) + FA *r*) + OM *r*) \* Max(0, (RTMG *q, r, i* – LSL *q, r, i* \* (¼)))]

If ERCOT has not approved verifiable costs for the SWGR:

SWSUC *q, r, d* =  (SWSF \* RCGSC *s, rc*) + ADJSWSUC *q, r, d*

SWMEC *q, r, d* = (RCGMEC *i, rc* \* Min (LSL *q, r, i* \* (¼), RTMG *q, r, i*))

SWOC *q, r, d* = ((PAHR *r, i* \* FIP + STOM *rc*) \* Max(0, (RTMG *q, r, i* – LSL *q, r, i* \* (¼))))

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| SWMWAMT *q, r* | $ | *Switchable Generation Make-Whole Payment*—The Switchable Generation Make-Whole Payment to the QSE *q,* for Resource *r*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| SWCG *q, r, d* | $ | *Switchable Generation Cost Guarantee*—The sum of eligible Startup Costs, minimum-energy costs, operating costs, and other Switchable Generation approved costs for Resource *r* represented by QSE *q* for all instructed hours, for the Operating Day *d*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| SWSUC *q ,r, d* | $ | *Switchable Generation* *Start-Up Cost* —The Startup Costs for Resource *r* represented by QSE *q* for startup hours, for the Operating Day *d*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| SWSF | none | *Switchable Generation* *Startup Factor* —The Switchable Generation Startup Factor for an SWGR. The SWSF shall be set to a value of 2 if the SWGR has a COP Resource Status of EMRSWGR within 24 hours of being released by the ERCOT Operator. Otherwise, the SWSF shall be set to a value of 1. |
| SWMEC *q, r, d* | $ | *Switchable Generation* *Minimum Energy Cost* —The minimum energy costs for Resource *r* represented by QSE *q* during instructed hours, for the Operating Day *d*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| SWOC *q, r, d* | $ | *Switchable Generation* *Operating Cost* —The operating costs for Resource *r* represented by QSE *q* during instructed hours, for the Operating Day *d*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| SWAC *q, r, d* | $ | *Switchable Generation Approved Costs –* The total amount of the calculation of financial loss, as submitted by the QSE *q* for the Resource *r,* as approved by ERCOT for the Operating Day *d*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| SWFC *q, r, d* | $ | *Switchable Generator* *Fuel Cost* —The incremental fuel costs and fees for Resource *r* represented by QSE *q* for all instructed hours, for the Operating Day *d*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. Incremental fuel costs must be based on those costs incurred as described in Section 9.14.9, Incremental Fuel Costs for Switchable Generation Make-Whole Payment. |
| SWFIPC *q, r, d* | $ | *Switchable Generator Fuel Imbalance Penalty Cost* —The fuel imbalance penalty cost for Resource *r* represented by QSE *q*, for the Operating Day, arising from the SWGR not consuming its contracted fuel quantities as a result of a switch from a non-ERCOT Control Area as requested by ERCOT. Fuel imbalance penalty costs are limited to those costs assessed for the period starting at the initiation of the ramp-down in the non-ERCOT Control Area to two hours following the time ERCOT released the SWGR. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| SWNEC *q, r, d* | $ | *Switchable Generator* *Net Energy Imbalance Cost* —The net energy imbalance costs for Resource *r* represented by QSE *q* for instructed hours, for the Operating Day *d*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. Net energy imbalance costs represent imbalance charges from non-ERCOT Control Area from the beginning of the ramp-down period in the other grid to two hours following the time ERCOT released the Resource. |
| SWNASC *q, r, d* | $ | *Switchable Generator* *Ancillary Services Imbalance Cost* —The net Ancillary Service imbalance costs for Resource *r* represented by QSE *q* for instructed hours, for the Operating Day *d*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. Net Ancillary Service imbalance costs represent imbalance charges from non-ERCOT Control Area from the time of shutdown in the other grid to two hours following the time ERCOT released the Resource. |
| SWMWDC *q, r, d* | $ | *Switchable Generator* *Make-Whole Payment Distribution Cost* —The Make-Whole Payment distribution costsfor Resource *r* represented by QSE *q* for instructed hours, for the Operating Day *d*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. Make-Whole Payment distribution costs represent charges from non-ERCOT Control Area from the time of shutdown in the other grid to two hours following the time ERCOT released the Resource. |
| SWRTREV *q, r, d* | $ | *Switchable Generation Real-Time Revenues –* The sum of energy and Ancillary Service revenues for the Resource *r,* represented by QSE *q,* during all instructed hours for the Operating Day *d.*  Where for a Combined Cycle Train, Resource *r* is the Combined Cycle Train. |
| GASPERSU *r, s* | none | *Percent of Natural Gas to Operate per Start*—The percentage of natural gas used by Resource *r* to operate per start *s*, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| OILPERSU *r, s* | none | *Percent of Oil to Operate per Start*—The percentage of fuel oil used by Resource *r* to operate per start *s*, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| SFPERSU *r, s* | none | *Percent of Solid Fuel to Operate per Start*—The percentage of solid fuel used by Resource *r* to operate per start *s*, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| GASPERME *r* | None | *Percent of Natural Gas to Operate at LSL*—The percentage of natural gas used by Resource *r* to operate at LSL, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| OILPERME *r* | None | *Percent of Oil to Operate at LSL*—The percentage of fuel oil used by Resource *r* to operate at LSL, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| SFPERME *r* | None | *Percent of Solid Fuel to Operate at LSL*—The percentage of solid fuel used by Resource *r* to operate at LSL, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DAFCRS *r, s* | MMBtu/Start | *Day-Ahead Actual Fuel Consumption Rate per Start*—The actual fuel consumption rate for Resource *r* to startup per start type *s*, adjusted by VOXR as defined in the Verifiable Cost Manual. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. For additional information, see Verifiable Cost Manual Section 3.3, Startup Fuel Consumption. |
| VOMS *r, s* | $/Start | *Variable Operations and Maintenance Cost per Start*—The operations and maintenance cost for Resource *r* to startup, per start *s*, including an adjustment for emissions costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. For additional information, see Verifiable Cost Manual Section 3.2, Submitting Startup Costs. |
| VOMLSL *r* | $/MWh | *Variable Operations and Maintenance Cost at LSL*—The operations and maintenance cost for Resource *r* to operate at LSL, including an adjustment for emissions costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. For additional information, see Verifiable Cost Manual Section 4.2, Submitting Minimum Energy Costs. |
| 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. |
| RTMG *q, r, i* | MWh | *Real-Time Metered Generation per QSE per Resource by Settlement Interval by hour*—The Real-Time energy from Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| AHR *r, i* | MMBtu / MWh | *Average Heat Rate per Resource*– The verifiable average heat rate for the Resource *r*, for the operating level, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| OM *r* | $/MWh | *Verifiable Operations and Maintenance Cost Above LSL*– The O&M cost for Resource *r* to operate above LSL. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. See the Verifiable Cost Manual for additional information. |
| SWIHR *q, r, d* | none | *Switchable Generation Instructed Hours*—The total number of Switchable Generation instructed hours, for Resource *r* represented by QSE *q,* for the Operating Day *d*. When one or more Combined Cycle Generation Resources are committed by ERCOT, the total number of instructed hours is calculated for the Combined Cycle Train for all switchable instructed Combined Cycle Generation Resources. |
| SFP | $/MMBtu | Solid Fuel Price—The solid fuel index price is $1.50. |
| GASPEROL *r* | none | *Percent of Natural Gas to Operate Above LSL*—The percentage of natural gas used by Resource *r* to operate above LSL, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| OILPEROL *r* | none | *Percent of Oil to Operate Above LSL*—The percentage of fuel oil used by Resource *r* to operate above LSL, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| SFPEROL *r* | none | *Percent of Solid Fuel to Operate Above LSL*—The percentage of solid fuel used by Resource *r* to operate above LSL, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| ADJSWSUC *q, r, d* | $ | *Adjustment to Switchable Generation* *Start-Up Cost* — Adjustment to Switchable Generation Start-up Cost for Resource *r* represented by QSE *q*, for the Operating Day *d*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. This adjustment may include eligible startup transition costs for a Combined Cycle Train or costs for any SWGR not captured in other billing determinants. |
| RCGSC s, *rc* | $/Start | *Resource Category Generic Startup Cost*—The Resource Category Generic Startup Cost cap for the category of the Resource *rc*, according to Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, for the Operating Day. |
| RCGMEC *i, rc* | $/MWh | *Resource Category Generic Minimum-Energy Cost*—The Resource Category Generic Minimum Energy Cost cap for the category of the Resource *rc*, according to Section 4.4.9.2.3, for the Operating Day. |
| PAHR *r, i* | MMBtu / MWh | *Proxy Average Heat Rate-* The proxy average heat rate for the Resource *r* for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| STOM *rc* | $/MWh | *Standard Operations and Maintenance Cost -* The standard O&M cost for the Resource Category *rc* for operations above LSL, shall be set to the minimum energy variable O&M costs, as described in paragraph (6)(c) of Section 5.6.1, Verifiable Costs. |
| RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. |
| FIP | $/MMBtu | *Fuel Index Price*—As defined in Section 2.1, Definitions. |
| FOP | $/MMBtu | *Fuel Oil Price*—As defined in Section 2.1. |
| FA *r* | $/MMBtu | *Fuel Adder* — The fuel adder is the average cost above the index price Resource *r* has paid to obtain fuel. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. See the Verifiable Cost Manual for additional information. |
| EMREAMT *q, r, p, i* | $ | *Emergency Energy Amount per QSE per Settlement Point per unit per interval*—The payment to QSE *q* for the additional energy produced by Generation Resource *r* at Resource Node *p* in Real-Time during the Emergency Condition, for the 15-minute Settlement Interval *i*. Payment for emergency energy is made to the Combined Cycle Train. |
| VSSVARAMT *q, r, i* | $ | *Voltage Support Service VAr Amount per QSE per Generation Resource -* The payment to QSE *q* for the VSS provided by Generation Resource *r,* for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Resource *r* is a Combined Cycle Train. |
| VSSEAMT *q, r, i* | $ | *Voltage Support Service Energy Amount per QSE per Generation Resource*—The lost opportunity payment to QSE *q* for ERCOT-directed VSS from Generation Resource *r* for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Resource *r* is a Combined Cycle Train. |
| RTRUREV *q, r* | $ | *Real-Time Reg-Up Revenue*— The Real-Time Reg-Up revenue for QSE *q* calculated forResource *r* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRDREV *q, r* | $ | *Real-Time Reg-Down Revenue*— The Real-Time Reg-Down revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRRREV *q, r* | $ | *Real-Time Responsive Reserve Revenue*— The Real-Time RRS revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTNSREV *q, r* | $ | *Real-Time Non-Spin Revenue*— The Real-Time Non-Spin revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTECRREV *q, r* | $ | *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. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| *q* | none | A QSE. |
| *r* | none | A Switchable Generation Resource. |
| *d* | none | An Operating Day containing the RUC instruction to the SWGR. |
| *i* | none | A 15-minute Settlement Interval within the hour of an Operating Day during which the SWGR is instructed by ERCOT. |
| *s* | none | An ERCOT area start that is eligible to have its costs included in the Switchable Generation Cost Guarantee. |
| *rc* | none | A Resource Category. |
| *p* | none | A Resource Node Settlement Point. |

