|  |  |  |  |
| --- | --- | --- | --- |
| NPRR Number | [863](http://www.ercot.com/mktrules/issues/NPRR863) | NPRR Title | Creation of Primary Frequency Response Service Product and Revisions to Responsive Reserve |
|  | |  | |
| Date | | June XX, 2018 | |
|  | |  | |
| Submitter’s Information | | | |
| Name | |  | |
| E-mail Address | |  | |
| Company | |  | |
| Phone Number | |  | |
| Cell Number | |  | |
| Market Segment | |  | |

|  |
| --- |
| Comments |

|  |
| --- |
| Revised Cover Page Language |

|  |  |  |  |
| --- | --- | --- | --- |
| NPRR Number | [863](http://www.ercot.com/mktrules/issues/NPRR863) | NPRR Title | Creation of Frequency Response Service Product and Revisions to Responsive Reserve |
| Nodal Protocol Sections Requiring Revision | | 2.1, Definitions  2.2, Acronyms and Abbreviations  3.2.5 Publication of Resource and Load Information  3.2.6.2.1 Peak Load Estimate  3.6.1, Load Resource Participation  3.8.3, Quick Start Generation Resources  3.8.4, Hydro Generation Resources  3.9.1, Current Operating Plan (COP) Criteria  3.16, Standards for Determining Ancillary Service Quantities  3.17.2, Responsive Reserve Service  3.17.4, Frequency Response Service (new)  3.18, Resource Limits in Providing Ancillary Service  4.2.1.1 Ancillary Service Plan  4.4.7.1, Self-Arranged Ancillary Service Quantities  4.4.7.1.1 Negative Self-Arranged Ancillary Service Quantities  4.4.7.2 Ancillary Service Offers  4.4.7.2.1 Ancillary Service Offer Criteria  4.4.7.3, Ancillary Service Trades  4.5.2, Ancillary Service Insufficiency  4.6.2.3.1, Day-Ahead Make-Whole Payment  4.6.4.1.5, Frequency Response Service Payment (new)  4.6.4.2.5, Frequency Response Service Charge (new)  6.4.9.2, Supplemental Ancillary Services Market  6.5.1.2, Centralized Dispatch  6.5.5.2, Operational Data Requirements  6.5.7.2, Resource Limit Calculator  6.5.7.5, Ancillary Services Capacity Monitor  6.5.7.6.2.2, Deployment of Responsive Reserve Service  6.5.7.6.2.3, Deployment and Recall of Responsive Reserve Service (new)  6.5.9.3.3, Watch  6.5.9.4.1, General Procedures Prior to EEA Operations  6.5.9.4.2, EEA Levels  6.6.5.1, Resource Base Point Deviation Charge  6.7.1, Payments for Ancillary Service Capacity Sold in a Supplemental Ancillary Services Market (SASM) or Reconfiguration Supplemental Ancillary Services Market (RSASM)  6.7.2, Payments for Ancillary Service Capacity Assigned in Real-Time Operations  6.7.2.1, Charges for Infeasible Ancillary Service Capacity Due to Transmission Constraints  6.7.2.2, Real-Time Adjustments to Day-Ahead Make Whole Payments due to Ancillary Services Infeasibility Charges  6.7.3, Charges for Ancillary Service Capacity Replaced Due to Failure to Provide  6.7.4, Adjustments to Cost Allocations for Ancillary Services Procurement  6.7.5, Real-Time Ancillary Service Imbalance Payment or Charge  6.7.7, Adjustments to Net Cost Allocations for Real-Time Ancillary Services  8.1, QSE and Resource Performance Monitoring  8.1.1.1, Ancillary Service Qualification and Testing  8.1.1.2.1.2, Responsive Reserve Service Qualification  8.1.1.2.1.6, Frequency Response Service Qualification (new)  8.1.1.3.4, Frequency Response Service Capacity Monitoring Criteria  8.1.1.4.2, Responsive Reserve Service Energy Deployment Criteria  8.1.1.4.4, Frequency Response Service Energy Deployment Criteria (new)  8.5.1.1, Governor in Service  8.5.1.3, Wind-powered Generation Resource (WGR) Primary Frequency Response  8.5.2, Primary Frequency Response Measurements  8.5.2.1, ERCOT Required Primary Frequency Response  9.2.3, DAM Settlement Charge Types  9.5.3, Real-Time Market Settlement Charge Types | |
| Revision Description | | This Nodal Protocol Revision Request (NPRR) separates the Primary Frequency Response function from Responsive Reserve (RRS), thereby establishing two discrete Ancillary Services: Frequency Response Service (FRS) and RRS. | |
| Business Case | | RRS has been a staple of the current suite of Ancillary Services since the beginning of the Zonal Market. This Ancillary Service has always consisted of two components, a Primary Frequency Response component and a 10-minute energy deployment component, and is a reflection of the technology available at the beginning of the market to provide the service - thermal Generation Resources. As technology has advanced, changes have been made to RRS to allow new participants to enter the market (e.g. Load Resources), however, the product has always remained a multi-component Ancillary Service which has proven to not be conducive to the entry of new participants, nor is it conducive to the efficient procurement and deployment of Ancillary Services on the ERCOT System. Several NPRRs with reasonable merit have failed to survive the stakeholder process as a direct result of the inflexibility of the current RRS product.  Under the current version of North American Electric Reliability Corporation (NERC) Reliability Standard BAL-001-1-TRE, Primary Frequency Response in the ERCOT Region, all On-Line Generation Resources are required to have their Governors in service and provide Primary Frequency Response unless exempted by the Balancing Authority (ERCOT). As a result, all Generation Resources on the system are providing an uncompensated service to the ERCOT System and are subject to compliance risk regardless of whether the Resource has a RRS Ancillary Service Resource Responsibility at the time. Additionally, this free service results in increased wear and tear and Operations and Maintenance (O&M) costs that are borne by the generator owner. As is the case with most things that are provided for free, Primary Frequency Response has become used most frequently and often masks the requirements needed to operate the ERCOT grid since its usage front runs the usage of other Ancillary Services which ultimately impacts price formation. This NPRR would allow for compensation to those Resources that hold a Frequency Response Service (FRS) Ancillary Service Resource Responsibility. At the same time, it creates a blanket exemption by ERCOT to those Generation Resources that do not have an FRS Ancillary Service Resource Responsibility, thereby mitigating undue compliance risk borne by Generation Resources located in ERCOT. This new exemption policy is consistent with ERCOT’s current modeling practices for gauging frequency response characteristics of the ERCOT System where ERCOT “turns off” the Governors for all Generation Resources that do not have a RRS Ancillary Service Resource Responsibility.  By separating Primary Frequency Response from RRS and creating two distinct Ancillary Service products, barriers to entry are removed, market efficiencies are realized, unnecessary regulatory compliance risk is removed, Resources are appropriately compensated for the service(s) that they provide, and the system’s frequency response characteristics will more closely align with the modeling currently done by ERCOT. | |

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

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

* NPRR841, Real-Time Adjustments to Day-Ahead Make Whole Payments due to Ancillary Services Infeasibility Charges (incorporated 3/1/18)
  + Section 6.7.4
* NPRR815, Revise the Limitation of Load Resources Providing Responsive Reserve (RRS) Service (unboxed 6/1/18)
  + Section 3.16

|  |
| --- |
| Revised Proposed Protocol Language |

**2.1 DEFINITIONS**

Fast Frequency Response (FFR)

The automatic self-deployment and provision by a Resource of their obligated response within 15 cycles after frequency meets or drops below a preset threshold or via an ERCOT Verbal Dispatch Instruction (VDI). Resources capable of automatically self-deploying and providing their full Ancillary Service Resource Responsibility within 15 cycles after frequency meets or drops below a preset threshold and sustaining a full response for at least 15 minutes may provide Frequency Response Service (FRS).

**Frequency Response Service (FRS)**

An Ancillary Service that provides operating reserves that is intended to:

(a) Arrest frequency within the first few seconds of a significant frequency deviation on the ERCOT Transmission Grid using Primary Frequency Response, Fast Frequency Response (FFR), and interruptible Load;

(b) After the first few seconds of a significant frequency deviation, help arrest and stabilize frequency; and

(c) Provide energy or continued Load interruption during the implementation of the Energy Emergency Alert (EEA);

**High Ancillary Service Limit (HASL)**

A dynamically calculated MW upper limit on a Resource to reserve the part of the Resource’s capacity committed for Ancillary Service, calculated as described in Section 6.5.7.2, Resource Limit Calculator.HASL is also included in Section 5.7.4.1.1, Capacity Shortfall Ratio Share, and in the Reliability Unit Commitment (RUC) optimization.

**Responsive Reserve (RRS)**

An Ancillary Service that provides operating reserves that is intended to:

(a) Restore Frequency Response Service (FRS) within ten minutes of a frequency deviation that results in significant depletion of FRS by restoring frequency to its scheduled value to return the system to normal;

(b) Provide energy or continued Load interruption prior to or during the implementation of the Energy Emergency Alert (EEA); and

(c) Provide backup regulation.

## 2.2 ACRONYMS AND ABBREVIATIONS

**FFR** Fast Frequency Response

**FRS** Frequency Response Service

3.2.5 Publication of Resource and Load Information

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(e) The aggregate Ancillary Service Offers (prices and quantities) in the DAM, for each type of Ancillary Service regardless of a Resource’s On-Line or Off-Line status. For Frequency Response Service (FRS) and Responsive Reserve (RRS) Service, ERCOT shall separately post aggregated offers from Generation Resources, Controllable Load Resources, and non-Controllable Load Resources. Linked Ancillary Service Offers will be included as non-linked Ancillary Service Offers;

(f) The aggregate Self-Arranged Ancillary Service Quantity, for each type of service, by hour;

(g) The aggregate amount of cleared Ancillary Service Offers; and

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

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

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

(i) As submitted;

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

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

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

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

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

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

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

(i) The Generation Resource name;

(ii) The Generation Resource status;

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

(iv) The Generation Resource Base Point from SCED;

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

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

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

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

(i) The Load Resource name;

(ii) The Load Resource status;

(iii) The Maximum Power Consumption (MPC for a Load Resource);

(iv) The Low Power Consumption (LPC for a Load Resource);

(v) The telemetered real power consumption; and

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

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

|  |
| --- |
| ***[NPRR843: Insert paragraph (6) below upon system implementation and renumber accordingly:]***  (6) If any Market Clearing Price for Capacity (MCPC) for an Ancillary Service exceeds 50 times the FIP for any Operating Hour in a DAM or Supplemental Ancillary Services Market (SASM) for the applicable Operating Day, ERCOT shall post on the MIS Public Area the portion on any Resource’s Ancillary Service Offer that is at or above 50 times the FIP for that Ancillary Service for each Operating Hour seven days after the applicable Operating Day. |

(6) ERCOT shall post on the MIS Public Area the offer price and the name of the Entity submitting the offer for the highest-priced offer selected or Dispatched by SCED 48 hours after the end of the applicable Operating Day. If multiple Entities submitted the highest-priced offers selected, all Entities shall be identified on the MIS Public Area.

(7) ERCOT shall post on the MIS Public Area the bid price and the name of the Entity submitting the bid for the highest-priced bid selected or Dispatched by SCED 48 hours after the end of the applicable Operating Day. If multiple Entities submitted the highest-priced bids selected, all Entities shall be identified on the MIS Public Area.

(8) ERCOT shall post on the MIS Public Area the offer price and the name of the Entity submitting the offer for the highest-priced Ancillary Service Offer selected for each Ancillary Service 48 hours after the end of the applicable Operating Day. If multiple Entities submitted the highest-priced offers selected, all Entities shall be identified on the MIS Public Area.

|  |
| --- |
| ***[NPRR843: Replace paragraph (8) above with the following upon system implementation:]***  (8) ERCOT shall post on the MIS Public Area the offer price and the name of the Entity submitting the offer for the highest-priced Ancillary Service Offer selected in the DAM for each Ancillary Service 48 hours after the end of the applicable Operating Day. This same report shall also include the highest-priced Ancillary Service Offer selected for any SASMs cleared for that same Operating Day. If multiple Entities submitted the highest-priced offers selected, all Entities shall be identified on the MIS Public Area. The report shall specify whether the Ancillary Service Offer was selected in a DAM or a SASM. |

(9) ERCOT shall post on the MIS Public Area for each Operating Day the following information for each Resource:

(a) The Resource name;

(b) The names of the Entities providing information to ERCOT;

(c) The names of the Entities controlling each Resource. ERCOT shall determine whether the Entity is in control of each Resource in accordance with subsection (e) of P.U.C. Subst. R. 25.502, Pricing Safeguards in Markets Operated by the Electric Reliability Council of Texas; and

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

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

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

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

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

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

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

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

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

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

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

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

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

|  |
| --- |
| ***[NPRR843: Insert paragraph (11) below upon system implementation:]***  (11) ERCOT shall post on the MIS Public Area the following information from any applicable SASMs for each hourly Settlement Interval for the applicable Operating Day 60 days prior to the current Operating Day:  (a) The Resource name and the Resource’s Ancillary Service Offers available for any applicable SASMs;  (b) The awards for each Ancillary Service from any applicable SASMs for each Generation Resource; and  (c) The awards for each Ancillary Service from any applicable SASMs for each Load Resource. |

3.2.6.2.1 Peak Load Estimate

(1) ERCOT shall prepare, at least annually, a forecast of the total peak Load for both summer and winter Peak Load Seasons for the current year and a minimum of ten future years using an econometric forecast, taking into account econometric inputs, weather conditions, demographic data and other variables as deemed appropriate by ERCOT. The firm Peak Load Season estimate shall be determined by the following equation:

**FIRMPKLD *s, i* = TOTPKLD s, *i* – LRRRS *s, i* – LRFRS *s, i* –LRNSRS­ *s, i* – ERS *s, i* – CLR *s, i* – ENERGYEFF *s, i***

The above variables are defined as follows:

| Variable | Unit | Definition |
| --- | --- | --- |
| FIRMPKLD *s, i* | MW | *Firm Peak Load Estimate*—The Firm Peak Load Estimate for the Peak Load Season *s* for the year *i.* |
| TOTPKLD *s, i* | MW | *Total Peak Load Estimate*—The Total Peak Load Estimate for the Peak Load Season *s* for the year *i.* |
| LRRRS *s, i* | MW | *Load Resource providing RRS*—The amount of RRS a Load Resource is providing for the Peak Load Season *s* for the year *i*. |
| LRFRS *s, i* | MW | *Load Resource providing FRS*—The amount of FRS a Load Resource is providing for the Peak Load Season *s* for the year *i*. |
| LRNSRS *s, i* | MW | *Load Resource providing Non-Spinning Reserve (Non-Spin)*—The estimated amount of Non-Spin that Load Resources are providing for the Peak Load Season *s* for the year *i.* |
| ERS *s, i* | MW | *Emergency Response Service (ERS)*—The estimated amount of ERS for the Peak Load Season *s* for the year *i* calculated as follows:   |  |  |  | | --- | --- | --- | | **Year (i)** | **Winter Peak Load** | **Summer Peak Load** | | Current Year (i = 1) | The simple average of the amount of ERS procured by ERCOT for the current year Standard Contract Term of October 1 to January 31 for the ERS Time Periods covering all or any part of Hour Ending 0600 and Hour Ending 1800. | The amount of ERS procured by ERCOT for the current year Standard Contract Term of June 1 through September 30 for an ERS Time Period covering all or any part of Hour Ending 1800. | | Second Year (i = 2) | The current year Winter Peak Load ERS amount escalated by the compound annual growth rate of the three Winter Peak Load ERS amounts preceding the current year. | The current year Summer Peak Load ERS amount escalated by the compound annual growth rate of the three Summer Peak Load ERS amounts preceding the current period. | | Third Year (i = 3) | The second year Winter Peak Load ERS amount escalated by the compound annual growth rate of the three Winter Peak Load ERS amounts preceding the current year. | The second year Summer Peak Load ERS amount escalated by the compound annual growth rate of the three Summer Peak Load ERS amounts preceding the current year. | | Years after Third Year (i > 3) | Equal to third year amount. | Equal to third year amount. | |
| CLR *s, i* | MW | *Amount of Controllable Load Resource*—Estimated amount of Controllable Load Resource that is available for Dispatch by ERCOT during the current year *i* for the Peak Load Season *s* not already included in LRRRS or LRNSRS. This value does not include Wholesale Storage Load (WSL). |
| ENERGYEFF *s, i* | MW | *Amount of Energy Efficiency Programs Procured*—Estimated amount of energy efficiency programs procured by Transmission and/or Distribution Service Providers (TDSPs) pursuant to P.U.C. Subst. R. 25.181, Energy Efficiency Goal, for the Peak Load Season *s* for the year *i.* ERCOT may also consider any energy efficiency and/or Demand response initiatives reported by Non-Opt-In Entities (NOIEs). |
| *i* | None | Year. |
| *s* | None | Peak Load Season. |

***3.6.1 Load Resource Participation***

(1) A Load Resource may participate by providing:

(a) Ancillary Service:

(i) Regulation Up (Reg-Up) Service as a Controllable Load Resource capable of providing Primary Frequency Response;

(ii) Regulation Down (Reg-Down) Service as a Controllable Load Resource capable of providing Primary Frequency Response;

(iii) Frequency Response Service (FRS) as a Controllable Load Resource or a Load Resource controlled by high-set under-frequency relay;

(iv) Responsive Reserve (RRS) Service as a Controllable Load Resource qualified for Security-Constrained Economic Dispatch (SCED) Dispatch and capable of providing Primary Frequency Response, or as a Load Resource that may or may not be controlled by high-set under-frequency relay; and

(v) Non-Spinning Reserve (Non-Spin) Service as a Controllable Load Resource qualified for SCED Dispatch;

(b) Energy in the form of Demand response from a Controllable Load Resource in Real-Time via SCED;

(c) Emergency Response Service (ERS) for hours in which the Load Resource does not have an Ancillary Service Resource Responsibility; and

(d) Voluntary Load response in Real-Time.

(2) Except for voluntary Load response and ERS, loads participating in any ERCOT market must be registered as a Load Resource and are subject to qualification testing administered by ERCOT.

(3) All ERCOT Settlements resulting from Load Resource participation are made only with the Qualified Scheduling Entity (QSE) representing the Load Resource.

(4) A QSE representing a Load Resource and submitting a bid to buy for participation in SCED, as described in Section 6.4.3.1, RTM Energy Bids, must represent the Load Serving Entity (LSE) serving the Load of the Load Resource. If the Load Resource is an Aggregate Load Resource (ALR), the QSE must represent the LSE serving the Load of all sites within the ALR.

(5) The Settlement Point for a Controllable Load Resource with a Real-Time Market (RTM) Energy Bid is its Load Zone Settlement Point.

(6) QSEs shall not submit offers for Load Resources containing sites associated with a Dynamically Scheduled Resource (DSR).

***3.8.3******Quick Start Generation Resources***

(1) The QSE for a Quick Start Generation Resource (QSGR) that is available for deployment by SCED shall set the COP Resource Status to OFFQS, and the COP Low Sustained Limit (LSL) and COP HSL values to the expected sustainable LSL and HSL for the QSGR for the hour. If the QSGR is providing Non-Spinning Reserve (Non-Spin) service, then the Ancillary Service Resource Responsibility for Non-Spin shall be set to the Resource’s QSE-assigned Non-Spin responsibility in the COP.  If the QSGR is providing Responsive Reserve (RRS), then the Ancillary Service Resource Responsibility for RRS shall be set to the Resource’s QSE-assigned RRS responsibility in the COP.

(2) The QSGR that is available for deployment by SCED shall telemeter a Resource Status of OFFQS and a LSL of zero prior to receiving a deployment instruction from SCED. This status is necessary in order for SCED to recognize that the Resource can be Dispatched. The status of the breaker shall be open and the output of the Resource shall be zero in order for the State Estimator to correctly assess the state of the system. After being deployed for energy from SCED, the Resource shall telemeter an LSL equal to or less than the Resource’s actual output until the Resource has ramped to its physical LSL. After reaching its physical LSL, the QSGR shall telemeter an LSL that reflects its physical LSL. The QSGR that is providing Off-Line Non-Spin shall always telemeter an Ancillary Service Resource Responsibility for Non-Spin to reflect the Resource’s Non-Spin obligation and shall always telemeter an Ancillary Service Schedule for Non-Spin of zero to make the capacity available for SCED.

(3) A QSGR with a telemeter breaker status of open and a telemeter Resource Status OFFQS shall not provide Regulation Service or Frequency Response Service (FRS).

(4) ERCOT shall adjust the QSGR’s Mitigated Offer Cap curve as described in Section 4.4.9.4.1, Mitigated Offer Cap.

(5) For a QSGR that is physically Off-Line, the Resource Entity shall submit a Normal Ramp Rate curve and Emergency Ramp Rate curve indicating QSGR’s ability to reach its ten-minute tested output from zero output in five minutes. This is necessary to prevent SCED from deploying multiple QSGRs due to ramp limitation in the first five minutes after being Dispatched by SCED. QSGRs shall be exempt from Base Point Deviation Charges as described in Section 6.6.5.3, Resources Exempt from Deviation Charges.

(6) Any hour in which the QSE for the QSGR has shown the Resource as available for SCED Dispatch as described in this Section 3.8.3 is considered a QSE-Committed Interval.

(7) QSEs must submit and maintain an Energy Offer Curve for their QSGRs for all hours in which the COP Resource Status is submitted as OFFQS. If a valid Energy Offer Curve or an Output Schedule does not exist for any QSGR for which a Resource Status of OFFQS is telemetered at the end of the Adjustment Period, then ERCOT shall notify the QSE and set the 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. For use as SCED inputs, ERCOT shall create proxy Energy Offer Curves for the Resource as described in paragraph (4) of Section 6.5.7.3, Security Constrained Economic Dispatch.

(8) Other than for the potential decommitment of a QSGR as described in Section 3.8.3.1, Quick Start Generation Resource Decommitment Decision Process, following a SCED QSGR deployment, the QSGR is expected to follow the SCED Base Points.

***3.8.4 Generation Resources Operating in Synchronous Condenser Fast Response Mode***

(1) A QSE is considered to have performed for the amount of its FRS obligation for the MW amount provided by a Generation Resource operating in synchronous condenser fast-response mode and triggered by an under-frequency relay device at the frequency set point specified in paragraph (3)(c) of Section 3.18, Resource Limits in Providing Ancillary Service, without corresponding FRS deployment by ERCOT. This provision applies only for the duration when FRS MW is deployed by automatic under-frequency relay action.

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

(1) Each QSE that represents a Resource must submit a COP to ERCOT that reflects expected operating conditions for each Resource for each hour in the next seven Operating Days.

(2) Each QSE that represents a Resource shall update its COP reflecting changes in availability of any Resource as soon as reasonably practicable, but in no event later than 60 minutes after the event that caused the change.

(3) The Resource capacity in a QSE’s COP must be sufficient to supply the Ancillary Service Supply Responsibility of that QSE.

(4) Load Resource COP values may be adjusted to reflect Distribution Losses in accordance with Section 8.1.1.2, General Capacity Testing Requirements.

(5) A COP must include the following for each Resource represented by the QSE:

(a) The name of the Resource;

(b) The expected Resource Status:

(i) Select one of the following for Generation Resources synchronized to the ERCOT System that best describes the Resource’s status. Unless otherwise provided below, these Resource Statuses are to be used for COP and/or Real-Time telemetry purposes, as appropriate.

(A) ONRUC – On-Line and the hour is a RUC-Committed Hour;

(B) ONREG – On-Line Resource with Energy Offer Curve providing Regulation Service;

(C) ON – On-Line Resource with Energy Offer Curve;

(D) ONDSR – On-Line Dynamically Scheduled Resource (DSR);

(E) ONOS – On-Line Resource with Output Schedule;

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

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

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

(I) ONTEST – On-Line blocked from Security-Constrained Economic Dispatch (SCED) for operations testing (while ONTEST, a Generation Resource may be shown on Outage in the Outage Scheduler);

(J) ONEMR – On-Line EMR (available for commitment or dispatch only for ERCOT-declared Emergency Conditions; the QSE may appropriately set LSL and High Sustained Limit (HSL) to reflect operating limits);

(K) ONFRS – On-Line as a synchronous condenser providing Frequency Response Service (FRS) but unavailable for Dispatch by SCED and available for commitment by RUC;

(L) ONOPTOUT – On-Line and the hour is a RUC Buy-Back Hour;

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

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

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

(P) ONFFRFRS – Available for Dispatch of FRS providing Fast Frequency Response (FFR) from Generation Resources This Resource Status is only to be used for Real-Time telemetry purposes; and

(ii) Select one of the following for Off-Line Generation Resources not synchronized to the ERCOT System that best describes the Resource’s status. These Resource Statuses are to be used for COP and/or Real-Time telemetry purposes, as appropriate.

(A) OUT – Off-Line and unavailable;

(B) OFFNS – Off-Line but reserved for Non-Spin;

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

(D) EMR – Available for commitment as a Resource contracted by ERCOT under Section 3.14.1, Reliability Must Run, or under paragraph (2) of Section 6.5.1.1, ERCOT Control Area Authority, or available for commitment only for ERCOT-declared Emergency Condition events; the QSE may appropriately set LSL and HSL to reflect operating limits; and

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

(A) ONRGL – Available for Dispatch of Regulation Service by Load Frequency Control (LFC) and, for any remaining Dispatchable capacity, by SCED with a Real-Time Market (RTM) Energy Bid;

(B) FRRSUP – Available for Dispatch of FRRS by LFC and not Dispatchable by SCED. This Resource Status is only to be used for Real-Time telemetry purposes;

(C) FRRSDN - Available for Dispatch of FRRS by LFC and not Dispatchable by SCED. This Resource Status is only to be used for Real-Time telemetry purposes;

(D) ONCLR – Available for Dispatch as a Controllable Load Resource by SCED with an RTM Energy Bid;

(E) ONRL – Available for Dispatch of RRS Service, excluding Controllable Load Resources;

(F) OUTL – Not available;

(E) ONFFRFRSL – Available for Dispatch of FRS Service, excluding Controllable Load Resources. This Resource Status is only to be used for Real-Time telemetry purposes;

(c) The HSL;

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

(d) The LSL;

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

(e) The High Emergency Limit (HEL);

(f) The Low Emergency Limit (LEL); and

(g) Ancillary Service Resource Responsibility capacity in MW for:

(i) Regulation Up (Reg-Up);

(ii) Regulation Down (Reg-Down);

(iii) FRS;

(iv) RRS; and

(v) Non-Spin.

(6) For Combined Cycle Generation Resources, the above items are required for each operating configuration. In each hour only one Combined Cycle Generation Resource in a Combined Cycle Train may be assigned one of the On-Line Resource Status codes described above.

(a) During a RUC study period, if a QSE’s COP reports multiple Combined Cycle Generation Resources in a Combined Cycle Train to be On-Line for any hour, then until the QSE corrects its COP, the On-Line Combined Cycle Generation Resource with the largest HSL is considered to be On-Line and all other Combined Cycle Generation Resources in the Combined Cycle Train are considered to be Off-Line. Furthermore, until the QSE corrects its COP, the Off-Line Combined Cycle Generation Resources as designated through the application of this process are ineligible for RUC commitment or de-commitment Dispatch Instructions.

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

(c) ERCOT systems shall allow only one Combined Cycle Generation Resource in a Combined Cycle Train to offer Off-Line Non-Spin in the DAM or Supplemental Ancillary Services Market (SASM).

(i) If there are multiple Non-Spin offers from different Combined Cycle Generation Resources in a Combined Cycle Train, then prior to execution of the DAM, ERCOT shall select the Non-Spin offer from the Combined Cycle Generation Resource with the highest HSL for consideration in the DAM and ignore the other offers.

(ii) Combined Cycle Generation Resources offering Off-Line Non-Spin must be able to transition from the shutdown state to the offered Combined Cycle Generation Resource On-Line state and be capable of ramping to the full amount of the Non-Spin offered.

(d) The DAM and RUC shall honor the registered hot, intermediate or cold Startup Costs for each Combined Cycle Generation Resource registered in a Combined Cycle Train when determining the transition costs for a Combined Cycle Generation Resource. In the DAM and RUC, the Startup Cost for a Combined Cycle Generation Resource shall be determined by the positive transition cost from the On-Line Combined Cycle Generation Resource within the Combine Cycle Train or from a shutdown condition, whichever ERCOT determines to be appropriate.

(7) ERCOT may accept COPs only from QSEs.

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

(9) A QSE representing a Generation Resource that is not actively providing Ancillary Services or is providing Off-Line Non-Spin that the Resource will provide following the shutdown, may only use a Resource Status of SHUTDOWN to indicate to ERCOT through telemetry that the Resource is operating in a shutdown sequence or a Resource Status of ONTEST to indicate in the COP and through telemetry that the Generation Resource is performing a test of its operations either manually dispatched by the QSE or by ERCOT as part of the test. A QSE representing a Generation Resource that is not actively providing Ancillary Services may only use a Resource Status of STARTUP to indicate to ERCOT through telemetry that the Resource is operating in a start-up sequence requiring manual control and is not available for Dispatch.

(10) If a QSE has not submitted a valid COP for any Generation Resource for any hour in the DAM or RUC Study Period, then the Generation Resource is considered to have a Resource Status as OUT thus not available for DAM awards or RUC commitments for those hours.

(11) If a COP is not available for any Resource for any hour from the current hour to the start of the DAM period or RUC study, then the Resource Status for those hours are considered equal to the last known Resource Status from a previous hour’s COP or from telemetry as appropriate for that Resource.

(12) A QSE representing a Resource may only use the Resource Status code of EMR for a Resource whose operation would have impacts that cannot be monetized and reflected through the Resource’s Energy Offer Curve or recovered through the RUC make-whole process or if the Resource has been contracted by ERCOT under Section 3.14.1 or under paragraph (2) of Section 6.5.1.1. If ERCOT chooses to commit an Off-Line unit with EMR Resource Status that has been contracted by ERCOT under Section 3.14.1 or under paragraph (2) of Section 6.5.1.1, the QSE shall change its Resource Status to ONRUC. Otherwise, the QSE shall change its Resource Status to ONEMR.

(13) A QSE representing a Resource may use the Resource Status code of ONEMR for a Resource that is:

(a) On-Line, but for equipment problems it must be held at its current output level until repair and/or replacement of equipment can be accomplished; or

(b) A hydro unit.

(14) A QSE operating a Resource with a Resource Status code of ONEMR may set the HSL and LSL of the unit to be equal to ensure that SCED does not send Base Points that would move the unit.

**3.16 Standards for Determining Ancillary Service Quantities**

(1) ERCOT shall comply with the requirements for determining Ancillary Service quantities as specified in these Protocols and the ERCOT Operating Guides.

(2) ERCOT shall, at least annually, determine with supporting data, the methodology for determining the quantity requirements for each Ancillary Service needed for reliability, including:

(a) The percentage or MW limit of Responsive Reserve (RRS) allowed from Load Resources providing RRS;

(b) The minimum capacity required from Resources providing FRS using PFR shall not be less than 1,150 MW;

(c) The maximum amount (MW) of Frequency Response Service (FRS) that can be provided by Resources capable of Fast Frequency Response (FFR);

(d) The maximum amount (MW) of Regulation Up Service (Reg-Up) that can be provided by Resources providing Fast Responding Regulation Up Service (FRRS-Up); and

(e) The maximum amount (MW) of Regulation Down Service (Reg-Down) that can be provided by Resources providing Fast Responding Regulation Down Service (FRRS-Down).

(f) The minimum capacity required from Resources providing FRS using Primary Frequency Response shall not be less than 1,150 MW.

(3) The ERCOT Board shall review and approve ERCOT's methodology for determining the minimum Ancillary Service requirements, the minimum capacity required from Resources providing Primary Frequency Response to provide RRS, the maximum amount of FRS that can be provided by Resources capable of FFR, and the maximum amount of Reg-Up and Reg-Down that can be provided by Resources providing FRRS-Up and FRRS-Down.

(4) If ERCOT determines a need for additional Ancillary Service Resources under these Protocols or the ERCOT Operating Guides, after an Ancillary Service Plan for a specified day has been posted, ERCOT shall inform the market by posting notice on the Market Information System (MIS) Public Area, of ERCOT’s intent to procure additional Ancillary Service Resources under Section 6.4.9.2, Supplemental Ancillary Services Market. ERCOT shall post the reliability reason for the increase in service requirements.

(5) Monthly, ERCOT shall determine and post on the MIS Secure Area a minimum capacity required from Resources providing FRS using Primary Frequency Response. The remaining capacity required for FRS may be supplied by all Resources qualified to provide FRS including Load Resources on high-set under-frequency relays, provided that FRS from these Load Resources shall be limited to 60% of the total ERCOT FRS requirement. ERCOT may increase the minimum capacity required from Resources providing FRS using Primary Frequency Response if it believes that the current posted quantity will have a negative impact on reliability or if it would require additional Regulation Service to be deployed.

(6) Monthly, ERCOT shall determine and post on the MIS Secure Area a minimum capacity required from Resources providing RRS. The amount of Load Resources that may or may not be on high-set under-frequency relays providing RRS is limited to 50% of the total ERCOT RRS requirement.

(7) The amount of FRS that a Qualified Scheduling Entity (QSE) can self-arrange using a Load Resource excluding Controllable Load Resources is limited to its Load Ratio Share (LRS) of the capacity allowed to be provided by Resources not providing FRS using Primary Frequency Response established in paragraph (5) above, provided that FRS from these Load Resources shall be limited to 60% of the total ERCOT FRS requirement.

(8) The amount of RRS that a QSE can self-arrange using a Load Resource excluding Controllable Load Resources is limited to the lower of:

(a) 50% of its RRS Ancillary Service Obligation, or

(b) A reduced percentage of its RRS Ancillary Service Obligation based on the limit established by ERCOT in paragraph (6) above.

(9) However, a QSE may offer more of the Load Resource above the percentage limit established by ERCOT for sale of FRS to other Market Participants. The total amount of FRS Service using the Load Resource procured by ERCOT is also limited to the capacity established in paragraph (5) above, up to the lesser of the 60% limit or the limit established by ERCOT in paragraph (5) above.

(10) A QSE may offer more of the Load Resource above the percentage limit established by ERCOT for sale of RRS to other Market Participants. The total amount of RRS using the Load Resource excluding Controllable Load Resources procured by ERCOT is also limited to the lesser of the 50% limit or the limit established by ERCOT in paragraph (8) above.

(11) The maximum MW amount of capacity from Resources providing FRRS-Up is limited to 65 MW. ERCOT may reduce this limit if it believes that this amount will have a negative impact on reliability or if this limit would require additional Regulation Service to be deployed.

(12) The maximum MW amount of capacity from Resources providing FRRS-Down is limited to 35 MW. ERCOT may reduce this limit if it believes that this amount will have a negative impact on reliability or if this limit would require additional Regulation Service to be deployed.

(13) Resources can only provide FRRS-Up or FRRS-Down if awarded Regulation Service in the Day-Ahead Market (DAM) for that particular Resource, up to the awarded quantity.

***3.17.2 Responsive Reserve Service***

(1) Responsive Reserve (RRS) is a service used to restore or maintain the frequency of the ERCOT System:

(a) In response to significant depletion of Frequency Response Service (FRS);

(b) As backup Regulation Service; and

(c) By providing energy to avoid getting into an Energy Emergency Alert (EEA).

(2) RRS may be provided through one or more of the following means:

(a) From On-Line or Off-Line Resources as prescribed in the Operating Guides following a significant frequency deviation in the ERCOT System; and

(b) Either manually or by using a four-second signal to provide energy on deployment by ERCOT.

(3) RRS may be used to provide energy prior to or during the implementation of an EEA. RRS provides Resource capacity, or capacity from interruptible Load available for deployment on ten minutes’ notice.

(4) RRS may be provided by:

(a) Unloaded, On-Line Generation Resource capacity;

(b) Quick Start Generation Resources (QSGRs);

(c) Load Resources that may or may not be controlled by high-set, under-frequency relays;

(d) Controllable Load Resources; and

(e) Generation Resources operating in synchronous condenser fast-response mode as defined in the Operating Guides.

***3.17.4 Frequency Response Service***

(1) Frequency Response Service (FRS) is a service used to restore or maintain the frequency of the ERCOT System in response to a significant frequency deviation.

(2) FRS is automatically self-deployed by Resources in a manner that results in real power increases or decreases.

(3) FRS may be provided by:

(a) On-Line Generation Resource capable of providing Primary Frequency Response with the capacity excluding Non-Frequency Responsive Capacity (NFRC);

(b) Resources capable of providing Fast Frequency Response (FFR) and sustaining their response for up to 15 minutes;

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

(d) Generation Resources operating in synchronous condenser fast-response mode as defined in the Operating Guides.

**3.18 Resource Limits in Providing Ancillary Service**

(1) For both Generation Resources and Load Resources the High Sustained Limit (HSL) must be greater than or equal to the Low Sustained Limit (LSL) and the sum of the Resource-specific designation of capacity to provide, Frequency Response Service (FRS), Responsive Reserve (RRS), Regulation Up (Reg-Up), Regulation Down (Reg-Down), and Non-Spinning Reserve (Non-Spin).

(2) For Non-Spin, the amount of Non-Spin provided must be less than or equal to the HSL for Off-Line Generation Resources.