(2) The total compensation to each QSE for the Switchable Generation Make-Whole Payment for a given hour in the Operating Day is calculated as follows:

**SWMWAMTQSETOT *q* =  SWMWAMT *q, r***

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| SWMWAMTQSETOT ***q*** | $ | *Switchable Generation Make-Whole Payment per QSE*—The total Switchable Generation Make-Whole Payment to the QSE *q*, for the hour. |
| SWMWAMT *q, r* | $ | *Switchable Generation Make-Whole Payment*—The Switchable Generation Make-Whole Payment to the QSE *q,* for Resource *r*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| *q* | none | A QSE. |
| *r* | none | A Switchable Generation Resource. |



















































































6.7.4 Real-Time Settlement for Updated Day-Ahead Market Ancillary Service Obligations

(1) Each QSE is charged or paid for net obligations for each Ancillary Service procured in the DAM. DAM costs are calculated for each QSE in accordance with Section 4.6.4, Settlement of Ancillary Services Procured in the DAM. DAM net total costs for Ancillary Service procured in the DAM are re-calculated for each QSE under this section based on Real-Time Load Ratio Share (LRS). Payments and/or charges for Ancillary Service obligations are calculated by Operating Hour as follows:

(a) For Regulation Up Service (Reg-Up), if applicable:

DARTPCRUAMT *q*= (DARUNOBL*q* -DASARUQ *q*) \* DARUPR - DARUAMT *q*

Where:

DARUNOBL *q* = DAPCRUQTOT \* HLRS *q*

DAPCRUQTOT = (PCRUR *r, q, DAM* *+* DARUOAWD *q* +DASARUQ *q*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| DARTPCRUAMT *q* | $ | *Day-Ahead Updated Real-Time Procured Capacity for Reg-Up Amount by QSE -* The payment or charge to QSE *q* for Reg-Up, for the re-calculated Real-Time obligation, for the Operating Hour. |
| DARUPR | $/MW | *Day-Ahead Reg-Up Price*—The DAM Reg-Up price for the Operating Hour. |
| DARUNOBL*q* | MW | *Day-Ahead Reg-Up New Obligation per QSE—*The updated Reg-Up Ancillary Service Obligation in Real-Time for QSE *q* for the Operating Hour. |
| DARUAMT *q* | $ | *Day-Ahead Reg-Up Amount per QSE*—QSE *q*’s share of the DAM costs for Reg-Up for the Operating Hour. |
| PCRUR *r, q, DAM* | MW | *Procured Capacity for Reg-Up per Resource per QSE in DAM*—The Reg-Up capacity awarded to QSE *q* in the DAM for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DARUOAWD *q* | MW | *Day-Ahead Reg-Up Award for the QSE* —The Reg-Up Only capacity awarded in the DAM to QSE *q* for the Operating Hour. |
| HLRS *q* | none | *Hourly Load Ratio Share per QSE*—The Real-Time LRS as defined in Section 6.6.2.4, QSE Load Ratio Share for an Operating Hour, for QSE *q*, for the Operating Hour. |
| DAPCRUQTOT | MW | *Day-Ahead Procured Capacity for Reg-Up Total*—The total Reg-Up capacity for all QSEs for all Reg-Up awarded and self-arranged in the DAM for the Operating Hour. |
| DASARUQ *q* | MW | *Day-Ahead Self-Arranged Reg-Up Quantity per QSE*—The self-arranged Reg-Up capacity submitted by QSE *q* before 1000 in the DAM for the Operating Hour. |
| *q* | none | A QSE. |
| *r* | none | A Resource. |

(b) For Regulation Down Service (Reg-Down), if applicable:

DARTPCRDAMT *q*= (DARDNOBL*q*- DASARDQ *q*) \* DARDPR - DARDAMT *q*

Where:

DARDNOBL *q* = DAPCRDQTOT \* HLRS *q*

DAPCRDQTOT =  (PCRDR *r, q, DAM* + DARDOAWD *q* + DASARDQ *q*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| DARTPCRDAMT *q* | $ | *Day-Ahead Updated Real-Time Procured Capacity for Reg-Down Amount by QSE -* The payment or charge to QSE *q* for Reg-Down, for the re-calculated Real-Time obligation, for the Operating Hour. |
| DARDPR | $/MW | *Day-Ahead Reg-Down Price*—The DAM Reg-Down price for the Operating Hour. |
| DARDNOBL*q* | MW | *Day -Ahead Reg-Down New Obligation per QSE—*The updated Reg-Down Ancillary Service Obligation in Real-Time, for QSE q, for the Operating Hour. |
| DARDAMT *q* | $ | *Day-Ahead Reg-Down Amount per QSE*—QSE *q*’s share of the DAM cost for Reg-Down, for the Operating Hour. |
| PCRDR *r, q, DAM* | MW | *Procured Capacity for Reg-Down per Resource per QSE in DAM*—The Reg-Down capacity awarded to QSE *q* in the DAM for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DARDOAWD *q* | MW | *Day-Ahead Reg-Down Only Award for the QSE* —The Reg-Down Only capacity awarded in the DAM to QSE *q* for the Operating Hour. |
| HLRS *q* | none | *Hourly Load Ratio Share per QSE*—The Real-Time as defined in Section 6.6.2.4, QSE Load Ratio Share for an Operating Hour for QSE *q*, for the Operating Hour. |
| DAPCRDQTOT | MW | *Day-Ahead Procured Capacity for Reg-Down Total*—The total Reg-Down capacity for all QSEs for all Reg-Down awarded and self-arranged, in the DAM for the Operating Hour. |
| DASARDQ *q* | MW | *Day-Ahead Self-Arranged Reg-Down Quantity per QSE*—The self-arranged Reg-Down capacity submitted by QSE *q* before 1000 in the DAM for the Operating Hour. |
| *q* | none | A QSE. |
| *r* | none | A Resource. |

(c) For Responsive Reserve (RRS), if applicable:

DARTPCRRAMT *q* = (DARRNOBL *q* – DASARRQ *q*) \* DARRPR - DARRAMT *q*

Where:

DARRNOBL *q* = DAPCRRQTOT \* HLRS *q*

DAPCRRQTOT = (PCRRR *r, q, DAM* + DARROAWD *q* + DASARRQ *q*)