(3) For RRS:

(a) The full amount of RRS provided from an On-Line Generation Resource must be less than or equal to ten times the Emergency Ramp Rate;

(b) The full amount of RRS provided by a Quick Start Generation Resource (QSGR) must be less than or equal to its proven ten-minute capability as demonstrated pursuant to paragraph (16) of Section 8.1.1.2, General Capacity Testing Requirements;

(c) Generation Resources operating in the synchronous condenser fast-response mode may provide RRS up to the Generation Resource’s proven 20-second response capability (which may be 100% of the HSL). The initiation setting of the automatic under-frequency relay setting shall not be lower than 59.80 Hz;

(d) The initiation setting of the automatic under-frequency relay setting for Load Resources providing RRS shall not be lower than 59.70 Hz.

(4) For FRS:

(a) The full amount of FRS awarded to or self-arranged from an On-Line Generation Resource is dependent upon the verified droop characteristics of the Resource. ERCOT shall calculate and update using the methodology described in the Nodal Operating Guide, a maximum MW amount of FRS for each Generation Resource subject to verified droop performance. The default value for any newly qualified generator shall be 20% of its HSL;

(b) Generation Resources operating in the synchronous condenser fast-response mode may provide FRS up to the Generation Resource’s proven 20-second response capability (which may be 100% of the HSL). The initiation setting of the automatic under-frequency relay setting shall not be lower than 59.80 Hz. Once deployed Resources telemetering ONFRS status shall telemeter FRS Ancillary Service Schedule of zero and when recalled by ERCOT after frequency recovers above 59.98 Hz, FRS Ancillary Service Schedule shall be a non-zero value equal to its FRS Ancillary Service Responsibility.

(c) The initiation setting of the automatic under-frequency relay setting for Load Resources providing FRS shall not be lower than 59.70 Hz; and

(d) The amount of FRS provided from a Resource capable of providing FFR must be less or equal to its 15-minute rated discharge capacity. The initiation setting of the automatic self-deployment of the Resource providing FRS as FFR must be no lower than 59.85 Hz. A Resource providing FRS as FFR that is deployed shall not recall their capacity until system frequency is greater than 59.98 Hz. Once deployed Resources telemetering ONFFRFRS status shall telemeter FRS Ancillary Service Schedule of zero and when recalled FRS Ancillary Service Schedule shall be a non-zero value equal to its FRS Ancillary Service Responsibility. Once recalled, a Resource providing FRS as FFR must restore their full FRS Ancillary Service Resource Responsibility within 15 minutes after cessation of deployment or as otherwise directed by ERCOT.

4.2.1.1 Ancillary Service Plan

(1) ERCOT shall analyze the expected Load conditions for the Operating Day and develop an Ancillary Service Plan that identifies the Ancillary Service MW necessary for each hour of the Operating Day. The MW of each Ancillary Service required may vary from hour to hour depending on ERCOT System conditions. ERCOT must post the Ancillary Service Plan to the Market Information System (MIS) Public Area by 0600 of the Day-Ahead.

(2) If ERCOT determines that an Emergency Condition may exist that would adversely affect ERCOT System reliability, it may change the percentage of Load Resources that are allowed to provide Responsive Reserve (RRS) Service and Frequency Response Service (FRS) from the monthly amounts determined previously, as described in Section 3.16, Standards for Determining Ancillary Service Quantities, and must post any change in the percentage to the MIS Public Area by 0600 of the Day-Ahead.

(3) ERCOT shall determine the total required amount of each Ancillary Service under Section 3.16, or use its operational judgment and experience to change the daily quantity of each required Ancillary Service.

(4) ERCOT shall include in the Ancillary Service Plan enough capacity to automatically control frequency with the intent to meet North American Electric Reliability Corporation (NERC) Reliability Standards.

(5) Once specified by ERCOT for an hour and published on the MIS Public Area, Ancillary Service quantity requirements for an Operating Day may not be decreased.

**4.4.7.1 Self-Arranged Ancillary Service Quantities**

(1) For each Ancillary Service, a QSE may self-arrange all or a portion of the Ancillary Service Obligation allocated to it by ERCOT. QSEs may not self-arrange Regulation Service amounts that include Fast Responding Regulation Up Service (FRRS-Up) or Fast Responding Regulation Down Service (FRRS-Down) quantities. In addition, a QSE may self-arrange up to 100 MW of Responsive Reserve (RRS), 50 MW of Frequency Response Service (FRS), 25 MW of Regulation Up Service (Reg-Up), 25 MW of Regulation Down Service (Reg-Down), and 100 MW of Non-Spinning Reserve (Non-Spin) in excess of its corresponding Ancillary Service Obligation, provided that the amount self-arranged from the QSE’s Resources for a given Ancillary Service shall not exceed the amount of the QSE’s Ancillary Services Obligation for that Ancillary Service. If a QSE elects to self-arrange Ancillary Service capacity, then ERCOT shall not pay the QSE for the Self-Arranged Ancillary Service Quantities for the portion that meets its Ancillary Service Obligation. Any Self-Arranged Ancillary Service Quantities in excess of a QSE’s Ancillary Service Obligation will be considered to be offered in the DAM or Supplemental Ancillary Service Market (SASM), as applicable, for $0/MWh.

(2) The QSE must indicate before 1000 in the Day-Ahead the Self-Arranged Ancillary Service Quantities, by service, so ERCOT can determine how much Ancillary Service capacity, by service, needs to be obtained through the DAM.

(3) At or after 1000 in the Day-Ahead, a QSE may not change its Self-Arranged Ancillary Service Quantities unless ERCOT opens a SASM.

(4) Before 1430 in the Day-Ahead, all Self-Arranged Ancillary Service Quantities must be represented by physical capacity, either by Generation Resources or Load Resources, or backed by Ancillary Service Trades.

(5) The QSE may self-arrange Reg-Up, Reg-Down, RRS, FRS, and Non-Spin.

(6) The QSE may self-arrange Ancillary Services from one or more Resources it represents and/or through an Ancillary Service Trade.

(7) The additional Self-Arranged Ancillary Service Quantity specified by the QSE in response to a SASM notice by ERCOT to obtain additional Ancillary Services in the Adjustment Period cannot be more than 100 MW of RRS, 50 MW of FRS, 25 MW of Reg-Up, 25 MW of Reg-Down, and 100 MW of Non-Spin greater than the additional Ancillary Service amount allocated by ERCOT to that QSE, as stated in the SASM notice, and cannot be changed once committed to ERCOT.

(8) If a QSE does not self-arrange all of its Ancillary Service Obligation, ERCOT shall procure the remaining amount of that QSE’s Ancillary Service Obligation.

(9) For self-arranged RRS Service, the QSE shall indicate the quantity of the service that is provided from:

(a) Generation Resources;

(b) Controllable Load Resources; and

(c) Load Resources controlled by high-set under-frequency relays.

***4.4.7.1.1 Negative Self-Arranged Ancillary Service Quantities***

(1) A QSE may submit a negative Self-Arranged Ancillary Service Quantity in the DAM. ERCOT shall procure all negative Self-Arranged Ancillary Service Quantities submitted by a QSE.

(2) Procurements of negative Self-Arranged Ancillary Service Quantities by ERCOT shall be settled in the same manner as Ancillary Service Obligations that are not self-arranged and according to the charges defined in Section 4.6.4.2, Charges for Ancillary Services Procurement in the DAM, and Section 6.7, Real-Time Settlement Calculations for the Ancillary Services.

(3) A QSE may not submit a negative Self-Arranged Ancillary Service Quantity in the DAM that is less than -500 MW per Ancillary Service. For negative self-arranged FRS and RRS, the QSE shall not specify Fast Frequency Response Resources, Controllable Load Resources and Load Resources controlled by high-set under-frequency relays. For compliance purposes, a QSE may not submit a negative Self-Arranged Ancillary Service Quantity in the DAM that is greater in magnitude than the absolute value of the net sales of its Ancillary Service Trades per Ancillary Service.

4.4.7.2 Ancillary Service Offers

(1) By 1000 in the Day-Ahead, a QSE may submit Generation Resource-specific Ancillary Service Offers to ERCOT for the DAM and may offer the same Generation Resource capacity for any or all of the Ancillary Service products simultaneously with any Energy Offer Curves from that Generation Resource in the DAM. A QSE may also submit Ancillary Service Offers in a SASM. Offers of more than one Ancillary Service product from one Generation Resource may be inclusive or exclusive of each other and of any Energy Offer Curves, as specified according to a procedure developed by ERCOT.

(2) By 1000 in the Day-Ahead, a QSE may submit Load Resource-specific Ancillary Service Offers for Regulation Service, Non-Spin, FRS, and RRS to ERCOT and may offer the same Load Resource capacity for any or all of those Ancillary Service products simultaneously. Offers of more than one Ancillary Service product from one Load Resource may be inclusive or exclusive of each other, as specified according to a procedure developed by ERCOT.

(3) Ancillary Service Offers remain active for the offered period until:

(a) Selected by ERCOT;

(b) Automatically inactivated by the software at the offer expiration time specified by the QSE when the offer is submitted; or

(c) Withdrawn by the QSE, but a withdrawal is not effective if the deadline for submitting offers has already passed.

(4) A Load Resource that is not a Controllable Load Resource may specify whether its Ancillary Service Offer for FRS and RRS may only be procured by ERCOT as a block.

(5) A QSE that submits an On-Line Ancillary Service Offer without also submitting a Three-Part Supply Offer for the DAM for any given hour will be considered by the DAM to be self-committed for that hour, as long as an Ancillary Service Offer for Off-Line Non-Spin was not also submitted for that hour. When the DAM considers a self-committed offer for clearing, the Resource constraints identified in paragraph (4)(c)(ii) of Section 4.5.1, DAM Clearing Process, other than HSL, are ignored. A Combined Cycle Generation Resource will be considered by the DAM to be self-committed based on an On-Line Ancillary Service Offer submittal if:

(a) Its QSE submits an On-Line Ancillary Service Offer without also submitting a Three-Part Supply Offer for the DAM for any Combined Cycle Generation Resource within the Combined Cycle Train for that hour;

(b) No Ancillary Service Offer for Off-Line Non-Spin for any Combined Cycle Generation Resource within the Combined Cycle Train is submitted for that hour; and

(c) No On-Line Ancillary Service Offer for any other Combined Cycle Generation Resource within the Combined Cycled Train is submitted for that hour.

4.4.7.2.1 Ancillary Service Offer Criteria

(1) Each Ancillary Service Offer must be submitted by a QSE and must include the following information:

(a) The selling QSE;

(b) The Resource represented by the QSE from which the offer would be supplied;

(c) The quantity in MW and Ancillary Service type from that Resource for this specific offer and the specific quantity in MW and Ancillary Service type of any other Ancillary Service offered from this same capacity;

(d) An Ancillary Service Offer linked to a Three-Part Supply Offer from a Resource designated to be Off-Line for the offer period in its COP may only be struck if the Three-Part Supply Offer is struck. The total capacity struck must be within limits as defined in item (4)(c)(iii) of Section 4.5.1, DAM Clearing Process;

(e) An Ancillary Service Offer linked to other Ancillary Service Offers or an Energy Offer Curve from a Resource designated to be On-Line for the offer period in its COP may only be struck if the total capacity struck is within limits as defined in item (4)(c)(iii) of Section 4.5.1;

(f) The first and last hour of the offer;

(g) A fixed quantity block, or variable quantity block indicator for the offer:

(i) If a fixed quantity block, not to exceed 150 MW, which may only be offered by a Load Resource controlled by high-set under-frequency relay providing FRS or RRS, and which may clear at a Market Clearing Price for Capacity (MCPC) below the Ancillary Service Offer price for that block, the single price (in $/MW) and single quantity (in MW) for all hours offered in that block; or

(ii) If a variable quantity block, which may be offered by a Generation Resource or a Load Resource, the single price (in $/MW) and single “up to” quantity (in MW) contingent on the purchase of all hours offered in that block; and

(h) The expiration time and date of the offer.

(2) A valid Ancillary Service Offer in the DAM must be received before 1000 for the effective DAM. A valid Ancillary Service Offer in an SASM must be received before the applicable deadline for that SASM.

(3) No Ancillary Service Offer price may exceed the System-Wide Offer Cap (SWCAP) (in $/MW). No Ancillary Service Offer price may be less than $0 per MW.

(4) The minimum amount per Resource for each Ancillary Service product that may be offered is one-tenth (0.1) MW.

(5) A Resource may offer more than one Ancillary Service.

(6) Offers for Load Resources may be adjusted to reflect Distribution Losses in accordance with Section 8.1.1.2, General Capacity Testing Requirements.

(7) A Load Resource that is qualified to perform as a Controllable Load Resource may not offer to provide Ancillary Services as a Controllable Load Resource and a Load Resource controlled by high-set under-frequency relay simultaneously behind a common breaker.

4.4.7.3 Ancillary Service Trades

(1) An Ancillary Service Trade is the information for a QSE-to-QSE transaction that transfers an obligation to provide Ancillary Service capacity between a buyer and a seller.

(2) An Ancillary Service Trade that is reported to ERCOT by 1430 in the Day-Ahead changes the Ancillary Service Supply Responsibility of the buyer and seller in the DRUC process. An Ancillary Service Trade that is reported to ERCOT after 1430 in the Day-Ahead changes the Ancillary Service Supply Responsibility of the buyer and seller in any applicable HRUC process, the deadline for which is after the trade is submitted.

(3) As soon as practicable, ERCOT shall notify each QSE through the Messaging System of any of its Ancillary Service Trades that are invalid Ancillary Service Trades. The QSE may correct and resubmit any invalid Ancillary Service Trade, but the reporting time of the trade is determined by when the validated Ancillary Service Trade was submitted and not when the original invalid Ancillary Service Trade was submitted.

(4) A QSE with an Ancillary Service Supply Responsibility for RRS, originally designated to be provided by a Generation Resource, may transfer its responsibility via Ancillary Service Trade(s) to another QSE only if that QSE designates the RRS will be provided by a Generation Resource.

(5) A QSE with an Ancillary Service Supply Responsibility for RRS, originally designated to be provided by a Load Resource providing RRS triggered with under-frequency relays set at 59.70 Hz, may transfer its responsibility via Ancillary Service Trade(s) to another QSE only if that QSE designates the RRS will be provided by either:

(a) A Generation Resource; or

(b) A Load Resource providing RRS triggered with under-frequency relays set at 59.70 Hz.

(6) The table below shows the RRS trades that are allowed for each type of original responsibility:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Allowable RRS Ancillary Service Trades** | | |
| **Original Responsibility** | **Generation Resource** |  | **Load Resource triggered at 59.7 Hz** |
| Generation Resource | Yes |  | No |
| Load Resource triggered at 59.7 Hz | Yes |  | Yes |

(7) The table below shows the FRS trades that are allowed for each type of original responsibility:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Allowable FRS Ancillary Service Trades** | | |
| **Original Responsibility** | **Generation Resource** | **Resource capable of FFR triggered at 59.85 Hz** | **Load Resource triggered at 59.7 Hz** |
| Generation Resource | Yes | No | No |
| Resource providing FFR triggered at 59.85 Hz | Yes | Yes | Yes |
| Load Resource triggered at 59.7 Hz | Yes | No | Yes |

***4.5.2 Ancillary Service Insufficiency***

(1) ERCOT shall determine if there is an insufficiency in Ancillary Service Offers. If ERCOT receives insufficient Ancillary Service Offers in the DAM to procure one or more required Ancillary Service such that the Ancillary Service Plan is deficient and system security and reliability is threatened:

(a) ERCOT shall declare an Ancillary Service insufficiency and issue a Watch under Section 6.5.9.3.3, Watch.

(b) ERCOT shall request additional Ancillary Service Offers.

(i) A QSE may resubmit an offer for an Ancillary Service that it submitted before the Watch for the same Ancillary Service, but the resubmitted offer must meet the following criteria to be considered a valid offer:

(A) The offer quantity may not be less than the offer quantity submitted before the Watch, unless the portion of the offer not resubmitted was priced higher than the portion of the offer that is being resubmitted; and

(B) For the amount of the offer quantity that is not more than the offer quantity submitted before the Watch, the offer must be priced equal to or less than the price of the offer submitted before the Watch.

(ii) For any amount of the offer that is greater in quantity than the QSE’s offer that was not submitted before the Watch, the incremental amount of the offer may be submitted at a price subject to the offer cap.

(c) ERCOT shall not begin executing the DAM sooner than 30 minutes after issuing the Watch. If the additional Ancillary Service Offers are still insufficient to supply the Ancillary Service required in the Day-Ahead Ancillary Service Plan, then ERCOT shall run the DAM by reducing the Ancillary Service Plan quantities only for purposes of the DAM by the amount of insufficiency.

(d) When ERCOT must reduce the Ancillary Service Plan for purposes of the DAM due to insufficient Ancillary Service Offers, ERCOT shall preserve the Ancillary Service Plan in the DAM in the following order of priority:

(i) Regulation Up (Reg-Up);

(ii) Regulation Down (Reg-Down);

(iii) Frequency Response Service (FRS);

(iv) Responsive Reserve (RRS); and

(v) Non-Spinning Reserve (Non-Spin).

(2) ERCOT shall procure the difference in capacity between the Day-Ahead Ancillary Service Plan and the DAM-reduced Ancillary Service Plan amounts using the Supplemental Ancillary Service Market (SASM) process in accordance with Section 6.4.9.2.2, SASM Clearing Process. If the SASM process is insufficient, then ERCOT may acquire the insufficient amount of Ancillary Services from Hourly Reliability Unit Commitment (HRUC) Resources that are qualified to provide the needed Ancillary Service. ERCOT may also issue a Watch and procure Ancillary Services in accordance with Section 6.5.9.3.3.

***4.6.2.3.1 Day-Ahead Make-Whole Payment***

(1) ERCOT shall pay the QSE a Day-Ahead Make-Whole Payment for an eligible Resource for each Operating Hour in a DAM-commitment period.

(2) Any Ancillary Service Offer cleared for the same Operating Hour, QSE, and Generation Resource as a Three-Part Supply Offer cleared in the DAM shall be included in the calculation of the Day-Ahead Make-Whole Payment.

(3) The guaranteed cost, energy revenue, and Ancillary Service revenue calculated for each Combined Cycle Generation Resource are each summed for the Combined Cycle Train, and the the Day-Ahead Make-Whole Amount is calculated for the Combined Cycle Train.

(4) For an Aggregate Generation Resource (AGR), Startup Cost shall be scaled according to the ratio of the maximum number of its generators online during a contiguous block of DAM-committed Intervals, as indicated by telemetry, compared to the total number of generators registered to the AGR and used in the approved verifiable cost for the AGR.