The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| DARTPCRRAMT *q* | $ | *Day-Ahead Updated Real-Time Procured Capacity for Responsive Reserve Amount by QSE -* The payment or charge to QSE *q* for RRS, for the re-calculated Real-Time obligation, for the Operating Hour. |
| DARRPR | $/MW | *Day-Ahead Responsive Reserve Price*—The DAM RRS price for the Operating Hour. |
| DARRNOBL*q* | MW | *Day-Ahead Responsive Reserve New Obligation per QSE—*The updated RRS Ancillary Service Obligation in Real-Time for QSE q for the Operating Hour. |
| DARRAMT *q* | $ | *Day-Ahead Responsive Reserve Amount per QSE*—QSE *q*’s share of the DAM cost for RRS for the Operating Hour. |
| PCRRR *r, q, DAM* | MW | *Procured Capacity for Responsive Reserve per Resource per QSE in DAM*—The RRS capacity awarded to QSE *q* in the DAM for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DARROAWD *q* | MW | *Day-Ahead Responsive Reserve Only Award for the QSE* —The RRS Only capacity awarded in the DAM to QSE *q* for the Operating Hour. |
| HLRS *q* | none | Hourly Load Ratio Share per QSE—The Real-Time LRS as defined in Section 6.6.2.4, QSE Load Ratio Share for an Operating Hour for QSE *q* for the Operating Hour. |
| DAPCRRQTOT | MW | *Day-Ahead Procured Capacity for Responsive Reserve Total* —The total RRS capacity for all QSEs for all RRS awarded and self-arranged in the DAM for the Operating Hour. |
| DASARRQ *q* | MW | *Day-Ahead Self-Arranged Responsive Reserve Quantity per QSE*—The self-arranged RRS capacity submitted by QSE *q* before 1000 in the DAM for the Operating Hour. |
| *q* | none | A QSE. |
| *r* | none | A Resource. |

(d) For Non-Spinning Reserve (Non-Spin), if applicable:

DARTPCNSAMT *q* = (DANSNOBL *q* – DASANSQ *q*) \* DANSPR - DANSAMT *q*

Where:

DANSNOBL *q*  = DAPCNSQTOT \* HLRS *q*

DAPCNSQTOT =  (PCNSR *r, q, DAM* + DANSOAWD *q* + DASANSQ *q*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| DARTPCNSAMT *q* | $ | *Day-Ahead Updated Real-Time Procured Capacity for Non-Spin Amount by QSE -* The payment or charge to QSE q for Non-Spin for the re-calculated Real-Time obligation for the Operating Hour. |
| DANSPR | $/MW | *Day-Ahead Non-Spin Price*—The DAM Non-Spin price for the Operating Hour. |
| DANSNOBL*q* | MW | *Day -Ahead Non-Spin New Obligation per QSE—*The updated Non-Spin Ancillary Service Obligation in Real-Time for QSE *q* for the Operating Hour. |
| PCNSR *r, q, DAM* | MW | *Procured Capacity for Non-Spin per Resource per QSE in DAM*—The Non-Spin capacity awarded to QSE *q* in the DAM for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DANSOAWD *q* | MW | *Day-Ahead Non-Spin Only Award for the QSE* — The Non-Spin Only capacity awarded in the DAM to QSE *q* for the Operating Hour. |
| DANSAMT *q* | $ | *Day-Ahead Non-Spin Amount per QSE*—QSE *q*’s share of the DAM cost for Non-Spin for the Operating Hour. |
| HLRS *q* | none | Hourly Load Ratio Share per QSE—The Real-Time LRS as defined in Section 6.6.2.4, QSE Load Ratio Share for an Operating Hour for QSE *q* for the Operating Hour. |
| DAPCNSQTOT | MW | *Day-Ahead Procured Capacity for Non-Spin Total* —The total Non-Spin capacity for all QSEs for all Non-Spin awarded and self-arranged in the DAM for the Operating Hour. |
| DASANSQ *q* | MW | *Day-Ahead Self-Arranged Non-Spin Quantity per QSE*—The self-arranged Non-Spin capacity submitted by QSE *q* before 1000 in the DAM for the Operating Hour. |
| *q* | none | A QSE. |
| *r* | none | A Resource. |

(e) For ERCOT Contingency Reserve Service(ECRS), if applicable:

DARTPCECRAMT *q* = (DAECRNOBL *q* – DASAECRQ *q*) \* DAECRPR –

DAECRAMT *q*

Where:

DAECRNOBL *q* = DAPCECRQTOT \* HLRS *q*

DAPCECRQTOT = (PCECRR *r, q, DAM* + DAECROAWD *q* + DASAECRQ *q*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| DARTPCECRAMT *q* | $ | *Day-Ahead Updated Real-Time Procured Capacity for ERCOT Contingency Reserve Service Amount by QSE -* The payment or charge to QSE q for ECRS for the re-calculated Real-Time obligation for the Operating Hour. |
| DAECRPR | $/MW | *Day-Ahead ERCOT Contingency Reserve Price*—The DAM ECRS price for the Operating Hour. |
| DAECRNOBL*q* | MW | *Day -Ahead ERCOT Contingency Reserve Service New Obligation per QSE*—The updated ECRS Ancillary Service Obligation in Real-Time for QSE *q* for the Operating Hour. |
| PCECRR *r, q, DAM* | MW | *Procured Capacity for ERCOT Contingency Reserve Service per Resource per QSE in DAM*—The ECRS capacity awarded to QSE *q* in the DAM for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DAECROAWD *q* | MW | *Day-Ahead ERCOT Contingency Reserve Service Only Award for the QSE —* The ECRS Only capacity awarded in the DAM to QSE *q* for the Operating Hour. |
| DAECRAMT *q* | $ | *Day-Ahead ERCOT Contingency Reserve Amount per QSE*—QSE *q*’s share of the DAM cost for ECRS for the Operating Hour. |
| HLRS *q* | none | *Hourly Load Ratio Share per QSE*—The Real-Time LRS as defined in Section 6.6.2.4, QSE Load Ratio Share for an Operating Hour for QSE *q* for the Operating Hour. |
| DAPCECRQTOT | MW | *Day-Ahead Procured Capacity for ERCOT Contingency Reserve Total*—The total ECRS capacity for all QSEs for all ECRS awarded and self-arranged in the DAM for the Operating Hour. |
| DASAECRQ *q* | MW | *Day-Ahead Self-Arranged ERCOT Contingency Reserve Quantity per QSE*—The self-arranged ECRS capacity submitted by QSE *q* before 1000 in the DAM for the Operating Hour. |
| *q* | none | A QSE. |
| *r* | none | A Resource. |



































































***6.7.5 Real-Time Ancillary Service Charges and Payments***

6.7.5.1 Real-Time Ancillary Service Imbalance Payment or Charge

(1) The payments or charges to each QSE for Real-Time Ancillary Services are as follows:

(a) Ancillary Service Imbalance payment or charges based on Real-Time Ancillary Service prices with an imbalance quantity determined by:

(i) The Real-Time Ancillary Service awarded; minus

(ii) The amount of Day-Ahead Market (DAM) Ancillary Service awards cleared in the DAM; minus

(iii) The amount of DAM Self Arranged Ancillary Services; plus

(iv) The amount of Ancillary Service Trades where the QSE is the buyer; minus

(v) The amount of Ancillary Service Trades where the QSE is the seller.

(b) Charges for Ancillary Service only offers purchased in the DAM.(c) Charges for any Ancillary Service trade overage per paragraph (7) of Section 4.4.7.1, Self-Arranged Ancillary Service Quantities.

6.7.5.2 Regulation Up Service Payments and Charges

(1) Reg-Up Imbalance Payment or Charge:

RTRUIMBAMT *q* = (-1) \* [[RTRUREV *q, r*  – (1/4)\* (PCRUR *r, q, DAM* \* RTMCPCRU)] – (1/4)\*((DASARUQ *q* \* RTMCPCRU) + (RUTP *q* – RUTS *q*) \* RTMCPCRU)]

Where:

RTRUREV *q, r  =* (1/4) \* RTRUAWD *q, r* \* RTMCPCRUR *q, r*

RTMCPCRUR *q, r =*  (RURWF *q, r, p, y* \* (RTMCPCRUS *y* + RTRDPARUS *y*))

RTRUAWD *q, r*  =  (RNWF *y* \* RTRUAWDS *q, r, p, y*)

Where:

RURWF *q, r, p, y*= [max( 0.001, RTRUAWDS *q, r, p, y*) \* TLMP *y*] / [****max(0.001,

RTRUAWDS *q, r, p, y*) \* TLMP *y*]

And:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRUIMBAMT *q* | $ | *Real-Time Reg-Up Imbalance Amount for the QSE*— The total payment or charge to QSE *q* for the Real-Time Reg-Up imbalance for each 15-minute Settlement Interval. |
| RTRUREV *q, r* | $ | *Real-Time Reg-Up Revenue*— The Real-Time Reg-Up revenue for QSE *q* calculated forResource *r* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRDPARUS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Reg-Up per SCED interval* - The Real-Time price adder for Reg-Up that captures the impact of reliability deployments on Reg-Up prices for the SCED interval y. |
| RTRUAWD *q, r* | MW | *Real-Time Reg-Up Award per Resource per QSE*— The Reg-Up amount awarded to QSE *q* for Resource *r* in Real-Time for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRUAWDS *q, r, p, y* | MW | *Real-Time Reg-Up Award per Resource per QSE per SCED interval -* The Reg-Up amount awarded to QSE *q* for Resource *r* in Real-Timefor the SCED interval *y.* Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTMCPCRUR *q, r* | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Up per Resource per QSE*⎯ The Real-Time MCPC for Reg-Up for Resource *r*, represented by QSE *q* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource r is the Combined Cycle Train. |
| RTMCPCRUS *y* | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Up per SCED interval -* The Real-Time MCPC for Reg-Up for the SCED interval *y.* |
| PCRUR *r, q, DAM* | MW | *Procured Capacity for Reg-Up per Resource per QSE in DAM*—The Reg-Up capacity awarded to QSE *q* in the DAM for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DARUAWD *q, r* | MW | *Day-Ahead Reg-Up Award per Resource per QSE*⎯ The Reg-Up capacity awarded in the DAM to QSE *q* for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTMCPCRU | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Up -* The Real-Time MCPC for Reg-Up for the 15-minute Settlement Interval. |
| DASARUQ ***q*** | MW | *Day-Ahead Self-Arranged Reg-Up Quantity per QSE*—The self-arranged Reg-Up quantity submitted by QSE *q* before 1000 in the DAM for the Operating Hour. |
| RUTP *q* | MW | *Trade Purchases for Reg-Up for the QSE—* The final approved trade purchases for QSE *q* for Reg-Up for the Operating Hour. |
| RUTS *q* | MW | *Trade Sales for Reg-Up for the QSE—* The final approved trade sales for QSE *q* for Reg-Up for the Operating Hour. |
| TLMP *y* | second | *Duration of SCED interval per interval -* The duration of the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval -* The weight used in the Ancillary Service award calculation for the portion of the SCED interval *y* within the Settlement Interval*.* |
| RURWF *q, r, p, y* | none | *Reg-Up Resource Node Weighting Factor per interval -* The Reg-Up Resource weight, based on Reg-Up awards, used in the Real-Time MCPC calculation for the portion of the SCED interval *y* within the Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *r* | none | A Resource. |
| *q* | none | A QSE. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |
| *p* | none | A Resource Node Settlement Point. |

(2) Reg-Up Only Charge:

RTRUOAMT *q* = (1/4) \* DARUOAWD *q* \* RTMCPCRU

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRUOAMT *q* | $ | *Real-Time Reg-Up Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Up Only awards for each 15-minute Settlement Interval. |
| DARUOAWD *q* | MW | *Day-Ahead Reg-Up Only Award for the QSE*⎯ The Reg-Up only capacity awarded in the DAM to the QSE *q* for the Operating Hour. |
| RTMCPCRU | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Up -* The Real-Time MCPC for Reg-Up for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

(3) Reg-Up Trade Overage Charges:

RTRUTOAMT *q* = (1/4) \* RTRUTO *q* \* RTMCPCRU

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRUTOAMT *q* | $ | *Real-Time Reg-Up Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Up trade overages for each 15-minute Settlement Interval. |
| RTRUTO *q* | MW | *Real-Time Reg-Up Trade Overage for the QSE* ⎯ The quantity of submitted Reg-Up trades in excess of DAM self- arrangement quantities for the QSE *q* for the Operating Hour. |
| RTMCPCRU | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Up -* The Real-Time MCPC for Reg-Up for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

6.7.5.3 Regulation Down Service Payments and Charges

(1) Reg-Down Imbalance Payment or Charge:

RTRDIMBAMT *q* = (-1) \* [[RTRDREV *q, r* – (1/4) \* (PCRDR *r, q, DAM* \* RTMCPCRD)] – (1/4) \* ((DASARDQ *q* \* RTMCPCRD) + (RDTP *q* – RDTS *q*) \* RTMCPCRD)]

Where:

RTRDREV *q, r  =* (1/4) \* RTRDAWD *q, r* \* RTMCPCRDR *q, r*

RTMCPCRDR *q, r =*  (RDRWF *q, r, p, y* \* (RTMCPCRDS *y* + RTRDPARDS *y*))

RTRDAWD *q, r* =  (RNWF *y* \* RTRDAWDS *q, r, p, y*)

Where:

RDRWF *q, r, p, y*= [max( 0.001, RTRDAWDS *q, r, p, y*) \* TLMP *y*] / [****max( 0.001,

RTRDAWDS *q, r, p, y*) \* TLMP *y*]

And:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRDIMBAMT *q* | $ | *Real-Time Reg-Down Imbalance Amount for the QSE*— The total payment or charge to QSE *q* for the Real-Time Reg-Down imbalance for each 15-minute Settlement Interval. |
| RTRDAWD*q, r* | MW | *Real-Time Reg-Down Award per Resource per QSE* - The Reg-Down amount awarded to QSE *q* for Resource *r* in Real-Time for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRDREV *q, r* | $ | *Real-Time Reg-Down Revenue*— The Real-Time Reg-Down revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRDAWDS*q, r, p, y* | MW | *Real-Time Reg-Down Award per Resource per QSE per SCED interval* - The Reg-Down Amount awarded to QSE *q* for Resource *r* in Real-Time for the SCED interval *y.* Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTMCPCRDR *q, r* | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Down per Resource per QSE*⎯ The Real-Time MCPC for Reg-Down for Resource *r*, represented by QSE *q* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTMCPCRDS *y* | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Down per SCED interval -* The Real-Time MCPC for Reg-Down for the SCED interval *y.* |
| PCRDR *r, q, DAM* | MW | *Procured Capacity for Reg-Down per Resource per QSE in DAM*—The Reg-Down capacity awarded to QSE *q* in the DAM for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTMCPCRD | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Down -* The Real-Time MCPC for Reg-Down for the 15-minute Settlement Interval. |
| RTRDPARDS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Reg-Down per SCED interval* - The Real-Time price adder for Reg-Down that captures the impact of reliability deployments on Reg-Down prices for the SCED interval *y*. |
| DASARDQ *q* | MW | *Day-Ahead Self-Arranged Reg-Down Quantity per QSE* —The self-arranged Reg-Down quantity submitted by QSE *q* before 1000 in the DAM for the Operating Hour. |
| RDTP *q* | MW | *Trade Purchases for Reg-Down for the QSE*— The trade purchases for QSE *q* for Reg-Down for the Operating Hour. |
| RDTS *q* | MW | *Trade Sales for Reg-Down for the QSE*— The trade sales for QSE *q* for Reg-Down for the Operating Hour. |
| TLMP *y* | second | *Duration of SCED interval per interval -* The duration of the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval -* The weight used in the Ancillary Service award calculation for the portion of the SCED interval y within the Settlement Interval. |
| RDRWF *q, r, p, y* | none | *Regulation Down Resource Node Weighting Factor per interval -* The Reg-Down Resource weight, based on Reg-Down awards, used in the Real-Time MCPC calculation for the portion of the SCED interval y within the Settlement Interval. Where for a Combined Cycle Train, the Resource r is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *r* | none | A Resource. |
| *q* | none | A QSE. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |
| *p* | none | A Resource Node Settlement Point. |

(2) Reg-Down Only Charge:

RTRDOAMT *q* = (1/4) \* DARDOAWD *q* \* RTMCPCRD

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRDOAMT *q* | $ | *Real-Time Reg-Down Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Down only awards for each 15-minute Settlement Interval. |
| DARDOAWD *q* | MW | *Day-Ahead Reg-Down Only Award for the QSE*⎯ The Reg-Down only capacity awarded in the DAM to the QSE *q* for the Operating Hour. |
| RTMCPCRD | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Down -* The Real-Time MCPC for Reg-Down for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

(3) Reg-Down Trade Overage Charge:

RTRDTOAMT *q* = (1/4) \* RTRDTO *q* \* RTMCPCRD

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRDTOAMT *q* | $ | *Real-Time Reg-Down Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Down trade overages for each 15-minute Settlement Interval. |
| RTRDTO *q* | MW | *Real-Time Reg-Down Trade Overage for the QSE* ⎯ The quantity of submitted Reg-Down trades in excess of their DAM self- arrangement quantity for the QSE *q* for the Operating Hour. |
| RTMCPCRD | $/MW | *Real-Time Market Clearing Price for Capacity for Reg-Down -* The Real-Time MCPC for Reg-Down for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

6.7.5.4 Responsive Reserve Payments and Charges

(1) RRS Imbalance Payment or Charge:

RTRRIMBAMT *q* = (-1) \* [[RTRRREV *q, r*  – (1/4) \* (PCRRR *r, q, DAM* \* RTMCPCRR)] – (1/4) \* ((DASARRQ *q* \* RTMCPCRR) + (RRTP *q* – RRTS *q*) \* RTMCPCRR)]

Where:

RTRRREV *q, r  =* (1/4) \* RTRRAWD *q, r* \* RTMCPCRRR *q, r*

RTMCPCRRR *q, r =*  (RRRWF *q, r, p, y* \* (RTMCPCRRS *y* + RTRDPARRS *y*))

RTRRAWD *q, r*  =  (RNWF *y* \* RTRRAWDS *q, r, p, y*)

Where:

RRRWF *q, r, p, y*= [max( 0.001, RTRRAWDS *q, r, p, y*) \* TLMP *y*] / [****max( 0.001,

RTRRAWDS *q, r, p, y*) \* TLMP *y*]

And:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRRIMBAMT *q* | $ | *Real-Time Responsive Reserve Imbalance Amount for the QSE*— The total payment or charge to QSE *q* for the Real-Time RRS imbalance for each 15-minute Settlement Interval. |
| RTRRAWD *q,r* | MW | *Real-Time Responsive Reserve Award per Resource per QSE*— The RRS amount awarded to QSE *q* for Resource *r* in Real-Time for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRRREV *q, r* | $ | *Real-Time Responsive Reserve Revenue*— The Real-Time RRS revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTRDPARRS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Responsive Reserve per SCED interval* – The Real-Time price adder for RRS that captures the impact of reliability deployments on RRS prices for the SCED interval y. |
| RTRRAWDS *q, r, p, y* | MW | *Real-Time Responsive Reserve Award per Resource per QSE per SCED interval -* The RRS amount awarded to QSE *q* for Resource *r* in Real-Time for the SCED interval *y.* Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTMCPCRRR *q, r* | $/MW | *Real-Time Market Clearing Price for Capacity for Responsive Reserve per Resource per QSE*⎯ The Real-Time MCPC for RRS for Resource *r*, represented by QSE *q* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTMCPCRRS *y* | $/MW | *Real-Time Market Clearing Price for Capacity for Responsive Reserve per SCED interval -* The Real-Time MCPC for RRS for the SCED interval *y.* |
| PCRRR *r, q, DAM* | MW | *Procured Capacity for Responsive Reserve per Resource per QSE in DAM*—The RRS capacity awarded to QSE *q* in the DAM for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTMCPCRR | $/MW | *Real-Time Market Clearing Price for Capacity for Responsive Reserve -* The Real-Time MCPC for RRS for the 15-minute Settlement Interval. |
| DASARRQ *q* | MW | *Day-Ahead Self-Arranged Responsive Reserve Quantity per QSE*—The self-arranged RRS quantity submitted by QSE *q* before 1000 in the DAM for the Operating Hour. |
| RRTP *q* | MW | *Trade Purchases for Responsive Reserve for the QSE—* The trade purchases for QSE *q* for RRS for the Operating Hour. |
| RRTS *q* | MW | *Trade Sales for Responsive Reserve for the QSE —* The trade sales for QSE *q* for RRS for the Operating Hour. |
| TLMP *y* | second | *Duration of SCED interval per interval -* The duration of the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval -* The weight used in the Ancillary Service award calculation for the portion of the SCED interval y within the Settlement Interval. |
| RRRWF *q, r, p, y* | none | *Responsive Reserve Resource Node Weighting Factor per interval -* The RRS Resource weight, based on RRS awards, used in the Real-Time MCPC calculation for the portion of the SCED interval y within the Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *r* | none | A Resource. |
| *q* | none | A QSE. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |
| *p* | none | A Resource Node Settlement Point. |

(2) RRS Only Charge:

RTRROAMT *q* = (1/4) \* DARROAWD *q* \* RTMCPCRR

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRROAMT *q* | $ | *Real-Time Responsive Reserve Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for RRS only awards for each 15-minute Settlement Interval. |
| DARROAWD *q* | MW | *Day-Ahead Responsive Reserve Only Award for the QSE*⎯ The RRS only capacity awarded in the DAM to the QSE *q* for the Operating Hour. |
| RTMCPCRR | $/MW | *Real-Time Market Clearing Price for Capacity for Responsive Reserve -*  The Real-Time MCPC for RRS for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

(3) RRS Trade Overage Charge:

RTRRTOAMT *q* = (1/4) \* RTRRTO *q* \* RTMCPCRR

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRRTOAMT *q* | $ | *Real-Time Responsive Reserve Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for RRS trade overages for each 15-minute Settlement Interval. |
| RTRRTO *q* | MW | *Real-Time Responsive Reserve Trade Overage for the QSE* ⎯ The quantity of submitted RRS trades in excess of their DAM self-arrangement quantity for the QSE *q* for the Operating Hour. |
| RTMCPCRR | $/MW | *Real-Time Market Clearing Price for Capacity for Responsive Reserve -* The Real-Time MCPC for RRS for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

6.7.5.5 Non-Spinning Reserve Service Payments and Charges

(1) Non-Spin Imbalance Payment or Charge:

RTNSIMBAMT *q* = (-1) \* [[RTNSREV *q, r*  – (1/4) \* (PCNSR *r, q, DAM* \* RTMCPCNS)] – (1/4) \* ((DASANSQ *q* \* RTMCPCNS) + (NSTP *q* – NSTS *q*) \* RTMCPCNS)]

Where:

RTNSREV *q, r  =* (1/4) \* RTNSAWD *q, r* \* RTMCPCNSR *q, r*

RTMCPCNSR *q, r =*  (NSRWF *q, r, p, y* \* (RTMCPCNSS *y* + RTRDPANSS *y*))

RTNSAWD *q, r*  =  (RNWF *y* \* RTNSAWDS *q, r, p, y*)

Where:

NSRWF *q, r, p, y*= [max( 0.001, RTNSAWDS *q, r, p, y*) \* TLMP *y*] / [****max( 0.001,

RTNSAWDS *q, r, p, y*) \* TLMP *y*]

And:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTNSIMBAMT *q* | $ | *Real-Time Non-Spin Imbalance Amount for the QSE*— The total payment or charge to QSE *q* for the Real-Time Non-Spin imbalance for each 15-minute Settlement Interval. |
| RTNSAWD *q, r* | MW | *Real Time Non-Spin Award per Resource per QSE* - The Non-Spin amount awarded to QSE *q* for Resource *r* in Real-Time for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTNSREV *q, r* | $ | *Real-Time Non-Spin Revenue*— The Real-Time Non-Spin revenue for QSE *q* calculated for Resource *r* for the 15-minute Settlement interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTNSAWDS *q, r, p, y* | MW | *Real Time Non-Spin Award per Resource per QSE* *per SCED interval* - The Non-Spin Amount awarded to QSE *q* for Resource *r* in Real-Time for the SCED interval *y.* Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTMCPCNSR *q,r* | $/MW | *Real-Time Market Clearing Price for Capacity for Non-Spin per Resource per QSE*⎯ The Real-Time MCPC for Non-Spin for Resource *r*, represented by QSE *q* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTMCPCNSS *y* | $/MW | *Real-Time Market Clearing Price for Capacity for Non-Spin per SCED Interval -* The Real-Time MCPC for Non-Spin for the SCED interval *y.* |
| PCNSR *r, q, DAM* | MW | *Procured Capacity for Non-Spin per Resource per QSE in DAM*—The Non-Spin capacity awarded to QSE *q* in the DAM for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTMCPCNS | $/MW | *Real-Time Market Clearing Price for Capacity for Non-Spin -* The Real-Time MCPC for Non-Spin for the 15-minute Settlement Interval. |
| RTRDPANSS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for Non-Spin per SCED interval* - The Real-Time price adder for Non-Spin that captures the impact of reliability deployments on Non-Spin prices for the SCED interval *y*. |
| DASANSQ *q* | MW | *Day-Ahead Self-Arranged Non-Spin Quantity per QSE*—The self-arranged Non-Spin quantity submitted by QSE *q* before 1000 in the DAM for the Operating Hour. |
| NSTP *q* | MW | *Trade Purchases for Non-Spin for the QSE*— The trade purchases for QSE *q* for Non-Spin for the Operating Hour. |
| NSTS *q* | MW | *Trade Sales for Non-Spin for the QSE—* The trade sales for QSE *q* for Non-Spin for the Operating Hour. |
| TLMP *y* | second | *Duration of SCED interval per interval -* The duration of the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval -* The weight used in the Ancillary Service award calculation for the portion of the SCED interval y within the Settlement Interval. |
| NSRWF *q, r, p, y* | none | *Non-Spin Resource Node Weighting Factor per interval -* The Non-Spin Resource weight, based on Non-Spin awards, used in the Real-Time MCPC calculation for the portion of the SCED interval y within the Settlement Interval*.* Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *r* | none | A Resource. |
| *q* | none | A QSE. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |
| *p* | none | A Resource Node Settlement Point. |