(5) The Day-Ahead Make-Whole Payment to each QSE for each DAM-committed Generation Resource is calculated as follows:

**DAMWAMT *q, p, r, h* = (-1) \* Max (0, DAMGCOST *q, p, r* + DAEREV *q, p, r, h* + DAASREV *q, r, h*) \* DAESR *q, p, r, h* / (DAESR *q, p, r, h*)**

(6) The Day-Ahead Make-Whole Guaranteed Costs are calculated for each eligible DAM-Committed Generation Resource as follows:

**For non-Combined Cycle Trains,**

DAMGCOST *q, p, r* = Min(DASUO *q, p, r* , DASUCAP *q, p, r*) + (Min(DAMEO *q, p, r, h* , DAMECAP *p ,q, r ,h* )\* DALSL *q, p, r, h*) + (DAAIEC *q, p, r, h* \* (DAESR *q, p, r, h* – DALSL *q, p, r, h*))

**For a Resource which is not an AGR,**

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

Then: DASUCAP *p,q, r* = verifiable Startup Costs *q, r, s*

DAMECAP *p,q,r,h* = verifiable minimum-energy costs *q, r, i*

Otherwise: DASUCAP *p,q, r* = Resource Category Startup Offer Generic Cap (RCGSC)

DAMECAP *p,q, r, h* = Resource Category Minimum-Energy Generic Cap (RCGMEC)

**For an AGR,**

DAMGCOST *q, p, r* = DASUPR *q, p, r* + (Min(DAMEO*q, p, r, h,* DAMECAP *p,q,r,h*) \* DALSL *q, p, r, h*) + (DAAIEC *q, p, r, h* \* (DAESR *q, p, r, h* – DALSL *q, p, r, h*))

Where:

DASUPR *q, p, r* = Min(DASUO *q, p, r*, DASUCAP *q, p, r*)

If ERCOT has approved verifiable Startup Costs

Then: DASUCAP *q, p, r* = Maxc(AGRRATIO *q, p, r* ) \* verifiable Startup Costs *q, r*

Where: AGRRATIO *q, p, r* = AGRMAXON *q, p, r* / AGRTOT *q, p, r*

Otherwise: DASUCAP *q, p, r* = Max*c*(AGGRATIO *q,p,r*) \* RCGSC

**For Combined Cycle Trains,**

DAMGCOST *q, p, r* = Min(DASUO *q, p, r* , DASUCAP*q, p, r*) +  (Min(DAMEO *q, p, r, h* , DAMECAP *q, p, r,h*) \* DALSL*q, p, r, h*) + (Max(0, Min(DASUO *afterCCGR* , DASUCAP*afterCCGR*) – Min(DASUO *beforeCCGR* , DASUCAP*beforeCCGR*)) +  (DAAIEC *q, p, r, h* \* (DAESR *q, p, r, h* – DALSL *q, p, r, h*))

(7) The Day-Ahead Make-Whole Revenue is calculated for each DAM-Committed Generation Resource as follows:

DAEREV *q, p, r, h*  = (-1) \* DASPP *p, h* \* DAESR *q, p, r, h*

DAASREV *q, r, h* = ((-1) \* MCPCRU *DAM, h* \* PCRUR *r, q, DAM, h*)

+ ((-1) \* MCPCRD *DAM, h*  \* PCRDR *r, q,DAM, h*)

+ ((-1) \* MCPCRR *DAM, h*  \* PCRRR *r, q,DAM, h*)

+ ((-1) \* MCPCNS *DAM, h*  \* PCNSR *r, q,DAM, h*)

+ ((-1) \* MCPCFRS *DAM, h*  \* PCFRR *r, q,DAM, h*)

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| DAMWAMT *q, p, r, h* | $ | *Day-Ahead Make-Whole Payment per QSE per Settlement Point per Resource per hour*⎯The payment to QSE *q* to make-whole the Startup Cost and energy cost of Resource *r* committed in the DAM at Resource Node *p* for the hour *h*. When a Combined Cycle Generation Resource is committed in the DAM, payment is made to the Combined Cycle Train for the DAM-committed Combined Cycle Generation Resource. |
| DAMGCOST *q, p, r* | $ | *Day-Ahead Market Guaranteed Amount per QSE per Settlement Point per Resource*⎯The sum of the Startup Cost and the operating energy costs of the DAM-committed Resource *r* at Resource Node *p* represented by QSE *q*, for the DAM-commitment period. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DAEREV *q, p, r, h* | $ | *Day-Ahead Energy Revenue per QSE per Settlement Point per Resource by hour*⎯The revenue received in the DAM for Resource *r* at Resource Node *p* represented by QSE *q*, based on the DAM Settlement Point Price, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DAASREV *q, r, h* | $ | *Day-Ahead Ancillary Service Revenue per QSE per Resource by hour*⎯The revenue received in the DAM for Resource *r* represented by QSE *q*, based on the Market Clearing Price for Capacity (MCPC) for each Ancillary Service in the DAM, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DASPP *p, h* | $/MWh | *Day-Ahead Settlement Point Price by Settlement Point by hour*⎯The DAM Settlement Point Price at Resource Node *p* for the hour *h*. |
| DAESR *q, p, r, h* | MW | *Day-Ahead Energy Sale from Resource per QSE by Settlement Point per Resource by hour*⎯The amount of energy cleared through Three-Part Supply Offers in the DAM for Resource *r* at Resource Node *p* represented by QSE *q* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DASUPR*q, p, r* | $/MWh | *Day-Ahead Startup Price per QSE per Settlement Point per Resource*—The derived Startup Price for an AGR *r* at Resource Node *p* represented by QSE *q*, for the first hour of the DAM-commitment period. |
| DASUCAP *q, p, r,* | $/start | *Day-Ahead Startup Cap per QSE per Settlement Point per Resource*—The amount used for AGR *r* or Resource *r* as Startup Costs. The cap is the Resource Category Startup Offer Generic Cap (RCGSC) unless ERCOT has approved verifiable unit-specific Startup Costs for that Resource, in which case the startup cap is the scaled verifiable unit-specific Startup Cost for the AGR or the verifiable unit-specific Startup Cost for non-AGR Resources. See Section 5.6.1, Verifiable Costs, for more information on verifiable costs. |
| DAMECAP *p,q,r,h* | $/MWh | *Day-Ahead Minimum-Energy Cap* —The amount used for Resource *r* for minimum-energy costs. The minimum cost is the Resource Category Minimum-Energy Generic Cap (RCGMEC) unless ERCOT has approved verifiable unit-specific minimum energy costs for that Resource, in which case the minimum energy cap is the verifiable unit-specific minimum energy cost. See Section 5.6.1 for more information on verifiable costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RCGSC | $/Start | *Resource Category Generic Startup Cost*—The Resource Category Generic Startup Cost cap for the category of the Resource, according to Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, for the Operating Day. |
| PCRUR *r, q, DAM, h* | MW | *Procured Capacity for Reg-Up from Resource per Resource per QSE per hour in DAM*—The Regulation Up (Reg-Up) capacity quantity awarded to QSE *q* in the DAM for Resource *r* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MCPCRU *DAM, h* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Up per hour in DAM*—The DAM MCPC for Reg-Up for the hour *h*. |
| PCRDR *r, q, DAM, h* | MW | *Procured Capacity for Reg-Down from Resource per Resource per QSE per hour in DAM*—The Regulation Down (Reg-Down) capacity quantity awarded to QSE *q* in the DAM for Resource *r* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MCPCRD *DAM, h* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Down per hour in DAM*—The DAM MCPC for Reg-Down for the hour *h*. |
| PCRRR *r, q, DAM, h* | MW | *Procured Capacity for Responsive Reserve from Resource per Resource per QSE per hour in DAM*—The Responsive Reserve (RRS) capacity quantity awarded to QSE *q* in the DAM for Resource *r* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MCPCRR *DAM, h* | $/MW per hour | *Market Clearing Price for Capacity for Responsive Reserve per hour in DAM*—The DAM MCPC for RRS for the hour *h*. |
| PCNSR *r, q, DAM, h* | MW | *Procured Capacity for Non-Spin from Resource per Resource per QSE per hour in DAM*—The Non-Spinning Reserve (Non-Spin) capacity quantity awarded to QSE *q* in the DAM for Resource *r* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MCPCNS *DAM, h* | $/MW per hour | *Market Clearing Price for Capacity for Non-Spin per hour in DAM*—The DAM MCPC for Non-Spin for the hour *h*. |
| PCFRR *r, q, DAM, h* | MW | *Procured Capacity for Frequency Response Service from Resource per Resource per QSE per hour in DAM*—The Frequency Response Service (FRS) capacity quantity awarded to QSE *q* in the DAM for Resource *r* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MCPCFR *DAM, h* | $/MW per hour | *Market Clearing Price for Capacity for Frequency Response Service per hour in DAM*—The DAM MCPC for FRS for the hour *h*. |
| DASUO *q, p, r* | $/start | *Day-Ahead Startup Offer per QSE per Settlement Point per Resource*—The Startup Offer included in the Three-Part Supply Offer submitted in the DAM associated with Resource *r* at Resource Node *p* represented by QSE *q*, for the first hour of the DAM-commitment period. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| AGRRATIO *q, p, r* | none | *Aggregate Generation Resource Ratio per QSE per Settlement Point per Aggregate Generation Resource*—A value which represents the ratio of the maximum number of generators online in an hour, as indicated by telemetry, compared to the total number of generators registered to the AGR and used in the approved verifiable cost for the AGR. The value is only applicable if the Resource is an AGR. |
| AGRMAXON *q, p, r* | none | *Aggregate Generation Resource Maximum Online per QSE per Settlement Point per Aggregate Generation Resource*—The maximum number of generators online during an hour, as indicated by telemetry. The value is only applicable if the Resource is an AGR. |
| AGRTOT *q, p, r* | none | *Aggregate Generation Resource Total per QSE per Settlement Point per Aggregate Generation Resource*—The total number of generators registered to the AGR and used in the approved verifiable cost for the AGR. The value is only applicable if the Resource is an AGR. |
| DAMEO *q, p, r, h* | $/MWh | *Day-Ahead Minimum-Energy Offer per QSE per Settlement Point per Resource per hour*—The Minimum-Energy Offer included in the Three-Part Supply Offer submitted in the DAM associated with Resource *r* at Resource Node *p* represented by QSE *q*, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DALSL *q, p, r, h* | MW | *Day-Ahead Low Sustained Limit per QSE per Settlement Point per Resource per hour*⎯The Low Sustained Limit (LSL) of Resource *r* at Resource Node *p* represented by QSE *q*, for the hour *h* as seen in the 1000 Day-Ahead snapshot. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| DAAIEC *q, p, r h* | $/MWh | *Day-Ahead Average Incremental Energy Cost per QSE per Settlement Point per Resource per hour*⎯The average incremental energy cost, calculated according to the Energy Offer Curve capped by the generic energy price, for the output levels between the DAESR and the LSL of Resource *r* at Resource Node *p* represented by QSE *q*, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *q* | none | A QSE. |
| *p* | none | A Resource Node Settlement Point. |
| *r* | none | A DAM-committed Generation Resource. |
| *h* | none | An hour in the DAM-commitment period. |
| *c* | none | A contiguous block of DAM-committed hours. |
| *afterCCGR* | none | The Combined Cycle Generation Resource to which a Combined Cycle Train transitions. |
| *beforeCCGR* | none | The Combined Cycle Generation Resource from which a Combined Cycle Train transitions. |

(8) The calculation of the Day-Ahead Average Incremental Energy Cost for each Resource for each hour is illustrated with the picture below, where Pcap is the Energy Offer Curve Cap. The method to calculate such cost is described in Section 4.6.5, Calculation of “Average Incremental Energy Cost” (AIEC).

$/

MWh

DASPP

P cap

P3

P2

P1

Q (P1) Q (P2) Q (P3) Q (P cap) Q cleared MW

[LSL] [DAESR]

Energy Offer Curve

The area under the capped Energy Offer Curve equals (DAAIEC \* (DAESR – LSL))

(9) The total of the Day-Ahead Make-Whole Payments to each QSE for Generation Resources for a given hour is calculated as follows:

**DAMWAMTQSETOT *q* = DAMWAMT *q, p, r***

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| DAMWAMTQSETOT *q* | $ | *Day-Ahead Make-Whole Payment QSE Total per QSE*⎯The total of the Day-Ahead Make-Whole Payments to QSE *q* for the DAM-committed Generation Resources represented by this QSE for the hour. |
| DAMWAMT *q, p, r* | $ | *Day-Ahead Make-Whole Payment per QSE per Settlement Point per Resource*⎯The payment to QSE *q* to make-whole the Startup Cost and energy cost of Resource *r* committed in the DAM at Resource Node *p* for the hour. When a Combined Cycle Generation Resource is committed in the DAM, payment is made to the Combined Cycle Train for the DAM-committed Combined Cycle Generation Resource. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |
| *r* | none | A DAM-committed Generation Resource. |

***4.6.4.1.5 Frequency Response Service Payment***

(1) ERCOT shall pay each QSE whose Ancillary Service Offers to provide Frequency Response Service (FRS) to ERCOT were cleared in the DAM, for each hour as follows:

**PCFRAMT *q* = (-1) \* MCPCFR *DAM* \* PCFR *q***

Where:

PCFR *q* =PCFRR *r, q, DAM*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Definition** |
| PCFRAMT *q* | $ | *Procured Capacity for Frequency Response Service Amount per QSE in DAM*—The DAM Frequency Response Service payment for QSE *q* for the hour. |
| PCFR *q* | MW | *Procured Capacity for Frequency Response Service per QSE in DAM*—The total Frequency Response Service capacity quantity awarded to QSE *q* in the DAM for all the Resources represented by this QSE for the hour. |
| PCFRR *r, q, DAM* | MW | *Procured Capacity for Frequency Response Service from Resource per Resource per QSE in DAM*—The Frequency Response Service capacity quantity awarded to QSE *q* in the DAM for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MCPCFR *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Frequency Response Service in DAM*—The DAM MCPC for Frequency Response Service for the hour. |
| *r* | none | A Resource. |
| *q* | none | A QSE. |

***4.6.4.2.5 Frequency Response Service Charge***

(1) Each QSE shall pay to ERCOT or be paid by ERCOT a FRS charge for each hour as follows:

DAFRAMT *q* = DAFRPR \* DAFRQ *q*

Where:

DAFRPR = (-1) \* PCFRAMTTOT / DAFRQTOT

PCFRAMTTOT = PCFRAMT *q*

DAFRQTOT = DAFRQ *q*

DAFRQ *q* = DAFRO *q* – DASAFRQ *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| DAFRAMT *q* | $ | *Day-Ahead Frequency Response Service Amount per QSE*—QSE *q*’s share of the DAM cost for FRS, for the hour. |
| DAFRPR | $/MW per hour | *Day-Ahead Frequency Response Service Price*—The Day-Ahead FRS price for the hour. |
| DAFRQ *q* | MW | *Day-Ahead Frequency Response Service Quantity per QSE*—The QSE *q*’s Day-Ahead Ancillary Service Obligation minus its self-arranged FRS quantity for the hour. |
| PCFRAMTTOT | $ | *Procured Capacity for Frequency Response Service Amount Total in DAM*—The total of the DAM FRS payments for all QSEs for the hour. |
| PCFRAMT *q* | $ | *Procured Capacity for Frequency Response Service Amount per QSE for DAM*—The DAM FRS payment for QSE *q* for the hour. |
| DAFRQTOT | MW | *Day-Ahead Frequency Response Service Quantity Total*—The sum of every QSE’s Day-Ahead Ancillary Service Obligation minus its self-arranged FRS quantity for the hour. |
| DAFRO *q* | MW | *Day-Ahead Frequency Response Service Obligation per QSE*—The FRS capacity obligation for QSE *q* for the DAM for the hour. |
| DASAFRQ *q* | MW | *Day-Ahead Self-Arranged Frequency Response Service Quantity per QSE*—The self-arranged FRS quantity submitted by QSE *q* before 1000 in the Day-Ahead. |
| *q* | none | A QSE. |

6.4.9.2 Supplemental Ancillary Services Market

(1) During the Adjustment Period, ERCOT may procure additional Regulation-Up (Reg-Up), Regulation Down (Reg-Down), Responsive Reserve (RRS), Frequency Response Service (FRS), and Non-Spin services for the reasons, and in the amounts, specified in Section 6.4.9.1, Evaluation and Maintenance of Ancillary Service Capacity Sufficiency, using a SASM.

(2) ERCOT shall allow QSEs to request to modify their Ancillary Service positions through a Reconfiguration Supplemental Ancillary Services Market (RSASM). The RSASM is executed at 0900 daily. This RSASM allows QSEs to potentially change their Ancillary Service Supply Responsibility from hour ending 1300 through hour ending 2400 of the current Operating Day. QSEs attempt to reduce their Ancillary Service Supply Responsibility through the RSASM by submitting less Ancillary Service capacity in their Resource’s COPs than their Ancillary Service Supply Responsibility. The difference between the Ancillary Service Supply Responsibility and the COP Ancillary Service capacity is the reconfiguration amount that is procured by the RSASM. The QSE must also have valid Ancillary Service Offers of an amount equal to or greater than their requested reconfiguration amount. The RSASM shall not be executed if there are not enough offers to procure the Ancillary Service reconfiguration amount.

(3) The SASM process for acquiring more Ancillary Service capacity or an Ancillary Service reconfiguration must use the following timelines:

(a) For Ancillary Service capacity related to ERCOT desired increases, for replacement of Ancillary Service capacity related to infeasibility or for failure of a QSE to provide one or more Ancillary Services, ERCOT shall send a notice, by ERCOT Hotline and electronic communication, at time X to all QSEs of the SASM. Time X may be any time not less than two hours before the start of the Operating Hour for which the additional Ancillary Services capacity are being procured. For cases of Ancillary Service capacity being infeasible or for failure of a QSE to provide one or more Ancillary Services, the Operating Hours covered by the SASM may be a subset of the Operating Hours for which the Ancillary Service capacity is declared infeasible or failed.

|  |  |  |
| --- | --- | --- |
| SASM Process | QSE Activities: | ERCOT Activities: |
| Time = X |  | Notify all QSEs of intent to procure Ancillary Services by ERCOT Hotline and electronic communication.  Notify QSEs of any additional Ancillary Service Obligation, allocated to each LSE and aggregated to the QSE level. |
| Time = X plus 30 minutes | May submit additional Self-Arranged Ancillary Service Quantities pursuant to Section 4.4.7.1, Self-Arranged Ancillary Service Quantities | Determine the amount of Ancillary Services to be procured. |
| Time = X plus 35 minutes |  | Execute SASM. |
| Time = X plus 45 minutes |  | Notify QSEs with awards of results.  Post the quantities and Market Clearing Prices for Capacity (MCPCs) of Ancillary Services bought in the SASM. |
| Time = X plus 60 minutes | Submit updated COP with updated Ancillary Service Resource Responsibility. | Validate COPs for Ancillary Service Resource Responsibility. |

(b) For an Ancillary Services reconfiguration, ERCOT shall execute an RSASM at 0900 (time E), for hour ending 1300 through hour ending 2400 of the current Operating Day.

|  |  |  |
| --- | --- | --- |
| SASM Process | QSE Activities: | ERCOT Activities: |
| Time = E – 15 minutes | QSEs nominate quantities of Ancillary Services that shall be included in the RSASM by submitting COPs with less Ancillary Service capacity than their Ancillary Service Supply Responsibility and submitting Ancillary Service Offers to cover the difference between the Ancillary Service Supply Responsibility and COP Ancillary Service capacity. | ERCOT sets the quantities of Ancillary Services to be procured in the RSASM equal to the difference between total Ancillary Service Supply Responsibility and total COP Ancillary Service capacity. |
| Time = E |  | Execute RSASM for hour ending 1300 through hour ending 2400 of the current Operating Day. |
| Time = E plus 15 minutes |  | Notify QSEs with awards of results.  Post the quantities and MCPCs of Ancillary Services bought in the RSASM. |
| Time = E plus 30 minutes | Submit updated COP with updated Ancillary Service Resource Responsibility. | Validate COPs for Ancillary Service Resource Responsibility. |

(4) Each QSE that is awarded capacity in a SASM is paid the SASM MCPC for the quantity it is awarded.