(2) Non-Spin Only Charge:

RTNSOAMT *q* = (1/4) \* DANSOAWD *q* \* RTMCPCNS

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTNSOAMT *q* | $ | *Real-Time Non-Spin Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for Non-Spin only award for each 15-minute Settlement Interval. |
| DANSOAWD *q* | MW | *Day-Ahead Non-Spin Only Award for the QSE*⎯ The Non-Spin only capacity awarded in the DAM to the QSE *q* for the Operating Hour. |
| RTMCPCNS | $/MW | *Real-Time Market Clearing Price for Capacity for Non-Spin -* The Real-Time MCPC for Non-Spin for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

(3) Non-Spin Trade Overage Charge:

RTNSTOAMT *q* = (1/4) \* RTNSTO *q* \* RTMCPCRNS

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTNSTOAMT *q* | $ | *Real-Time Non-Spin Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for Non-Spin trade overages for each 15-minute Settlement Interval. |
| RTNSTO *q* | MW | *Real-Time Non-Spin Trade Overage for the QSE* ⎯ The quantity of submitted Non-Spin trades in excess of their DAM self-arrangement quantity for the QSE *q* for the Operating Hour. |
| RTMCPCNS | $/MW | *Real-Time Market Clearing Price for Capacity for Non-Spin -* The Real-Time MCPC for Non-Spin for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

6.7.5.6 ERCOT Contingency Reserve Service Payments and Charges

(1) ECRS Imbalance Payment or Charge:

RTECRIMBAMT *q* = (-1) \* [[RTECRREV*q, r* – (1/4) \* (PCECRR *r, q, DAM* \*

RTMCPCECR)] – (1/4) \* ((DASAECRQ *q* \* RTMCPCECR) + (ECRTP *q* – ECRTS *q*) \* RTMCPCECR)]

Where:

RTECRREV *q, r  =* (1/4) \* RTECRAWD *q, r* \* RTMCPCECRR *q, r*

RTMCPCECRR *q, r =* (ECRRWF *q, r, p, y* \* (RTMCPCECRS *y* + RTRDPAECRS *y))*

RTECRAWD *q,r*  =  (RNWF *y* \* RTECRAWDS *q, r, p, y*)

Where:

ECRRWF *q, r, p, y* = [max( 0.001, RTECRAWDS *q, r, p, y*) \* TLMP *y*] / [****max( 0.001,

RTECRAWDS *q, r, p, y*) \* TLMP *y*]

And:

RNWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTECRIMBAMT *q* | $ | *Real-Time ERCOT Contingency Reserve Service Imbalance Amount for the QSE—* The total payment or charge to QSE q for the Real-Time ECRS imbalance for each 15-minute Settlement Interval. |
| RTECRAWD q,r | MW | *Real-Time ERCOT Contingency Reserve Service Award per Resource per QSE*⎯ The ECRS amount awarded to QSE *q* for Resource *r* in Real-Time for 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. |
| RTECRREV *q, r* | $ | *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. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTECRAWDS *q, r, p, y* | MW | *Real-Time ERCOT Contingency Reserve Service Award per Resource per QSE per SCED interval* - The ECRS amount awarded to QSE *q* for Resource *r* in Real-Time for the SCED interval *y.* Where for a Combined Cycle Train, the Resource r is the Combined Cycle Train. |
| RTMCPCECRR *q, r* | $/MW | *Real-Time Market Clearing Price for Capacity for ERCOT Contingency Reserve Service per Resource per QSE* ⎯ The Real-Time MCPC for ECRS for Resource *r*, represented by QSE *q* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTMCPCECRS *y* | $/MW | *Real-Time Market Clearing Price for Capacity for ERCOT Contingency Reserve Service per SCED Interval* — The Real-Time MCPC for ECRS for the SCED interval *y.* |
| PCECRR *r, q, DAM* | MW | *Procured Capacity for ERCOT Contingency Reserve Service per Resource per QSE in DAM*—The ECRS capacity awarded to QSE *q* in the DAM for Resource *r* for the Operating Hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTMCPCECR | $/MW | *Real-Time Market Clearing Price for Capacity for ERCOT Contingency Reserve Service* — The Real-Time MCPC for ECRS for the 15-minute Settlement Interval. |
| RTRDPAECRS *y* | $/MW | *Real-Time Reliability Deployment Price Adder for Ancillary Service for ERCOT Contingency Reserve Service per SCED interval* - The Real-Time price adder for ECRS that captures the impact of reliability deployments on ECRS prices for the SCED interval *y*. |
| DASAECRQ *q* | MW | *Day-Ahead Self-Arranged ERCOT Contingency Reserve Service Quantity per QSE*—The self-arranged ECRS quantity submitted by QSE *q* before 1000 in the DAM for the Operating Hour. |
| ECRTP *q* | MW | *Trade Purchases for ERCOT Contingency Reserve Service for the QSE—* The trade purchases for QSE *q* for ECRS for the Operating Hour. |
| ECRTS *q* | MW | *Trade Sales for ERCOT Contingency Reserve Service for the QSE—* The trade sales for QSE *q* for ECRS for the Operating Hour. |
| TLMP *y* | second | *Duration of SCED interval per interval -* The duration of the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval -* The weight used in the Ancillary Service award calculation for the portion of the SCED interval y within the Settlement Interval. |
| ECRRWF *q, r, p, y* | none | *ERCOT Contingency Reserve Service Resource Node Weighting Factor per interval -* The ECRS Resource weight, based on ECRS awards, used in the Real-Time MCPC calculation for the portion of the SCED interval y within the Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *r* | none | A Resource. |
| *q* | none | A QSE. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |
| *p* | none | A Resource Node Settlement Point. |

(2) ECRS Only Charge:

RTECROAMT *q* = (1/4) \* DAECROAWD *q* \* RTMCPCECR

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTECROAMT *q* | $ | *Real-Time ERCOT Contingency Reserve Service Only Amount for the QSE—* The total charge to QSE *q* in Real-Time for ECRS only awards for each 15-minute Settlement Interval. |
| DAECROAWD *q* | MW | *Day-Ahead ERCOT Contingency Service Only Award for the QSE*⎯ The ECRS only capacity awarded in the DAM to the QSE *q* for the Operating Hour. |
| RTMCPCECR | $/MW | *Real-Time Market Clearing Price for Capacity for ERCOT Contingency Reserve Service* — The Real-Time MCPC for ECRS for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

(3) ECRS Trade Overage Charge:

RTECRTOAMT *q* = (1/4) \* RTECRTO *q* \* RTMCPCRECR

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTECRTOAMT *q* | $ | *Real-Time ERCOT Contingency Reserve Service Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for ECRS trade overages for each 15-minute Settlement Interval. |
| RTECRTO *q* | MW | *Real-Time ERCOT Contingency Reserve Service Trade Overage for the QSE* ⎯ The quantity of submitted ECRS trades in excess of their DAM self-arrangement quantity for the QSE *q* for the Operating Hour. |
| RTMCPCECR | $/MW | *Real-Time Market Clearing Price for Capacity for ERCOT Contingency Reserve Service* — The Real-Time MCPC for ECRS for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

#### 6.7.5.7 Real-Time Derated Ancillary Service Capability Payment

(1) If ERCOT manually reduces the amount of an Ancillary Service that may be awarded to a Resource in Real-Time under paragraph (6) of Section 6.4.9.1.1, Ancillary Service Awards, and the reduction reduces the payment the QSE would have received under Section 6.7.5.1, Real-Time Ancillary Service Imbalance Payment or Charge, the QSE may be eligible for a Real-Time derated Ancillary Service capability payment under this section.

(2) In order to be eligible for a Real-Time derated Ancillary Service capability payment, the QSE must:

(a) File a timely Settlement and billing dispute, identifying the following items, by Settlement Interval:

(i) Dollar amount and calculation of the estimated Real-Time derated Ancillary Service capability payment;

(ii) The quantity of Ancillary Service awards, by Ancillary Service product, that were not awarded due to ERCOT’s manual reduction of the SCED-recommended award;

(iii) Any additional revenues earned by the QSE under Section 6.6.3.1, Real-Time Energy Imbalance Payment or Charge at a Resource Node; and

(iv) Any additional revenues earned by the QSE under Section 6.7.5.1, Real-Time Ancillary Service Imbalance Payment or Charge.

(b) Have submitted an Ancillary Service Offer for the disputed Settlement Interval(s). The Ancillary Service Offer used to calculate the Real-Time derated Ancillary Service capability payment shall be the most recent offer received by ERCOT effective for the disputed Settlement Interval(s) before ERCOT manually reduced the amount of Ancillary Service to be awarded.

(3) ERCOT shall attempt to validate the calculations provided by the QSE, and may request additional supporting documentation or explanation with respect to the submitted materials within 15 Business Days of receipt. Additional information requested by ERCOT must be provided by the QSE within 15 Business Days of ERCOT’s request. Upon determination by ERCOT that no additional supporting documentation or explanation is needed from the disputing QSE, ERCOT shall notify the QSE of its acceptance or rejection of the claim for the Real-Time derated Ancillary Service capability payment within 15 Business Days.

(4) The price used to determine the derated MWs that were not awarded due to the manual reduction shall be the Real-Time MCPC for the Ancillary Service that was reduced.

(5) The amount recoverable under this section shall be capped by the Real-Time MCPC for the Ancillary Service that was reduced, multiplied by the reduced quantity.

(6) The amount recoverable under this section shall be reduced by any additional revenue received by the QSE, as determined in paragraphs (2)(a)(iii) and (2)(a)(iv) above.

(7) The Real-Time derated Ancillary Service capability payment for a given 15-minute Settlement Interval is calculated as follows:

**RTDASAMT *q* = (-1) \* Min[(RTRUILD *q* + RTRDILD *q* + RTRRILD *q* + RTNSILD*q* + RTECRILD *q* – RTEIRD** *q* **– RTASIRD *q*),** **RTDASCAP*q,r*]**

Where:

RTDASCAP*q. r* = (1/4) \* (RTMCPCRU \* RTRUDQ *q, r***+**  RTMCPCRD \* RTRDDQ *q, r***+**

RTMCPCRR \* RTRRDQ *q, r* **+**  RTMCPCNS \* RTNSDQ *q, r* **+**

RTMCPCECR \* RTECRDQ *q, r* )

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RTDASAMT *q* | $ | *Real-Time Derated Ancillary Service Amount*—The payment to QSE *q* for amounts recoverable resulting from a manual reduction of Ancillary Services by ERCOT for the 15-minute Settlement Interval. |
| RTRUILD*q* | $ | *Real-Time Derated Regulation Up Imbalance Losses for Deration*—The payments not made to QSE *q* under paragraph (1) of Section 6.7.5.2, RegulationUp Service Payments and Charges, for the 15-minute Settlement Interval. |
| RTRDILD *q* | $ | *Real-Time Derated Regulation Down Imbalance Losses for Deration*—The payments not made to QSE *q* under paragraph (1) of Section 6.7.5.3, Regulation Down Service Payments and Charges, for the 15-minute Settlement Interval. |
| RTRRILD *q* | $ | *Real-Time Derated Responsive Reserve Imbalance Losses for Deration*—The payments not made to QSE *q* under paragraph (1) of Section 6.7.5.4, Responsive Reserve Payments and Charges, for the 15-minute Settlement Interval. |
| RTNSILD *q* | $ | *Real-Time Derated Non-Spin Imbalance Losses for Deration*—The payments not made to QSE *q* under paragraph (1) of Section 6.7.5.5, Non-Spinning Reserve Service Payments and Charges, for the 15-minute Settlement Interval. |
| RTECRILD q | $ | *Real-Time Derated ERCOT Contingency Reserve Service Imbalance Losses for Deration*—The payments not made to QSE *q* under paragraph (1) of Section 6.7.5.6, ERCOT Contingency Reserve Service Payments and Charges, for the 15-minute Settlement Interval. |
| RTEIRD*q* | $ | *Real-Time Energy Imbalance Revenues for Deration*—The additional payments to QSE *q* under Section 6.6.3.1, Real-Time Energy Imbalance Payment or Charge at a Resource Node, for the 15-minute Settlement Interval. |
| RTASIRD*q* | $ | *Real-Time Ancillary Service Imbalance Revenues for Deration*—The additional Ancillary Service imbalance payments to QSE *q* for all Ancillary Service products for the 15-minute Settlement Interval. |
| RTDASPCAP *q, r* | $ | *Real-Time Derated Ancillary Service Payment Cap—*The amount recoverable for Resource *r* represented by QSE *q,* capped by the Real-Time MCPC for the Ancillary Service product that was derated, multiplied by the quantity by which the Resource’s capability to provide the Ancillary Service was reduced for the 15-minute Settlement Interval. |
| RTMCPCRU | $/MW | *Real-Time Market Clearing Price for Capacity for Regulation Up* - The Real-Time MCPC for Reg-Up for the 15-minute Settlement Interval. |
| RTMCPCRD | $/MW | *Real-Time Market Clearing Price for Capacity for Regulation Down* - The Real-Time MCPC for Reg-Down for the 15-minute Settlement Interval. |
| RTMCPCRR | $/MW | *Real-Time Market Clearing Price for Capacity for Responsive Reserve* - The Real-Time MCPC for RRS for the 15-minute Settlement Interval. |
| RTMCPCNS | $/MW | *Real-Time Market Clearing Price for Capacity for Non-Spin* - The Real-Time MCPC for Non-Spin for the 15-minute Settlement Interval. |
| RTMCPCECR | $/MW | *Real-Time Market Clearing Price for Capacity for ERCOT Contingency Reserve Service* — The Real-Time MCPC for ECRS for the 15-minute Settlement Interval. |
| RTRUDQ *q, r* | MW | *Real-Time Regulation Up Derated Quantity* - The Reg-Up quantity manually reduced by ERCOT for the Resource *r* represented by QSE *q* for the 15-minute Settlement Interval. |
| RTRDDQ *q, r* | MW | *Real-Time Regulation Down Derated* *Quantity -* The Reg-Down quantity manually reduced by ERCOT for the Resource *r* represented by QSE *q* for the 15-minute Settlement Interval. |
| RTRRDQ *q, r* | MW | *Real-Time Responsive Reserve Derated Quantity -* The RRS quantity manually reduced by ERCOT for the Resource *r* represented by QSE *q* for the 15-minute Settlement Interval. |
| RTECRDQ *q, r* | MW | *Real-Time ERCOT Contingency Reserve Service Derated Quantity* - The ECRS quantity manually reduced by ERCOT for the Resource *r* represented by QSE *q* for the 15-minute Settlement Interval. |
| RTNSDQ *q, r* | MW | *Real-Time Non-Spin Derated Quantity* - The Non Spin quantity manually reduced by ERCOT for the Resource *r* represented by QSE *q* for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |
| *r* | none | A Resource. |

#### 6.7.5.8 Real-Time Derated Ancillary Service Capability Charge

(1) The total cost for Real-Time derated Ancillary Service payments and charges is allocated to QSEs representing Load based on Load Ratio Share (LRS). The Real-Time derated Ancillary Service Payment allocations to each QSE for a given 15-minute Settlement Interval are calculated as follows:

LARTDASAMT *q* = (-1) \* RTDASAMTTOT \* LRS *q*

Where:

RTDASAMTTOT =  RTDASAMT *q*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| LARTDASAMT *q* | $ | *Load Allocated Real-Time Derated Ancillary Service Amount per QSE* – The charge to QSE *q* due to a manual reduction of Ancillary Services to be awarded for the 15-minute Settlement Interval. |
| RTDASAMTTOT | $ | *Real-Time Derated Ancillary Service Amount Total* —The total of all payments to all QSEs for amounts recoverable due to an ERCOT issued manual reduction of Ancillary Services to be awarded for the 15-minute Settlement Interval. |
| RTDASAMT *q* | $ | *Real-Time Derated Ancillary Service Amount*—The payment to QSE *q* for amounts recoverable due to an ERCOT issued manual reduction of Ancillary Services to be awarded for the 15-minute Settlement Interval. |
| LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2, QSE Load Ratio Share for a 15-Minute Settlement Interval, for QSE *q* for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |































***6.7.6 Real-Time Ancillary Service Revenue Neutrality Allocation***

(1) The total cost for Real-Time Ancillary Service payments and charges is allocated to the QSEs representing Load based on Load Ratio Share (LRS). The Real-Time Ancillary Service allocations to each QSE for a given 15-minute Settlement Interval are calculated as follows:

(a) For Reg-Up:

LARTRUAMT *q* = (-1) \* (RTRUIMBAMTTOT + RTRUOAMTTOT +

RTRUTOAMTTOT) \* LRS *q*

Where:

RTRUIMBAMTTOT =  (RTRUIMBAMT *q*)

RTRUOAMTTOT =  (RTRUOAMT *q*)