(5) For purpose of Settlement, the reduction to the Ancillary Service Supply Responsibility is considered a failure quantity and each QSE that has their Ancillary Service Supply Responsibility reduced by an RSASM is charged in accordance with Sections 6.7.3, Charges for Ancillary Service Capacity Replaced Due to Failure to Provide, and 6.7.4, Adjustments to Cost Allocations for Ancillary Services Procurement. QSEs participating in RSASMs are not subject to performance metrics for “failure to provide” amounts until the end of the Adjustment Period for each hour cleared in the RSASM.

(6) ERCOT shall allocate additional Ancillary Service Obligations to QSEs using the same percentages as the original Day-Ahead allocation of Ancillary Service Obligations.

**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. Frequency Response Service (FRS) shall be self-deployed in response to frequency deviations.

(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) 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.

(4) 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), determination of the High Ancillary Service Limit (HASL), High Dispatch Limit (HDL), Low Dispatch Limit (LDL) and Low Ancillary Service Limit (LASL), and is consistent with telemetered HSL, LSL and Non-Frequency Responsive Capacity (NFRC);

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

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

(d) Net Reactive Power (in MVAr);

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

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

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

(h) Generation Resource breaker and switch status;

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

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

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

(j) NFRC currently available (unloaded) and included in the HSL of the Combined Cycle Generation Resource’s current configuration;

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

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

(m) LSL;

(n) Configuration identification for Combined Cycle Generation Resources;

(o) Ancillary Service Schedule for each quantity of RRS and Non-Spin which is equal to the Ancillary Service Resource Responsibility minus the amount of Ancillary Service deployment;

(i) For On-line Non-Spin, Ancillary Service Schedule shall be set to zero;

(ii) For Off-Line Non-Spin and for On-Line Non-Spin using Off-Line power augmentation technology the Ancillary Service Schedule shall equal the Non-Spin obligation and then shall be set to zero within 20 minutes following Non-Spin deployment;

(p) Ancillary Service Resource Responsibility for each quantity of Regulation Up Service (Reg-Up), Regulation Down Service (Reg-Down), FRS, RRS and Non-Spin. The sum of Ancillary Service Resource Responsibility for all Resources in a QSE is equal to the Ancillary Service Supply Responsibility for that QSE;

(q) Reg-Up and Reg-Down participation factors represent how a QSE is planning to deploy the Ancillary Service energy on a percentage basis to specific qualified Resource(s). The Reg-Up and Reg-Down participation factors for a Resource providing Fast Responding Regulation Up Service (FRRS-Up) or Fast Responding Regulation Down Service (FRRS-Down) shall be zero; and

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

(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) Ancillary Service Schedule (in MW) for each quantity of RRS and Non-Spin, which is equal to the Ancillary Service Resource Responsibility minus the amount of Ancillary Service deployment;

(g) Ancillary Service Resource Responsibility (in MW) for each quantity of Reg-Up and Reg-Down for Controllable Load Resources, and RRS and Non-Spin for all Load Resources;

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

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

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

(k) Resource Status (Resource Status shall be ONRL if high-set under-frequency relay is active);

(l) Reg-Up and Reg-Down participation factor, which represents how a QSE is planning to deploy the Ancillary Service energy on a percentage basis to specific qualified Resource(s). The Reg-Up and Reg-Down participation factors for a Resource providing FRRS-Up or FRRS-Down shall be zero; and

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

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

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

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

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

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

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

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

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

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

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

(a) Combustion turbine inlet air cooling methods;

(b) Duct firing;

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

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

(11) A QSE representing Generation Resources other than Combined Cycle Generation Resources may telemeter an NFRC value for their Generation Resource only if the QSE or Resource Entity associated with that Generation Resource has first requested and obtained ERCOT’s approval of the Generation Resource’s NFRC quantity.

|  |
| --- |
| ***[NPRR829: Insert paragraph (12) below upon system implementation:]***  (12) A QSE representing a Non-Modeled Generator that elects to include the net generation of the Non-Modeled Generator in the estimate of Real-Time Liability (RTL) shall provide ERCOT Real-Time telemetry of the net generation of the Non-Modeled Generator. |

**6.5.7.2 Resource Limit Calculator**

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

(2) The figures below illustrate how the Resource Limit Calculator determines the Resource limits for Generation and Load Resources:

Generation Resources:

LSL

HSL

Time

LSL

-

LASL

-

HASL

-

Generation

Increase

Generation

Decrease

Services

Provided: Reg

Down, FRS

Provided: Reg Up,

Responsive, Non-Spin;

FRS

Current

Telemetry

HDL

LDL

Ramp

Rate

5 Minutes

**Generation**

Quantity

Offer Curve Generation

LSL

HSL

-

-

-

Generation

Increase

Generati

Decrease

Ramp

Rate

5 Minutes

-

0

-

-

Generation

Increase

Generation

Decrease

Ramp

Rate

5 Minutes

Ancillary

Load Resources:

Time

LSL = LPC -

LASL -

HASL -

Ancillary Services Provided: Reg-Down

Current Load

Telemetry

HDL

LDL

5-30 Minutes

**Load**

Quantity

Bid Curve Load

LSL/LPC

HSL/MPC

0

Increasing

Consumption

Decreasing

Consumption

Ramp

Rate

Ancillary Services Provided: Reg-Up, RRS, Non-Spin

HSL = MPC -

Normal Load   
Fluctuation

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

**HASL = Max (LASL, (HSLTELEM – (RRSTELEM + RUSTELEM + NSRSTELEM + FRSTELEM + NFRCTELEM)))**

|  |  |
| --- | --- |
| **Variable** | **Description** |
| HASL | High Ancillary Service Limit. |
| HSLTELEM | High Sustained Limit provided via telemetry – per Section 6.5.5.2. |
| LASL | Low Ancillary Service Limit. |
| RRSTELEM | RRS Ancillary Service Schedule provided by telemetry. |
| RUSTELEM | Reg-Up Ancillary Service Resource Responsibility designation provided by telemetry. |
| NSRSTELEM | Non-Spin Ancillary Service Schedule provided via telemetry. |
| FRSTELEM | FRS Ancillary Service Schedule provided via telemetry. |
| NFRCTELEM | NFRC currently available (unloaded) and included in the HSL of the Generation Resource with non-zero Responsive Reserve Ancillary Service Schedule telemetry. |

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

**LASL = LSLTELEM + RDSTELEM**

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

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

**SURAMP = RAMPRATE – (RUSTELEM \* REGP / 5)**

|  |  |
| --- | --- |
| **Variable** | **Description** |
| SURAMP | SCED Up Ramp Rate. |
| RAMPRATE | Normal Ramp Rate up, as telemetered by the QSE, when RRS is not deployed or when the subject Resource is not providing RRS.  Emergency Ramp Rate up, as telemetered by the QSE, for Resources deploying RRS. |
| RUSTELEM | Reg-Up Ancillary Service Resource Responsibility designation provided by telemetry. |
| REGP | Percentage of Regulation Service for which ramp rate will be reserved in Real-Time. The value will be between one and zero. Market Participants will be notified of the change in this value. |

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

**SDRAMP = NORMRAMP – (RDSTELEM \* REGP / 5)**

| **Variable** | **Description** |
| --- | --- |
| SDRAMP | SCED Down Ramp Rate. |
| NORMRAMP | Normal Ramp Rate down, as telemetered by the QSE. |
| RDSTELEM | Reg-Down Ancillary Service Resource Responsibility designation by Resource provided via telemetry. |
| REGP | Percentage of Regulation Service for which ramp rate will be reserved in Real-Time. The value will be between one and zero. Market Participants will be notified of the change in this value. |

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

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

**HDL = POWERTELEM – (SDRAMP \* 5)**

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

**HDL = Min (POWERTELEM + (SURAMP \* 5), HASL)**

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

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

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

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

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

**LDL = Max (POWERTELEM - (SDRAMP \* 5), LASL)**

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

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

**HASL = Max (LPCTELEM, (MPCTELEM – RDSTELEM))**

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

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

**LASL = Min (HASL, (LPCTELEM + (RRSTELEM + RUSTELEM + NSRSTELEM)))**

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

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

**SURAMP = RAMPRATE – (RUSTELEM \* REGP / 5)**

|  |  |
| --- | --- |
| **Variable** | **Description** |
| SURAMP | SCED Up Ramp Rate. |
| RAMPRATE | Normal Ramp Rate up, as telemetered by the QSE, when RRS is not deployed or when the subject Load Resource is not providing RRS.  Emergency Ramp Rate up, as telemetered by the QSE, for Load Resources deploying RRS. |
| RUSTELEM | Reg-Up Ancillary Service Resource Responsibility designation provided by telemetry. |
| REGP | Percentage of Regulation Service for which ramp rate will be reserved in Real-Time. The value will be between one and zero. Market Participants will be notified of the change in this value. |

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

**SDRAMP = NORMRAMP – (RDSTELEM \* REGP / 5)**

| **Variable** | **Description** |
| --- | --- |
| SDRAMP | SCED Down Ramp Rate. |
| NORMRAMP | Normal Ramp Rate down, as telemetered by the QSE. |
| RDSTELEM | Reg-Down Ancillary Service Resource Responsibility designation by Resource provided via telemetry. |
| REGP | Percentage of Regulation Service for which ramp rate will be reserved in Real-Time. The value will be between one and zero. Market Participants will be notified of the change in this value. |

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

**HDL = Min (POWERTELEM + (SDRAMP \* 5), HASL)**

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

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

**LDL = Max (POWERTELEM - (SURAMP \* 5), LASL)**

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

**6.5.7.5 Ancillary Services Capacity Monitor**

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

(a) RRS capacity from:

(i) Generation Resources;

(ii) Load Resources excluding Controllable Load Resources;

(iii) Controllable Load Resources; and

(iv) Quick Start Generation Resources (QSGRs);

(b) Ancillary Service Resource Responsibility for RRS from:

(i) Generation Resources;

(ii) Load Resources excluding Controllable Load Resources; and

(iii) Controllable Load Resources; and

(iv) QSGRs;

(c) RRS deployed to Generation 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 Responsibility for Non-Spin from:

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

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

(iii) Load Resources;

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

(v) QSGRs;

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

(g) Ancillary Service Resource Responsibility 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 Schedule;

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

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

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

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

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

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

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





***WGRs***

***online***

***All***

***WGR***

***online***

***i***

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

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

****

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





***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

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

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





***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

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





***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***





***resources***

***FFR***

***online***

***All***

***resource***

***FFR***

***online***

***i***

**PRC7 = (Capacity from Resources capable of providing FFR)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 | Synchronous condenser output |
| PRC4 | MW | Capacity from Load Resources carrying RRS Ancillary Service Resource Responsibility |
| PRC5 | MW | Capacity from Controllable Load Resources active in SCED and carrying Ancillary Service Resource Responsibility |
| PRC6 | MW | Capacity from Controllable Load Resources active in SCED and not carrying Ancillary Service Resource Responsibility |
| **PRC7** | MW | Capacity from Resources capable of providing FFR |
| 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 carrying Ancillary Service Resource Responsibility |
| LRDF\_2 |  | The currently approved Load Resource Reserve Discount Factor for Controllable Load Resources not carrying Ancillary Service Resource Responsibility |
| NFRC | MW | Non-Frequency Responsive Capacity |

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

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

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

**6.5.7.6.2.2 Deployment of Frequency Response Service (FRS)**

(1) FRS is intended to:

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

(b) Provide energy during the implementation of an EEA.

(2) ERCOT shall deploy FRS 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) ;FRS energy deployment by automatic Governor response as a result of frequency deviation;

(b) Through use of an automatic Dispatch Instruction signal to deploy FRS capacity from Generation Resources or deploy FRS capacity from Controllable Load Resources during EEA;

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

(d) FRS energy deployment by automatic action of high-set under-frequency relays as a result of a significant frequency deviation.

(3) ERCOT shall deploy FRS 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 FRS on Load Resources, excluding Controllable Load Resources, must be as described in Section 6.5.9.4, Energy Emergency Alert.

(4) ERCOT may deploy FRS in response to system disturbance requirements as specified in the Operating Guides if no additional energy is available to be dispatched from SCED as determined by the Ancillary Service Capacity Monitor.

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

(6) ERCOT shall allocate the deployment of FRS proportionally among QSEs that provide FRS using Resources that are not on high-set under-frequency relays.

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

(8) Once FRS is deployed, the QSE’s obligation to deliver FRS remains in effect until specifically instructed by ERCOT to stop providing FRS. However, except in an Emergency Condition, the QSE’s obligation to deliver FRS may not exceed the period for which the service was committed.

(9) Following the deployment or recall of a deployment by Dispatch Instruction of FRS, QSE shall adjust the telemetered FRS Ancillary Service Schedule of Resources providing the service and ERCOT shall adjust the HASL and LASL based on the QSE’s telemetered Ancillary Service Schedule for FRS as described in Section 6.5.7.2, Resource Limit Calculator, to account for such deployment.

(10) QSEs providing FRS and ERCOT shall meet the deployment performance requirements specified in Section 8, Performance Monitoring.

(11) For FRS deployment that is not automatic in response to frequency deviation, ERCOT shall issue FRS deployment Dispatch Instructions over ICCP for Generation Resources and Controllable Load Resources and Extensible Markup Language (XML) for all other Load Resources. Those Dispatch Instructions must contain the MW output requested. For Generation Resources and Controllable Load Resources from which FRS capacity was deployed, ERCOT shall use SCED to dispatch FRS energy. The Base Points for those Resources includes FRS energy as well as any other energy dispatched by SCED.

(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 responsibility or, if only partial deployment is possible, skip the Load Resource with the block deployment option and proceed to deploy the next available Resource.

(13) The amount of RRS that a QSE can self-arrange using a Load Resource that is not a Controllable Load Resource is limited to the percentage amount of total RRS that the Load Resource can provide as specified by ERCOT. However, a QSE may offer additional Load Resources into the ERCOT RRS Ancillary Service market.

(14) FRS provided from a Generation Resource shall be responsive to frequency deviations greater than 60.0167 Hz and less than 59.983 Hz. Generation Resources providing FRS must have a Governor droop setting that is not greater than5.0%.

(15) FRS 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.

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

(17) ERCOT shall deploy FRS 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) FRS energy deployment during an EEA;

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

(c) FRS 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 *Deployment and Recall of Responsive Reserve Service***

(1) RRS is intended to:

(a) Help restore the frequency to 60 Hz within ten minutes of a significant frequency deviation;

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

(c) Provide backup to Reg-Up.

(2) ERCOT shall deploy RRS 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) Automatic Dispatch Instruction signal to release RRS capacity from Generation Resources and Controllable Load Resources to SCED; and/or

(b) Dispatch Instruction for deployment of Load Resources energy via electronic Messaging System.

(3) ERCOT shall deploy RRS when frequency drops below 59.91 Hz and available Reg-Up is not sufficient to restore frequency. Upon deployment of Off-Line RRS from a QSGR providing RRS, the Resource’s Ancillary Service Schedule for RRS must be adjusted for the ERCOT instructed RRS deployment and the Resource’s status must be set to OFFQS to be available for dispatch by SCED.

(4) Energy from Resources providing RRS may also be manually deployed by ERCOT pursuant to Section 6.5.9, Emergency Operations.

(5) ERCOT shall use SCED and Non-Spin as soon as practicable to recover RRS reserves.

(6) Following a RRS deployment, the QSE’s obligation to deliver RRS remains in effect until ERCOT issues a recall instruction or its RRS obligation expires, whichever occurs first.

(7) Following a deployment or recall Dispatch Instruction of RRS, a QSE shall adjust the telemetered RRS Ancillary Service Schedule for the Resource providing the service and ERCOT shall adjust the HASL based on the QSE’s telemetered Ancillary Service Schedule for RRS as described in Section 6.5.7.2, Resource Limit Calculator, to account for such deployment.

(8) For Generation Resources and Controllable Load Resources providing RRS, Base Points include RRS energy as well as any other energy dispatched by SCED. A Resource must be able to be fully dispatched by SCED to its RRS Ancillary Service Resource Responsibility within the ten-minute time frame according to its telemetered Emergency Ramp Rate.

(9) Each QSE providing RRS shall meet the deployment performance requirements specified in Section 8.1.1.4.2, Responsive Reserve Service Energy Deployment Criteria.

(10) ERCOT shall issue instructions to release RRS capacity provided from Generation Resources and Controllable Load Resources to SCED over ICCP, and shall issue deployment instructions for Load Resources providing RRS via Extensible Markup Language (XML). Such instructions shall contain the MW requested.

(11) 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 Resource Responsibility or, if only partial deployment is possible, skip the Load Resource with the block deployment option and proceed to deploy the next available Resource.

(12) ERCOT shall recall automatically deployed RRS capacity once system frequency recovers above 59.97 Hz.

(13) ERCOT shall recall RRS 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.

6.5.9.3.3 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) Conditions have developed such that additional Ancillary Services are needed in the current Operating Period;

(b) There are insufficient Ancillary Services or Energy Offers in the DAM;

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

(d) 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;

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

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

(g) The SCED process fails to reach a solution, whether or not ERCOT is using one of the measures specified in paragraph (3) of Section 6.5.9.2, Failure of the SCED Process.

(3) With the issuance of a Watch pursuant to paragraph (2)(a) above, ERCOT may exercise its authority to immediately procure the following services from existing offers:

(a) Frequency Response Service (FRS);

(b) Regulation Services;

(c) RRS services; and

(d) Non-Spin services.

(4) If ERCOT issues a Watch because insufficient Ancillary Service Offers were received in the DAM or Supplemental Ancillary Service Market (SASM), and if the Watch does not result in sufficient offers and the DAM or SASM is executed with insufficient offers, then ERCOT may acquire the insufficient amount of Ancillary Services as follows:

(a) The SASM process shall be conducted in accordance with Section 6.4.9.2.2, SASM Clearing Process. If the SASM process is not sufficient, then;

(b) The HRUC process shall be conducted to commit planned Off-Line Resources qualified to provide the Ancillary Service(s) that are insufficient in accordance with Section 5.2.2.2, RUC Process Timeline After an Aborted Day-Ahead Market. If the HRUC process is not sufficient, then;

(c) If the insufficiency arose due to insufficient Ancillary Service Offers received in the DAM or ERCOT needs to increase the Ancillary Service requirements after DAM clearing, ERCOT may assign the insufficient amounts of Ancillary Service(s) to QSEs with planned On-Line Resources qualified to provide the insufficient Ancillary Service(s), even if there are no existing Ancillary Service Offers for those QSEs’ Resources. ERCOT shall prorate the required Ancillary Service capacity among QSEs representing On-Line capacity not already reserved for Ancillary Services in the COP in a way that maximizes the distribution of the assignment.

(d) A QSE may request cancellation of the assignment of Ancillary Services to its On-Line Resources if there are equipment or Resource control issues which limit the ability of the Resources to provide the Ancillary Services. If ERCOT accepts the cancellation, ERCOT may require QSEs to submit supporting information describing the Resource control issues.

(5) If ERCOT issues a Watch because market-based congestion management techniques embedded in SCED as specified in these Protocols will not be adequate to resolve one or more transmission security violations and, in ERCOT’s judgment, no approved CMP is adequate to resolve those violations, ERCOT may instruct Resources to change output and, if still necessary, curtail DC Tie Load on any DC Tie other than the North and East DC Ties to return the ERCOT System to a reliable condition.

|  |
| --- |
| [NPRR825: Delete paragraph (5) above upon system implementation and renumber accordingly.] |

(6) 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.

6.5.9.4.1 General Procedures Prior to EEA Operations

(1) Prior to declaring EEA Level 1 detailed in Section 6.5.9.4.2, EEA Levels, ERCOT may perform the following operations consistent with Good Utility Practice:

(a) Provide Dispatch Instructions to QSEs for specific Resources to operate at an Emergency Base Point to maximize Resource deployment so as to increase Responsive Reserve levels on other Resources;

(b) Commit specific available Resources as necessary that can respond in the timeframe of the emergency. Such commitments will be settled using the HRUC process;

(c) Start RMR Units available in the time frame of the emergency. RMR Units should be loaded to full capability;

(d) Utilize available Resources providing RRS and Non-Spin services as required; and

(e) ERCOT shall use the PRC and system frequency to determine the appropriate Emergency Notice and EEA levels.

***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.

(b) QSEs shall:

(i) Ensure COPs and telemetered HSLs are updated and reflect all Resource delays and limitations; and

(ii) Suspend any ongoing ERCOT required Resource performing 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 1,375 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 FRS supplied from Load Resources (controlled by high-set under-frequency relays). ERCOT may deploy ERS-10, ERS-30, or FRS 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 FRS 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 FRS 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 FRS. 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;

(B) At the discretion of the ERCOT Operator, instruct QSEs to deploy the remaining FRS 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 FRS. 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 FRS 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 obligation 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 FRS provided by 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 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 1,375 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.

6.6.5.1 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 Low Sustained Limit (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 = AVGBP q, r, p, i + AVGREG q, r, p, i + AVGFRS q, r, p, i

AVGBP*q, r, p, i* =  (AVGBP5M *q, r, p, i, y*) / 3

AVGREG*q, r, p, i* =  (AVGREG5M *q, r, p, i, y*) / 3

AVGFRS*q, r, p, i* =  (AVGFRS5M *q, r, p, i, y*) / 3

Where:

AVGREG5M *q, r, p, i, y*=(AVGREGUP5M*q, r, p, i, y* - AVGREGDN5M*q, r, p, i, y*)

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. |
| AVGBP *q, r, p, i* | MW | *Average Base Point per QSE per Settlement Point per Resource*—The average of the five-minute clock interval Base Points over the 15-minute Settlement Interval *i* for Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p*. |
| AVGBP5M *q, r, p, i, y* | MW | *Average five-minute clock interval Base Point per QSE per Settlement Point per Resource*—The average Base Point for the Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p*, for the five-minute clock interval *y* within the 15-minute Settlement Interval *i*. The time-weighted average of the linearly ramped Base Points in a five-minute clock interval *y*. The linearly ramped Base Point is calculated every four seconds such that it ramps from its initial value to the SCED Base Point over a five-minute clock interval *y*. The initial value of the linearly ramped Base Point will be the four second value of the previous linearly ramped Base Point at the time the new SCED Base Point is received into the ERCOT Energy Management System (EMS).  The linear ramp is recalculated each time that a new Base Point is received from SCED. AVGBP5M is equal to the ABP value calculated for use in Generation Resource Energy Deployment Performance (GREDP) or the ABP value calculated for use in the 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. |
| AVGREG *q, r, p, i* | MW | *Average Regulation Instruction per QSE per Settlement Point per Resource* —The average of the five-minute clock interval *y* Regulation Instruction Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* over the 15-minute Settlement Interval *i*. |
| AVGREG5M *q, r, p, i, y* | MW | *Total Average five-minute clock interval Regulation Instruction per QSE per Settlement Point per Resource*—The total amount of regulation that the Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* should have produced based on Load Frequency Control (LFC) deployment signals over the five-minute clock interval *y* within the 15-minute Settlement Interval *i*. |
| AVGREGUP5M *q, r, p, i, y* | MW | *Average Regulation Instruction Up per QSE per Settlement Point per Resource*—The amount of Regulation Up (Reg-Up) that the Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* should have produced based on LFC deployment signals over the five-minute clock interval *y* within the 15-minute Settlement Interval *i*. |
| AVGREGDN5M *q, r, p, i, y* | MW | *Average Regulation Instruction Down per QSE per Settlement Point per Resource*—The amount of Regulation Down (Reg-Down) that the Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* should have produced based on LFC deployment signals over the five-minute clock interval *y* within the 15-minute Settlement Interval *i*. |
| AVGFRS*q, r, p, i* |  | *Average Frequency Response Service self-deployed per QSE per Settlement Point per Resource* —The average of the five-minute clock interval *y* Frequency Response Service self-deployed by Generation Resource, or Load Resource, or Resource capable of Fast Frequency Response (FFR) *r* represented by QSE *q* at Settlement Point *p* over the 15-minute Settlement Interval *i*. |
| AVGFRS5M *q, r, p, i, y* | MW | *Total Average five-minute clock interval Frequency Response Service self-deployed per QSE per Settlement Point per Resource*—The total amount of Frequency Response Service (FRS) that the Generation Resource, or Load Resource, or Resource capable of Fast Frequency Response (FFR) *r* represented by QSE *q* at Settlement Point *p* should have produced based on ERCOT estimated Primary Frequency Response projections based on the Resource’s approved droop performance over the five-minute clock interval *y* within the 15-minute Settlement Interval *i*. |
| *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. |

6.7.1 Payments for Ancillary Service Capacity Sold in a Supplemental Ancillary Services Market (SASM) or Reconfiguration Supplemental Ancillary Services Market (RSASM)

(1) If a Supplemental Ancillary Services Market (SASM) or a Reconfiguration Supplemental Ancillary Services Market (RSASM) is executed for one or more Operating Hours for any reason, ERCOT shall pay Qualified Scheduling Entities (QSEs) for their Ancillary Service Offers cleared in the SASM or RSASM, based on the Market Clearing Price for Capacity (MCPC) for that SASM or RSASM and that service. By service and by SASM or RSASM, the payment to each QSE for a given Operating Hour is calculated as follows:

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

RTPCRUAMT *q, m* = (-1) \* MCPCRU *m* \* RTPCRU *q, m*

Where:

RTPCRU *q,**m* = PCRUR *q, r, m*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTPCRUAMT *q, m* | $ | *Procured Capacity for Reg-Up Amount by QSE by market*—The payment to QSE *q* for the Ancillary Service Offers cleared in the market *m* to provide Reg-Up, for the hour. |
| MCPCRU *m* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Up by market—*The MCPC for Reg-Up from the market *m*, for the hour. |
| RTPCRU *q, m* | MW | *Procured Capacity for Reg-Up by QSE by market—*The portion of QSE *q*’s Ancillary Service Offers cleared in the market *m* to provide Reg-Up, for the hour. |
| PCRUR *q, r, m* | MW | *Procured Capacity for Reg-Up from Resource per Resource per QSE by market*—The Reg-Up capacity quantity awarded to QSE *q* in the market *m* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *m* | none | An Ancillary Service market (SASM or RSASM). |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |

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

RTPCRDAMT *q, m* = (-1) \* MCPCRD *m* \* RTPCRD *q, m*

Where:

RTPCRD *q,**m* = PCRDR *r, q, m*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTPCRDAMT *q, m* | $ | *Procured Capacity for Reg-Down Amount by QSE by market*—The payment to QSE *q* for the Ancillary Service Offers cleared in the market *m* to provide Reg-Down, for the hour. |
| MCPCRD *m* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Down by market—*The MCPC for Reg-Down from the market *m*, for the hour. |
| RTPCRD *q, m* | MW | *Procured Capacity for Reg-Down by QSE by market—*The portion of QSE *q*’s Ancillary Service Offers cleared in the market *m* to provide Reg-Down, for the hour. |
| PCRDR *r, q, m* | MW | *Procured Capacity for Reg-Down from Resource per Resource per QSE by market*—The Reg-Down capacity quantity awarded to QSE *q* in the market *m* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *m* | none | An Ancillary Service market (SASM or RSASM). |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |

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

RTPCRRAMT *q, m* = (-1) \* MCPCRR *m* \* RTPCRR *q, m*

Where:

RTPCRR *q,**m* = PCRRR *q, r, m*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTPCRRAMT *q, m* | $ | *Procured Capacity for Responsive Reserve Amount by QSE by market*—The payment to QSE *q* for the Ancillary Service Offer cleared in the market *m* to provide RRS, for the hour. |
| MCPCRR *m* | $/MW per hour | *Market Clearing Price for Capacity for Responsive Reserve by market—*The MCPC for RRS from the market *m*, for the hour. |
| RTPCRR *q, m* | MW | *Procured Capacity for Responsive Reserve by QSE by market—*The portion of QSE *q* Ancillary Service Offers cleared in the market *m* to provide RRS, for the hour. |
| PCRRR *q,r, m* | MW | *Procured Capacity for Responsive Reserve from Resource per Resource per QSE by market*—The RRS capacity quantity awarded to QSE *q* in the market *m* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *m* | none | An Ancillary Service market (SASM or RSASM). |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |

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

RTPCNSAMT *q, m* = (-1) \* MCPCNS *m* \* RTPCNS *q, m*

Where:

RTPCNS *q,**m* = PCNSR *q, r, m*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTPCNSAMT *q, m* | $ | *Procured Capacity for Non-Spin Amount by QSE by market*—The payment to QSE *q* for Ancillary Service Offer cleared in the market *m* to provide Non-Spin, for the hour. |
| MCPCNS *m* | $/MW per hour | *Market Clearing Price for Capacity for Non-Spin by market—*The MCPC for Non-Spin from the market *m*, for the hour. |
| RTPCNS *q, m* | MW | *Procured Capacity for Non-Spin by QSE by market—*The portion of QSE *q*’s Ancillary Service Offer cleared in the market *m* to provide Non-Spin, for the hour. |
| PCNSR *q,r, m* | MW | *Procured Capacity for Non-Spin from Resource per Resource per QSE by market*—The Non-Spin capacity quantity awarded to QSE *q* in the market *m* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *m* | none | An Ancillary Service market (SASM or RSASM). |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |

(e) For Frequency Response Service (FRS), if applicable:

RTPCFRAMT *q, m* = (-1) \* MCPCFR *m* \* RTPCFR *q, m*

Where:

RTPCFR *q,**m* = PCFRR *q, r, m*

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTPCFRAMT *q, m* | $ | *Procured Capacity for Frequency Response Service Amount by QSE by market*—The payment to QSE *q* for the Ancillary Service Offer cleared in the market *m* to provide FRS, for the hour. |
| MCPCFR *m* | $/MW per hour | *Market Clearing Price for Capacity for Frequency Response Service by market—*The MCPC for FRS from the market *m*, for the hour. |
| RTPCFR *q, m* | MW | *Procured Capacity for Frequency Response Service by QSE by market—*The portion of QSE *q* Ancillary Service Offers cleared in the market *m* to provide FRS, for the hour. |
| PCFRR *q,r, m* | MW | *Procured Capacity for Frequency Response Service from Resource per Resource per QSE by market*—The FRS capacity quantity awarded to QSE *q* in the market *m* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| *m* | none | An Ancillary Service market (SASM or RSASM). |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |

***6.7.2 Payments for Ancillary Service Capacity Assigned in Real-Time Operations***

(1) Resources that have received an Ancillary Service Assignment during a Watch as set forth in paragraph (4) of Section 6.5.9.3.3, Watch, may receive a payment for the un-deployed quantity of Ancillary Service reserves associated with each hour of the Ancillary Service Assignment if the Resource’s dispatch is limited by the Ancillary Service Assignment. ERCOT will provide a Verbal Dispatch Instruction (VDI) to every QSE with an On-Line Resource with an Ancillary Service Assignment. The QSE must file a Settlement dispute to be considered for the Real-Time assigned Ancillary Services payment amount. The payment to each QSE and Resource for the 15-minute Settlement Interval in which the Resource received an Ancillary Service Assignment will be made when the Resource is dispatched to its High Ancillary Service Limit (HASL) in at least one Security Constrained Economic Dispatch (SCED) interval in the 15-minute Settlement Interval. The payment shall be calculated as follows.

(a) For Reg-Up, if applicable:

**RTAURUAMTQSETOT *q =*   RTAURUAMT *q r, p, i***

Where:

**RTAURUAMT *q,r,p,i* = (-1) \* 1/4 \* RTAURUR *q,r,p* \* (RTSPPp,i - RTRSVPOR)**

RTRSVPOR =  (RNWF  *y* \* RTORPA *y*)

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

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTAURUAMTQSETOT *q* | $ | *Real-Time Assigned Un-Deployed Regulation Up Payment Amount per QSE -* The payment to QSE *q* for a Real-Time un-deployed Reg-Up Ancillary Service Assignment. |
| RTAURUAMT*q*,*r,p,i* | $ | *Real-Time Assigned Un-Deployed Regulation Up Payment Amount per Resource per QSE*⎯The payment to QSE *q* for a Real-Time un-deployed Reg-Up Ancillary Service Assignment to Resource *r* at the Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| RTAURUR *q,r,p* | MW | *Real-Time Assigned Un-Deployed Regulation Up Quantity per Resource per QSE*⎯The quantity of un-deployedReg-Up assigned under a Watch to a QSE *q* for Resource *r* at Settlement Point *p* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTSPP*p,i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*⎯The Real-Time Settlement Point Price at the Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| RTRSVPOR | $/MWh | *Real-Time Reserve Price for On-Line Reserves*⎯The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval. |
| 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 Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| RTORPA*y* | $/MWh | *Real-Time On-Line Reserve Price Adder per interval*⎯The Real-Time On-Line Reserve Price Adder for the SCED interval *y*. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resourcethat was allocated Reg-Up Ancillary Service Assignment by the QSE. |
| *p* | none | A Settlement Point for the Resource Node that was allocated Reg-Up Ancillary Service Assignment by the QSE. |
| *i* | none | A 15-minute Settlement Interval in the Operating Hour. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(b) For RRS, if applicable:

**RTAURRAMTQSETOT *q =*   RTAURRAMT *q r, p, i***

Where:

**RTAURRAMT *q r,p,i* = (-1) \* 1/4 \* RTAURRR *q, r,p* \* (RTSPPp,i – RTRSVPOR)**

RTRSVPOR =  (RNWF  *y* \* RTORPA *y*)

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

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTAURRAMTQSETOT *q* | $ | *Real-Time Assigned Un-Deployed Response Reserve Payment Amount per QSE -* The payment to QSE *q* for a Real-Time un-deployed RRS Ancillary Service Assignment. |
| RTAURRAMT *q, r,p i* | $ | *Real-Time Assigned Un-Deployed Responsive Reserve Payment Amount per Resource per QSE -* The payment to QSE *q* for a Real-Time un-deployed RRS Ancillary Service Assignment to Resource *r* at the Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| RTAURRR *q,r,p* | MW | *Real-Time Assigned Un-Deployed Responsive Reserve Quantity per Resource per QSE -* The quantity of un-deployed RRS assigned under a Watch to a QSE *q* for Resource *r* at the Settlement Point *p* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTSPP*p,i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*⎯*-* The Real-Time Settlement Point Price at the Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| RTRSVPOR | $/MWh | *Real-Time Reserve Price for On-Line Reserves*⎯The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval. |
| 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 Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| RTORPA*y* | $/MWh | *Real-Time On-Line Reserve Price Adder per interval*⎯The Real-Time On-Line Reserve Price Adder for the SCED interval *y*. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resourcethat was allocated RRS Ancillary Service Assignment by the QSE. |
| *p* | none | A Settlement Point for the Resource Node that was allocated RRS Ancillary Service Assignment by the QSE. |
| *i* | none | A 15-minute Settlement Interval in the Operating Hour. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

(c) For FRS, if applicable:

**RTAUFRAMTQSETOT *q =*   RTAUFRAMT *q r, p, i***

Where:

RTAUFRAMT *q r, p, i* = (-1) \* 1/4 \* RTAUFRR *q, r, p* \* (RTSPP*p, i*– RTRSVPOR)

RTRSVPOR =  (RNWF *y* \* RTORPA *y*)

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

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTAUFRAMTQSETOT *q* | $ | *Real-Time Assigned Un-Deployed Frequency Response Service Payment Amount per QSE -* The payment to QSE *q* for a Real-Time un-deployed FRS Ancillary Service Assignment. |
| RTAUFRAMT *q, r,p i* | $ | *Real-Time Assigned Un-Deployed Frequency Response Service Payment Amount per Resource per QSE -* The payment to QSE *q* for a Real-Time un-deployed FRS Ancillary Service Assignment for Resource *r* at the Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| RTAUFRR *q,r,p* | MW | *Real-Time Assigned Un-Deployed Frequency Response Service Quantity per Resource per QSE -* The quantity of un-deployed FRS assigned under a Watch to a QSE *q* for Resource *r* at the Settlement Point *p* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTSPP*p,i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*⎯*-* The Real-Time Settlement Point Price at the Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| RTRSVPOR | $/MWh | *Real-Time Reserve Price for On-Line Reserves*⎯The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval. |
| 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 Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| RTORPA*y* | $/MWh | *Real-Time On-Line Reserve Price Adder per interval*⎯The Real-Time On-Line Reserve Price Adder for the SCED interval *y*. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resourcethat was allocated FRS Ancillary Service Assignment by the QSE. |
| *p* | none | A Settlement Point for the Resource Node that was allocated FRS Ancillary Service Assignment by the QSE. |
| *i* | none | A 15-minute Settlement Interval in the Operating Hour. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. |

**6.7.2.1 Charges for Infeasible Ancillary Service Capacity Due to Transmission Constraints**

(1) A charge to each QSE with Ancillary Service Supply Responsibility that is deemed infeasible by ERCOT as a result of a transmission constraints, whether or not a SASM is executed, is calculated as follows:

(a) For Reg-Up, if applicable:

**RUINFQAMT *q* = MCPCRU *DAM* \* RUINFQ *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RUINFQAMT *q* | $ | *Reg-Up Infeasible Quantity Amount per QSE*— The charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Reg-Up, for the hour. |
| MCPCRU *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Up in DAM*—The DAM MCPC for Reg-Up, for the hour. |
| RUINFQ *q* | MW | *Reg-Up Infeasible Quantity per QSE —*QSE *q*’s total capacity associated with infeasibleAncillary Service Supply Responsibilities for Reg-Up, for the hour. |
| *q* | none | A QSE. |

(b) For Reg-Down, if applicable:

**RDINFQAMT *q* = MCPCRD *DAM* \* RDINFQ *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RDINFQAMT *q* | $ | *Reg-Down Infeasible Quantity Amount per QSE*— The charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Reg-Down, for the hour. |
| MCPCRD *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Down in DAM*—The DAM MCPC for Reg-Down, for the hour. |
| RDINFQ *q* | MW | *Reg-Down Infeasibility Quantity per QSE —*QSE *q*’s total capacity associated with infeasibleAncillary Service Supply Responsibilities for Reg-Down, for the hour. |
| *q* | none | A QSE. |

(c) For RRS, if applicable:

**RRINFQAMT *q* = MCPCRR *DAM* \* RRINFQ *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RRINFQAMT *q* | $ | *Responsive Reserve Service Infeasible Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for RRS, for the hour. |
| MCPCRR *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Responsive Reserve in DAM*—The DAM MCPC for RRS, for the hour. |
| RRINFQ *q* | MW | *Responsive Reserve Infeasibility Quantity per QSE —*QSE *q*’s total capacity associated with infeasibleAncillary Service Supply Responsibilitiesfor RRS, for the hour. |
| *q* | none | A QSE. |

(d) For Non-Spin, if applicable:

**NSINFQAMT *q* = MCPCNS *DAM* \* NSINFQ *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| NSINFQAMT *q* | $ | *Non-Spin Infeasible Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Non-Spin, for the hour. |
| MCPCNS *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Non-Spin in DAM*—The DAM MCPC for Non-Spin, for the hour. |
| NSINFQ *q* | MW | *Non-Spin Infeasibility Quantity per QSE—*QSE *q*’s total capacity associated with infeasible Ancillary Service Supply Responsibilities for Non-Spin, for the hour. |
| *q* | none | A QSE. |

(e) For FRS, if applicable:

**FRINFQAMT *q* = MCPCFR *DAM* \* FRINFQ *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| FRINFQAMT *q* | $ | *Frequency Response Service Infeasible Quantity Amount per QSE*— The charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for FRS, for the hour. |
| MCPCFR *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Frequency Response Service in DAM*—The DAM MCPC for FRS, for the hour. |
| FRINFQ *q* | MW | *Frequency Response Service Infeasible Quantity per QSE —*QSE *q*’s total capacity associated with infeasibleAncillary Service Supply Responsibilities for FRS, for the hour. |
| *q* | none | A QSE. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [NPRR841: Insert Section 6.7.2.2 below upon system implementation:]  **6.7.2.2 Real-Time Adjustments to Day-Ahead Make Whole Payments due to Ancillary Services Infeasibility Charges**  (1) ERCOT shall pay the QSE for which ERCOT calculates a charge for infeasible Ancillary Service capacity due to transmission constraints a Real-Time Day-Ahead Make-Whole Payment for an eligible Resource for each Operating Hour in a DAM commitment period.  (2) The guaranteed cost, energy revenue, and Ancillary Service revenue calculated for each Combined Cycle Generation Resource are each summed for the Combined Cycle Train, and the Real-Time Day-Ahead Make-Whole Amount is calculated for the Combined Cycle Train.  RTDAMWAMT *q, r, p, h* = (-1)\*Max(0,DAMGCOST *q, r, p* + DAEREV *q, r, p, h* + INFQAR *q, r, p, h* + DAASREV *q, r, h* + DAMWAMT *q, r, p, h*) \* ASINFQR *q, r, p, h* / ASINFQR *q, r, p, h*  Where:  INFQAR *q, r, p, h =*RUINFQAR *q, r, p, h* + RDINFQAR *q, r, p, h* + RRINFQAR *q, r, p, h* + NSINFQAR *q, r, p, h* + FRINFQAR *q, r, p, h*  And,  RUINFQAR *q, r, p, h =* MCPCRU*DAM* \* RUINFQR *q, r, p, h*  RDINFQAR *q, r, p, h =* MCPCRD*DAM* \* RDINFQR *q, r, p, h*  RRINFQAR *q, r, p, h =* MCPCRR*DAM* \* RRINFQR *q, r, p, h*  NSINFQAR *q, r, p, h =* MCPCNS*DAM* \* NSINFQR *q, r, p, h*  FRINFQAR *q, r, p, h*  = MCPCFR *DAM*  \* FRINFQR *q, r, p, h*  ASINFQR *q, r, p, h =*RUINFQR *q, r, p, h* + RDINFQR *q, r, p, h* + RRINFQR *q, r, p, h* +  NSINFQR *q, r, p, h* +FRINFQR *q, r, p, h*  The above variables are defined as follows:   |  |  |  | | --- | --- | --- | | **Variable** | **Unit** | **Description** | | RTDAMWAMT *q, r, p, h* | $ | *Real-Time Day-Ahead Make-Whole Payment Amount per QSE per Resource per Settlement Point per hour* ⎯The Real-Time calculated payment to QSE *q* to make-whole the Startup Cost and energy costs of Resource *r* committed in the DAM at Resource Node *p* for the hour *h*. When a Combined Cycle Generation Resource is committed in the DAM, payment is made to the Combined Cycle Train for the DAM-committed Combined Cycle Generation Resource. | | DAMGCOST *q, r, p* | $ | *Day-Ahead Market Guaranteed Amount per QSE per Resource per Settlement Point* ⎯The sum of the Startup Cost and the operating energy costs of the DAM-committed Resource *r* at Resource Node *p* represented by QSE *q*, for the DAM-commitment period. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | DAEREV *q, r, p, h* | $ | *Day-Ahead Energy Revenue per QSE per Resource per Settlement Point per hour* ⎯The revenue received in the DAM for Resource *r* at Resource Node *p* represented by QSE *q*, based on the DAM Settlement Point Price, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | INFQAR *q, r, p, h* | $ | *Infeasible Quantity Amount per QSE per Resource per Settlement Point per hour* —The dollar amount to QSE *q* for Resource *r* of its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibility, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | DAMWAMT *q, r, p, h* | $ | *Day-Ahead Make-Whole Payment per QSE per Resource per Settlement Point per hour* ⎯The payment to QSE *q* to make-whole the Startup Cost and energy cost of Resource *r* committed in the DAM at Resource Node *p* for the hour *h*. When a Combined Cycle Generation Resource is committed in the DAM, payment is made to the Combined Cycle Train for the DAM-committed Combined Cycle Generation Resource. | | DAASREV *q, r, h* | $ | *Day-Ahead Ancillary Service Revenue per QSE per Resource by hour*⎯The revenue received in the DAM for Resource *r* represented by QSE *q*, based on the MCPC for each Ancillary Service in the DAM, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | RUINFQAR *q, r, p, h* | $ | *Reg-Up Infeasible Quantity Amount per QSE per Resource per Settlement Point per hour* — The dollar amount to QSE *q,* for Resource *r,* for its capacity associated with infeasible deployment of Ancillary Service Supply Responsibility for Reg-Up, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | MCPCRU *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Up in DAM*—The DAM MCPC for Reg-Up for the hour. | | RDINFQAR *q, r, p, h* | $ | *Reg-Down Infeasible Quantity Amount per QSE per Resource per Settlement Point per hour* — The dollar amount to QSE *q,* for Resource *r,* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibility for Reg-Down, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | MCPCRD *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Down in DAM*—The DAM MCPC for Reg-Down for the hour. | | RRINFQAR *q, r, p, h* | $ | *Responsive Reserve Service Infeasible Quantity Amount per QSE per Resource per Settlement Point per hour* — The dollar amount to QSE *q,* for Resource *r,* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibility for RRS, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | MCPCRR *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Responsive Reserve Service in DAM*—The DAM MCPC for RRS for the hour. | | NSINFQAR *q, r, p, h* | $ | *Non-Spin Infeasible Quantity Amount per QSE per Resource per Settlement Point per hour* — The dollar amount to QSE *q,* for Resource *r,* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibility for Non-Spin, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | MCPCNS *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Non-Spin Service in DAM*—The DAM MCPC for Non-Spin for the hour. | | FRINFQAR *q, r, p, h* | $ | *Frequency Response Service Infeasible Quantity Amount per QSE per Resource per Settlement Point per hour* — The dollar amount to QSE *q,* for Resource *r,* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibility for FRS, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | MCPCFR *DAM* | $/MW per hour | *Market Clearing Price for Capacity for Frequency Response Service in DAM*—The DAM MCPC for FRS for the hour. | | ASINFQR *q, r, p, h* | MW | *Ancillary Service Infeasible Quantity per QSE per Resource per Settlement Point per hour —* The Resource *r* total capacity associated with infeasibleAncillary Service Supply Responsibility, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | RUINFQR *q, r, p, h* | MW | *Reg-Up Infeasible Quantity per QSE per Resource per Settlement Point per hour —*The Resource *r* totalcapacity associated with infeasibleAncillary Service Supply Responsibility for Reg-Up, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | RDINFQR *q, r, p, h* | MW | *Reg-Down Infeasible Quantity per QSE per Resource per Settlement Point per hour —* The Resource *r* total capacity associated with infeasibleAncillary Service Supply Responsibility for Reg-Down, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | RRINFQR *q, r, p, h* | MW | *Responsive Reserve Infeasible Quantity per QSE per Resource per Settlement Point per hour —* The Resource *r* total capacity associated with infeasibleAncillary Service Supply Responsibility for RRS, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | NSINFQR *q, r, p, h* | MW | *Non-Spin Infeasible Quantity per QSE per Resource per Settlement Point per hour —* The Resource *r* total capacity associated with infeasible Ancillary Service Supply Responsibility for Non-Spin, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | FRINFQR *q, r, p, h* | MW | *Frequency Response Service Quantity per QSE per Resource per Settlement Point per hour —* The Resource *r* total capacity associated with infeasible Ancillary Service Supply Responsibility for FRS, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | *h* | none | An hour in the DAM-commitment period. | | *q* | none | A QSE. | | *r* | none | A DAM-committed Generation Resource. | | *p* | none | A Resource Node Settlement Point. |   (3) The total Real-Time Day-Ahead Make-Whole Payments to each QSE for Generation Resources for a given hour is calculated as follows:  RTDAMWAMTQSETOT *q, h* =  RTDAMWAMT *q, r, p, h*  And,  RTDAMWAMTTOT *h* =  RTDAMWAMTQSETOT *q, h*  The above variables are defined as follows:   | Variable | Unit | Definition | | --- | --- | --- | | RTDAMWAMTQSETOT *q, h* | $ | *Real-Time Day-Ahead Make-Whole Payment Amount per QSE per hour*⎯The Real-Time calculated payment to QSE *q* to make-whole the Startup Cost and energy costs of all Resources *r* committed in the DAM at Resource Node *p* for the hour *h*. | | RTDAMWAMT *q, r, p, h* | $ | *Real-Time Day-Ahead Make-Whole Payment Amount per QSE per Resource per Settlement Point per hour* ⎯The Real-Time calculated payment to QSE *q* to make-whole the Startup and energy costs of Resource *r* committed in the DAM at Resource Node *p* for the hour *h*. For a Combined Cycle Generation Resource is committed in the DAM, payment is made to the Combined Cycle Train for the DAM-committed Combined Cycle Generation Resource. | | RTDAMWAMTTOT *h* | $ | *Real-Time Day-Ahead Make-Whole Payment Amount per hour*⎯The Real-Time calculated payment to all QSEs to make-whole the Startup and energy costs of all Resources *r* committed for the hour *h*. | | *h* | none | An hour in the DAM-commitment period. | | *q* | none | A QSE. | | *r* | none | A DAM-committed Generation Resource. | | *p* | none | A Resource Node Settlement Point. |   (4) For each QSE for which ERCOT calculates a Real-Time DAM Make-Whole payment an adjustment for each Ancillary Service is computed as follows:  RUMWINFA *q ,h* = RTDAMWAMT *q, r, p, h* \* RUINFQR *q , r, p, h* / ASINFQR *q, r, p, h*  RDMWINFA *q, h* = RTDAMWAMT *q, r, p, h* \* RDINFQR *q, r, p, h* / ASINFQR*q, r, p, h*  RRMWINFA *q, h* = RTDAMWAMT *q, r, p, h* \* RRINFQR*q, r, p, h* / ASINFQR*q, r, p, h*  NSMWINFA *q, h* = RTDAMWAMT *q , r, p, h* \* NSINFQR *q, r, p, h* / ASINFQR*q, r, p, h*  FRMWINFA *q, h* = RTDAMWAMT *q , r, p, h* \* FRINFQR *q, r, p, h* / ASINFQR*q, r, p, h*  The above variables are defined as follows:   |  |  |  | | --- | --- | --- | | **Variable** | **Unit** | **Description** | | RUMWINFA *q, h* | $ | *Regulation Up Make-Whole Infeasible Amount per QSE per hour*⎯ The total Real-Time calculated payment to QSE *q,* for its contribution of Regulation Up Ancillary Service, to make-whole the Startup and energy costs of all Resources committed in the DAM for the hour *h*. | | RDMWINFA *q, h* | $ | *Regulation Down Make-Whole Amount per QSE per hour* ⎯ The total Real-Time calculated payment to QSE *q,* for its contribution of Reg-Down, to make-whole the Startup and energy costs of all Resources committed in the DAM for the hour *h*. | | RRMWINFA *q, h* | $ | *Responsive Reserve Make-Whole Infeasible Amount per QSE per hour* ⎯ The total Real-Time calculated payment to QSE *q,* for its contribution of RRS, to make-whole the Startup and energy costs of all Resources committed in the DAM for the hour *h*. | | NSMWINFA *q, h* | $ | *Non-Spin Make-Whole Infeasible Amount per QSE per hour* ⎯ The total Real-Time calculated payment to QSE *q,* for its contribution of Non-Spin, to make-whole the Startup and energy costs of all Resources committed in the DAM for the hour *h*. | | FRMWINFA *q, h* | $ | *Frequency Response Service Make-Whole Infeasible Amount per QSE per hour* ⎯ The total Real-Time calculated payment to QSE *q,* for its contribution of FRS, to make-whole the Startup and energy costs of all Resources committed in the DAM for the hour *h*. | | RTDAMWAMT *q, r, p, h* | $ | *Real-Time Day-Ahead Make-Whole Payment Amount per QSE per Resource per Settlement Point per hour* ⎯The Real-Time calculated payment to QSE *q* to make-whole the Startup Cost and energy costs of Resource *r* committed in the DAM at Resource Node *p* for the hour *h*. When a Combined Cycle Generation Resource is committed in the DAM, payment is made to the Combined Cycle Train for the DAM-committed Combined Cycle Generation Resource. | | RUINFQR *q, r, p, h* | MW | *Reg-Up Infeasible Quantity per QSE per Resource per Settlement Point per hour —*The Resource *r total* capacity associated with infeasibleAncillary Service Supply Responsibility for Reg-Up, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | RDINFQR *q, r, p, h* | MW | *Reg-Down Infeasible Quantity per QSE per Resource per Settlement Point per hour —* The Resource *r* total capacity associated with infeasibleAncillary Service Supply Responsibility for Reg-Down, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | RRINFQR *q, r, p, h* | MW | *Responsive Reserve Infeasible Quantity per QSE per Resource per Settlement Point per hour —* The Resource *r* total capacity associated with infeasibleAncillary Service Supply Responsibility for RRS, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | NSINFQR *q, r, p, h* | MW | *Non-Spin Infeasible Quantity per QSE per Resource per Settlement Point per hour —* The Resource *r* total capacity associated with infeasible Ancillary Service Supply Responsibility for Non-Spin, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | FRINFQR *q, r, p, h* | MW | *Frequency Response Service Quantity per QSE per Resource per Settlement Point per hour —* The Resource *r* total capacity associated with infeasible Ancillary Service Supply Responsibility for FRS, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | ASINFQR *q, r, p, h* | MW | *Ancillary Service Infeasible Quantity per QSE per Resource per Settlement Point per hour —* The Resource *r* total capacity associated with infeasibleAncillary Service Supply Responsibility, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | *h* | none | An hour in the DAM-commitment period. | | *q* | none | A QSE. | | *r* | none | A DAM-committed Generation Resource. | | *p* | none | A Resource Node Settlement Point. | |

6.7.3 Charges for Ancillary Service Capacity Replaced Due to Failure to Provide

(1) A charge to each QSE that fails on its Ancillary Service Supply Responsibility, whether or not a SASM is executed due to its failure to supply, is calculated based on the greatest of the MCPC in the Day-Ahead Market (DAM) or any SASM for the same Operating Hour. Included in the failed quantity is the charge to each QSE that reduces its Ancillary Service Supply Responsibility by an RSASM, which is calculated based on the cleared MCPC associated with the RSASM. By service, the charge to each QSE for a given Operating Hour is calculated as follows:

(a) The total charge of failure on Ancillary Service Supply Responsibility for Reg-Up by QSE, if applicable:

**RUFQAMTQSETOT *q* = RUFQAMT *q +* RRUFQAMT *q***

Where:

RUFQAMT *q* = ((MCPCRU *m*) \* RUFQ *q*)

RRUFQAMT *q* = MCPCRU *rs* \* RRUFQ *q,* *rs*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| RUFQAMTQSETOT *q* | $ | *Reg-Up Failure Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Up, for the hour. |
| RRUFQAMT *q* | $ | *Reconfiguration Reg-Up Failure Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Up, for the hour. |
| RUFQAMT *q* | $ | *Reg-Up Failure Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with failures on its Ancillary Service Supply Responsibility for Reg-Up, for the hour. |
| MCPCRU *m* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Up by market—*The MCPC for Reg-Up in the market *m*, for the hour. |
| MCPCRU *rs* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Up by RSASM—*The MCPC for Reg-Up in the RSASM *rs*, for the hour. |
| RUFQ *q* | MW | *Reg-Up Failure Quantity per QSE—*QSE *q* total capacity associated with failures on its Ancillary Service Supply Responsibility for Reg-Up, for the hour. |
| RRUFQ *q, rs* | MW | *Reconfiguration Reg-Up Failure Quantity per QSE—*QSE *q* total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Up, for the hour. |
| *rs* | none | The RSASM for the given Operating Hour. |
| *m* | none | The DAM, SASM, or RSASM for the given Operating Hour. |
| *q* | none | A QSE. |

(b) The total charge of failure on Ancillary Service Supply Responsibility for Reg-Down by QSE, if applicable:

**RDFQAMTQSETOT *q* = RDFQAMT *q +* RRDFQAMT *q***

Where:

RDFQAMT *q* = ((MCPCRD *m*) \* RDFQ *q*)

RRDFQAMT *q* = MCPCRD *rs* \* RRDFQ *q,* *rs*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| RDFQAMTQSETOT *q* | $ | *Reg-Down Failure Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Down, for the hour. |
| RRDFQAMT *q* | $ | *Reconfiguration Reg-Down Failure Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Down, for the hour. |
| RDFQAMT *q* | $ | *Reg-Down Failure Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with failures on its Ancillary Service Supply Responsibility for Reg-Down, for the hour. |
| MCPCRD *m* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Down by market—*The MCPC for Reg-Down in the market *m*, for the hour. |
| MCPCRD *rs* | $/MW per hour | *Market Clearing Price for Capacity for Reg-Down by RSASM—*The MCPC for Reg-Down in the RSASM *rs*, for the hour. |
| RDFQ *q* | MW | *Reg-Down Failure Quantity per QSE*—QSE *q*’s total capacity associated with failures on its Ancillary Service Supply Responsibility for Reg-Down, for the hour. |
| RRDFQ *q, rs* | MW | *Reconfiguration Reg-Down Failure Quantity per QSE*—QSE *q*’s total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Down, for the hour. |
| *rs* | none | The RSASM for the given Operating Hour. |
| *m* | none | The DAM, SASM, or RSASM for the given Operating Hour. |
| *q* | none | A QSE. |

(c) The total charge of failure on Ancillary Service Supply Responsibility for RRS by QSE, if applicable:

**RRFQAMTQSETOT *q* = RRFQAMT *q +* RRRFQAMT *q***

Where:

RRFQAMT *q* = ((MCPCRR *m*) \* RRFQ *q*)

RRRFQAMT *q* = MCPCRR *rs* \* RRRFQ *q,* *rs*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| RRFQAMTQSETOT *q* | $ | *Responsive Reserve Failure Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for RRS, for the hour. |
| RRRFQAMT *q* | $ | *Reconfiguration Responsive Reserve Failure Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for RRS, for the hour. |
| RRFQAMT *q* | $ | *Responsive Reserve Failure Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with failures on its Ancillary Service Supply Responsibility for RRS, for the hour. |
| MCPCRR *m* | $/MW per hour | *Market Clearing Price for Capacity for Responsive Reserve per market—*The MCPC for RRS in the market *m*, for the hour. |
| MCPCRR *rs* | $/MW per hour | *Market Clearing Price for Capacity for Responsive Reserve per RSASM—*The MCPC for RRS in the RSASM *rs*, for the hour. |
| RRFQ *q* | MW | *Responsive Reserve Failure Quantity per QSE -* QSE *q*’s total capacity associated with failures on its Ancillary Service Supply Responsibility for RRS, for the hour. |
| RRRFQ *q, rs* | MW | *Reconfiguration Responsive Reserve Failure Quantity per QSE—*QSE *q*’s total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for RRS, for the hour. |
| *rs* | none | The RSASM for the given Operating Hour. |
| *m* | none | The DAM, SASM, or RSASM for the given Operating Hour. |
| *q* | none | A QSE. |

(d) The total charge of failure on Ancillary Service Supply Responsibility for Non-Spin by QSE, if applicable:

**NSFQAMTQSETOT *q* = NSFQAMT *q +* RNSFQAMT *q***

Where:

NSFQAMT *q* = ((MCPCNS *m*) \* NSFQ *q*)

RNSFQAMT *q* = MCPCNS *rs* \* RNSFQ *q,* *rs*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| NSFQAMTQSETOT *q* | $ | *Non-Spin Failure Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for Non-Spin, for the hour. |
| RNSFQAMT *q* | $ | *Reconfiguration Non-Spin Failure Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for Non-Spin, for the hour. |
| NSFQAMT *q* | $ | *Non-Spin Failure Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with failures on its Ancillary Service Supply Responsibility for Non-Spin, for the hour. |
| MCPCNS *m* | $/MW per hour | *Market Clearing Price for Capacity for Non-Spin by market—*The MCPC for Non-Spin in the market *m*, for the hour. |
| MCPCNS *rs* | $/MW per hour | *Market Clearing Price for Capacity for Non-Spin by RSASM—*The MCPC for Non-Spin in the RSASM *rs*, for the hour. |
| NSFQ *q* | MW | *Non-Spin Failure Quantity per QSE—*QSE *q*’s total capacity associated with failures on its Ancillary Service Supply Responsibility for Non-Spin, for the hour. |
| RNSFQ *q, rs* | MW | *Reconfiguration Non-Spin Failure Quantity per QSE—*QSE *q*’s total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for Non-Spin, for the hour. |
| *rs* | none | The RSASM for the given Operating Hour. |
| *m* | none | The DAM, SASM, or RSASM for the given Operating Hour. |
| *q* | none | A QSE. |

(e) The total charge of failure on Ancillary Service Supply Responsibility for FRS by QSE, if applicable:

**FRFQAMTQSETOT *q* = FRFQAMT *q +* RFRFQAMT *q***

Where:

FRFQAMT *q* = ((MCPCFR *m*) \* FRFQ *q*)

RFRFQAMT *q* = MCPCFR *rs* \* RFRFQ *q,* *rs*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| FRFQAMTQSETOT *q* | $ | *Frequency Response Service Failure Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for FRS, for the hour. |
| RFRFQAMT *q* | $ | *Reconfiguration Frequency Response Service Failure Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for FRS, for the hour. |
| FRFQAMT *q* | $ | *Frequency Response Service Failure Quantity Amount per QSE*—The charge to QSE *q* for its total capacity associated with failures on its Ancillary Service Supply Responsibility for FRS, for the hour. |
| MCPCFR *m* | $/MW per hour | *Market Clearing Price for Capacity for Frequency Response Service per market—*The MCPC for FRS in the market *m*, for the hour. |
| MCPCFR *rs* | $/MW per hour | *Market Clearing Price for Capacity for Frequency Response Service per RSASM—*The MCPC for FRS in the RSASM *rs*, for the hour. |
| FRFQ *q* | MW | *Frequency Response Service Failure Quantity per QSE -* QSE *q*’s total capacity associated with failures on its Ancillary Service Supply Responsibility for FRS, for the hour. |
| RFRFQ *q, rs* | MW | *Reconfiguration Frequency Response Service Failure Quantity per QSE—*QSE *q*’s total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for FRS, for the hour. |
| *rs* | none | The RSASM for the given Operating Hour. |
| *m* | none | The DAM, SASM, or RSASM for the given Operating Hour. |
| *q* | none | A QSE. |

6.7.4 Adjustments to Cost Allocations for Ancillary Services Procurement

(1) Each QSE for which ERCOT purchases Ancillary Service capacity in the DAM, a SASM, or an RSASM, is charged for the QSE’s share of the net costs incurred for each service. For each QSE, its share of the DAM costs has been calculated in Section 4.6.4, Settlement of Ancillary Services Procured in the DAM; its share of the net total costs incurred in the DAM, a SASM, or an RSASM less its DAM charge is calculated in this section.

(2) For Reg-Up, if applicable:

(a) The net total costs for Reg-Up for a given Operating Hour is calculated as follows:

**RUCOSTTOT = (-1) \* ((RTPCRUAMTTOT *m*) + PCRUAMTTOT + RUFQAMTTOT +**

**RUINFQAMTTOT)**

Where:

Total payment of SASM- and RSASM-procured capacity for Reg-Up by market

RTPCRUAMTTOT *m* = RTPCRUAMT *q, m*

Total payment of DAM-procured capacity for Reg-Up

PCRUAMTTOT = PCRUAMT *q*

Total charge of failure on Ancillary Service Supply Responsibility for Reg-Up

RUFQAMTTOT = RUFQAMTQSETOT *q*

Total payment of SASM- and RSASM-procured capacity for Reg-Up by QSE

RTPCRUAMTQSETOT *q* = RTPCRUAMT *q, m*

Total charge of infeasible Ancillary Service Supply Responsibility for Reg-Up

RUINFQAMTTOT =  RUINFQAMT *q*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RUCOSTTOT | $ | *Reg-Up Cost Total*—The net total costs for Reg-Up for the hour. |
| RTPCRUAMTTOT *m* | $ | *Procured Capacity for Reg-Up Amount Total by market—*The total payments to all QSEs for the Ancillary Service Offers cleared in the market *m* for Reg-Up, for the hour. |
| RTPCRUAMT *q, m* | $ | *Procured Capacity for Reg-Up Amount per QSE by market*—The payment to QSE *q* for its Ancillary Service Offers cleared in the market *m* for Reg-Up, for the hour. |
| RUFQAMTTOT | $ | *Reg-Up Failure Quantity Amount Total*—The total charges to all QSEs for their capacity associated with failures and reconfiguration reductions on their Ancillary Service Supply Responsibilities for Reg-Up, for the hour. |
| RUFQAMTQSETOT *q* | $ | *Reg-Up Failure Quantity Amount Total per QSE*—The charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Up, for the hour. |
| RTPCRUAMTQSETOT *q* | $ | *Procured Capacity for Reg-Up Amount Total per QSE*—The total payments to a QSE *q* in all SASMs and RSASMs for the Ancillary Service Offers cleared for Reg-Up, for the hour. |
| PCRUAMT *q* | $ | *Procured Capacity for Reg-Up Amount per QSE in DAM*—The DAM Reg-Up payment for QSE *q*, for the hour. |
| RUINFQAMTTOT | $ | *Reg-Up Infeasible Quantity Amount Total* — The charge to all QSEs for their total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Reg-Up, for the hour. |
| RUINFQAMT *q* | $ | *Reg-Up Infeasible Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Reg-Up, for the hour. |
| PCRUAMTTOT | $ | *Procured Capacity for Reg-Up Amount Total in DAM*—The total of the DAM Reg-Up payments for all QSEs, for the hour. |
| *q* | none | A QSE. |
| *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [NPRR841: Replace paragraph (a) above with the following upon system implementation:]  (a) The net total costs for Reg-Up for a given Operating Hour is calculated as follows:  **RUCOSTTOT = (-1) \* ((RTPCRUAMTTOT *m*) + PCRUAMTTOT + RUFQAMTTOT +**  **RUINFQAMTTOT + RUMWINFATOT)**  Where:  Total payment of SASM- and RSASM-procured capacity for Reg-Up by market  RTPCRUAMTTOT *m* = RTPCRUAMT *q, m*  Total payment of DAM-procured capacity for Reg-Up  PCRUAMTTOT = PCRUAMT *q*  Total charge of failure on Ancillary Service Supply Responsibility for Reg-Up  RUFQAMTTOT = RUFQAMTQSETOT *q*  Total payment of SASM- and RSASM-procured capacity for Reg-Up by QSE  RTPCRUAMTQSETOT *q* = RTPCRUAMT *q, m*  Total charge of infeasible Ancillary Service Supply Responsibility for Reg-Up  RUINFQAMTTOT =  RUINFQAMT *q*  Total Real-Time DAM Make-Whole Payment for Reg-Up  RUMWINFATOT =  RUMWINFA *q, h*  The above variables are defined as follows:   |  |  |  | | --- | --- | --- | | **Variable** | **Unit** | **Description** | | RUCOSTTOT | $ | *Reg-Up Cost Total*—The net total costs for Reg-Up for the hour. | | RTPCRUAMTTOT *m* | $ | *Procured Capacity for Reg-Up Amount Total by market—*The total payments to all QSEs for the Ancillary Service Offers cleared in the market *m* for Reg-Up, for the hour. | | RUMWINFATOT | $ | *Reg-Up Make-Whole Infeasible Amount total*⎯ The total Real-Time calculated payment to all QSEs*,* for their contribution of Reg-Up, to make-whole the Startup and energy costs of all Resources committed in the DAM, for the hour. | | RUMWINFA *q, h* | $ | *Reg-Up Make-Whole Infeasible Amount per QSE per hour*⎯ The total Real-Time calculated payment to QSE *q,* for its contribution of Reg-Up, to make-whole the Startup and energy costs of all Resources committed in the DAM, for the hour *h*. | | RTPCRUAMT *q, m* | $ | *Procured Capacity for Reg-Up Amount per QSE by market*—The payment to QSE *q* for its Ancillary Service Offers cleared in the market *m* for Reg-Up, for the hour. | | RUFQAMTTOT | $ | *Reg-Up Failure Quantity Amount Total*—The total charges to all QSEs for their capacity associated with failures and reconfiguration reductions on their Ancillary Service Supply Responsibilities for Reg-Up, for the hour. | | RUFQAMTQSETOT *q* | $ | *Reg-Up Failure Quantity Amount Total per QSE*—The charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Up, for the hour. | | RTPCRUAMTQSETOT *q* | $ | *Procured Capacity for Reg-Up Amount Total per QSE*—The total payments to a QSE *q* in all SASMs and RSASMs for the Ancillary Service Offers cleared for Reg-Up, for the hour. | | PCRUAMT *q* | $ | *Procured Capacity for Reg-Up Amount per QSE in DAM*—The DAM Reg-Up payment for QSE *q*, for the hour. | | RUINFQAMTTOT | $ | *Reg-Up Infeasible Quantity Amount Total* — The charge to all QSEs for their total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Reg-Up, for the hour. | | RUINFQAMT *q* | $ | *Reg-Up Infeasible Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Reg-Up, for the hour. | | PCRUAMTTOT | $ | *Procured Capacity for Reg-Up Amount Total in DAM*—The total of the DAM Reg-Up payments for all QSEs, for the hour. | | *q* | none | A QSE. | | *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. | |

(b) Each QSE’s share of the net total costs for Reg-Up for the Operating Hour is calculated as follows:

**RUCOST *q* = RUPR \* RUQ *q***

Where:

RUPR = RUCOSTTOT / RUQTOT

RUQTOT = RUQ *q*

RUQ *q* = RUO *q* – SARUQ *q*

RUO *q* = (SARUQ *q* + (RTPCRU *q, m*)+ PCRU *q* –

RUFQ *q* – RRUFQ *q*) \* HLRS *q*

SARUQ *q*= DASARUQ *q* + RTSARUQ *q*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RUCOST *q* | $ | *Reg-Up Cost per QSE*—QSE *q*’s share of the net total costs for Reg-Up, for the hour. |
| RUPR | $/MW per hour | *Reg-Up Price—*The price for Reg-Up calculated based on the net total costs for Reg-Up, for the hour. |
| RUCOSTTOT | $ | *Reg-Up Cost Total*—The net total costs for Reg-Up, for the hour. See item (2)(a) above. |
| RUQTOT | MW | *Reg-Up Quantity Total*—The sum of every QSE’s Ancillary Service Obligation minus its self-arranged Reg-Up quantity in the DAM and any and all SASMs, for the hour. |
| RUQ *q* | MW | *Reg-Up Quantity per QSE*—The QSE *q*’s Ancillary Service Obligation minus its self-arranged Reg-Up quantity in the DAM and any and all SASMs, for the hour. |
| RUO *q* | MW | *Reg-Up Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour. |
| 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 Day-Ahead. |
| RTSARUQ *q* | MW | *Self-Arranged Reg-Up Quantity per QSE for all SASMs*—The sum of all self-arranged Reg-Up quantities submitted by QSE *q* for all SASMs due to an increase in the Ancillary Service Plan per Section 4.4.7.1, Self-Arranged Ancillary Service Quantities. |
| RTPCRU *q, m* | MW | *Procured Capacity for Reg-Up per QSE by market—*The MW portion of QSE *q*’s Ancillary Service Offers cleared in the market *m* to provide Reg-Up, for the hour. |
| RUFQ *q* | MW | *Reg-Up Failure Quantity per QSE—*QSE *q*’s total capacity associated with failures on its Ancillary Service Supply Responsibility for Reg-Up, for the hour. |
| RRUFQ *q* | MW | *Reconfiguration Reg-Up Failure Quantity per QSE—*QSE *q* total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Up, for the hour. |
| HLRS *q* | none | *The Hourly Load Ratio Share calculated for QSE q for the hour*. See Section 6.6.2.4, QSE Load Ratio Share for an Operating Hour. |
| PCRU *q* | MW | *Procured Capacity for Reg-Up per QSE in DAM*—The total Reg-Up capacity quantity awarded to QSE *q* in the DAM for all the Resources represented by the QSE, for the hour. |
| SARUQ*q* | MW | *Total Self-Arranged Reg-Up Quantity per QSE for all markets*—The sum of all self-arranged Reg-Up quantities submitted by QSE *q* for DAM and all SASMs. |
| *q* | none | A QSE. |
| *m* | none | A SASM for the given Operating Hour. |

(c) The adjustment to each QSE’s DAM charge for the Reg-Up for the Operating Hour, due to changes during the Adjustment Period or Real-Time operations, is calculated as follows:

**RTRUAMT *q*= RUCOST *q* – DARUAMT *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RTRUAMT *q* | $ | *Real-Time Reg-Up Amount per QSE*—The adjustment to QSE *q*’s share of the costs for Reg-Up, for the hour. |
| RUCOST *q* | $ | *Reg-Up Cost per QSE*—QSE *q*’s share of the net total costs for Reg-Up, for the hour. |
| DARUAMT *q* | $ | *Day-Ahead Reg-Up Amount per QSE*—QSE *q*’s share of the DAM cost for Reg-Up, for the hour. |
| *q* | none | A QSE. |

(3) For Reg-Down, if applicable:

(a) The net total costs for Reg-Down for a given Operating Hour is calculated as follows:

**RDCOSTTOT = (-1) \* ((RTPCRDAMTTOT *m*) + PCRDAMTTOT + RDFQAMTTOT +**

**RDINFQAMTTOT)**

Where:

Total payment of SASM- and RSASM-procured capacity for Reg-Down by market

RTPCRDAMTTOT *m* = RTPCRDAMT *q, m*

Total payment of DAM-procured capacity for Reg-Down

PCRDAMTTOT= PCRDAMT *q*

Total charge of failure on Ancillary Service Supply Responsibility for Reg-Down

RDFQAMTTOT = RDFQAMTQSETOT *q*

Total payment of SASM- and RSASM-procured capacity for Reg-Down by QSE

RTPCRDAMTQSETOT *q* = RTPCRDAMT *q, m*