RTRUTOAMTTOT =  (RTRUTOAMT *q*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| LARTRUAMT *q* | $ | *Load-Allocated Real-Time Reg-Up Amount for the QSE*— The QSE *q*­’s share of the total Real-Time Reg-Up amount for the 15-minute Settlement Interval. |
| RTRUIMBAMT *q* | $ | *Real-Time Reg-Up Imbalance Amount for the QSE -* The total payment or charge to QSE *q* for the Real-Time Reg-Up imbalance for each 15-minute Settlement Interval. |
| RTRUOAMT *q* | $ | *Real-Time Reg-Up Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Up only awards for each 15-minute Settlement Interval. |
| RTRUIMBAMTTOT | $ | *Real-Time Reg-Up Imbalance Market Total Amount - T*he total charge to all QSEs for the Real-Time Reg-Up imbalance for each 15-minute Settlement Interval. |
| RTRUOAMTTOT | $ | *Real-Time Reg-Up Only Market Total Amount -* The total charge to all QSEs in Real-Time for Reg-Up only awards for each 15-minute Settlement Interval. |
| RTRUTOAMT *q* | $ | *Real-Time Reg-Up Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Up trade overages for each 15-minute Settlement Interval. |
| RTRUTOAMTTOT | $ | *Real-Time Reg-Up Trade Overage Total Amount* — The total charge to all QSEs for Real-Time Reg-Up trade overages for each 15-minute Settlement Interval. |
| LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2, QSE Load Ratio Share for a 15-Minute Settlement Interval, for QSE *q* for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

(b) For Reg-Down:

LARTRDAMT *q* = (-1) **\* (**RTRDIMBAMTTOT + RTRDOAMTTOT +

RTRDTOAMTTOT) \* LRS *q*

Where:

RTRDIMBAMTTOT = (RTRDIMBAMT *q*)

RTRDOAMTTOT = (RTRDOAMT *q*)

RTRDTOAMTTOT = (RTRDTOAMT *q*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| LARTRDAMT *q* | $ | *Load-Allocated Real-Time Reg-Down Amount for the QSE* ⎯ The QSE *q*’s share of the total Real-Time Reg-Down amount for the 15-minute Settlement Interval. |
| RTRDIMBAMT *q* | $ | *Real-Time Reg-Down Imbalance Amount for the QSE -* The total payment or charge to QSE *q* for the Real-Time Reg-Down imbalance for each 15-minute Settlement Interval. |
| RTRDOAMT *q* | $ | *Real-Time Reg-Down Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Down only awards for each 15-minute Settlement Interval. |
| RTRDIMBAMTTOT | $ | *Real-Time Reg-Down Imbalance Market Total Amount -* The total payment or charge to all QSEs for the Real-Time Reg-Down imbalance for each 15-minute Settlement Interval. |
| RTRDOAMTTOT | $ | *Real-Time Reg-Down Only Market Total Amount -* The total charge to all QSEs in Real-Time for Reg-Down only awards for each 15-minute Settlement Interval. |
| RTRDTOAMT *q* | $ | *Real-Time Reg-Down Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Down trade overages for each 15-minute Settlement Interval. |
| RTRDOAMTTOT | $ | *Real-Time Reg-Down Trade Overage Total Amount* — The total charge to all QSEs for Real-Time Reg-Down trade overages for each 15-minute Settlement Interval. |
| LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2, QSE Load Ratio Share for a 15-Minute Settlement Interval, for QSE *q* for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

(c) For Responsive Reserve (RRS):

LARTRRAMT *q* = (-1) **\* (**RTRRIMBAMTTOT + RTRROAMTTOT +

RTRRTOAMTTOT) \* LRS *q*

Where:

RTRRIMBAMTTOT =  (RTRRIMBAMT *q*)

RTRROAMTTOT =  (RTRROAMT *q*)

RTRRTOAMTTOT =  (RTRRTOAMT *q*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| LARTRRAMT *q* | $ | *Load-Allocated Real-Time Responsive Reserve Amount for the QSE* ⎯ The QSE’s share of the total Real-Time RRS amount for the 15-minute Settlement Interval. |
| RTRRIMBAMT *q* | $ | *Real-Time Responsive Reserve Imbalance Amount for the QSE -* The total payment or charge to QSE *q* for the Real-Time RRS imbalance for each 15-minute Settlement Interval. |
| RTRROAMT *q* | $ | *Real-Time Responsive Reserve Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for RRS only awards for each 15-minute Settlement Interval. |
| RTRRIMBAMTTOT | $ | *Real-Time Responsive Reserve Imbalance Market Total Amount -* The total payment or charge to all QSEs for the Real-Time RRS imbalance for each 15-minute Settlement Interval. |
| RTRROAMTTOT | $ | *Real-Time Responsive Reserve Only Market Total Amount -* The total charge to all QSEs in Real-Time for RRS only awards for each 15-minute Settlement Interval. |
| RTRRTOAMT *q* | $ | *Real-Time Responsive Reserve Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for RRS trade overages for each 15-minute Settlement Interval. |
| RTRROAMTTOT | $ | *Real-Time Responsive Reserve Trade Overage Total Amount* — The total charge to all QSEs for Real-Time RRS trade overages for each 15-minute Settlement Interval. |
| LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2, QSE Load Ratio Share for a 15-Minute Settlement Interval, for QSE *q* for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

(d) For Non-Spin:

LARTNSAMT *q* = (-1) \* (RTNSIMBAMTTOT + RTNSOAMTTOT +

RTNSTOAMTTOT) \* LRS *q*

Where:

RTNSIMBAMTTOT =  (RTNSIMBAMT *q*)

RTNSOAMTTOT =  (RTNSOAMT *q*)

RTNSTOAMTTOT =  (RTNSTOAMT *q*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| LARTNSAMT *q* | $ | *Load-Allocated Real-Time Non-Spin Amount for the QSE* ⎯ The QSE’s share of the total Real-Time Non-Spin amount for the 15-minute Settlement Interval. |
| RTNSIMBAMT *q* | $ | *Real-Time Non-Spin Imbalance Amount for the QSE -* The total payment or charge to QSE *q* for the Real-Time Non-Spin imbalance for each 15-minute Settlement Interval. |
| RTNSOAMT *q* | $ | *Real-Time Non-Spin Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for Non-Spin only awards for each 15-minute Settlement Interval. |
| RTNSIMBAMTTOT | $ | *Real-Time Non-Spin Imbalance Market Total Amount -* The total payment or charge to all QSEs for the Real-Time Non-Spin imbalance for each 15-minute Settlement Interval. |
| RTNSOAMTTOT | $ | *Real-Time Non-Spin Only Market Total Amount -* The total charge to all QSEs in Real-Time for Non-Spin only awards for each 15-minute Settlement Interval. |
| RTNSTOAMT *q* | $ | *Real-Time Non-Spin Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for Non-Spin trade overages for each 15-minute Settlement Interval. |
| RTNSOAMTTOT | $ | *Real-Time Non-Spin Trade Overage Total Amount* — The total charge to all QSEs for Real-Time Non-Spin trade overages for each 15-minute Settlement Interval. |
| LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2, QSE Load Ratio Share for a 15-Minute Settlement Interval, for QSE *q* for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |

(e) For ERCOT Contingency Reserve Service (ECRS):

LARTECRAMT *q* = (-1) \* (RTECRIMBAMTTOT + RTECROAMTTOT +

RTECRTOAMTTOT) \* LRS *q*

Where:

RTECRIMBAMTTOT =  (RTECRIMBAMT *q*)

RTECROAMTTOT = (RTECROAMT *q*)

RTECRTOAMTTOT = (RTECRTOAMT *q*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| LARTECRAMT *q* | $ | *Load-Allocated Real-Time ERCOT Contingency Reserve Service Amount for the QSE -* The QSE *q*’s share of the total Real-Time ECRS amount for the 15-minute Settlement Interval. |
| RTECRIMBAMT *q* | $ | *Real-Time ERCOT Contingency Reserve Service Imbalance Amount for the QSE -* The total payment or charge to QSE *q* for the Real-Time ECRS imbalance for each 15-minute Settlement Interval. |
| RTECROAMT *q* | $ | *Real-Time ERCOT Contingency Reserve Service Only Amount for the QSE—* The total charge to QSE *q* in Real-Time for ECRS only awards for each 15-minute Settlement Interval. |
| RTECRIMBAMTTOT | $ | *Real-Time ERCOT Contingency Reserve Service Imbalance Market Total Amount -* The total payment or charge to all QSEs for the Real-Time ECRS imbalance for each 15-minute Settlement Interval. |
| RTECROAMTTOT | $ | *Real-Time ERCOT Contingency Reserve Service Only Market Total Amount -* The total charge to all QSEs in Real-Time for ECRS only awards for each 15-minute Settlement Interval. |
| RTECRTOAMT *q* | $ | *Real-Time ERCOT Contingency Reserve Service Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for ECRS trade overages for each 15-minute Settlement Interval. |
| RTECROAMTTOT | $ | *Real-Time ERCOT Contingency Reserve Service Trade Overage Total Amount* — The total charge to all QSEs for Real-Time ECRS trade overages for each 15-minute Settlement Interval. |
| LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2, QSE Load Ratio Share for a 15-Minute Settlement Interval, for QSE *q* for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |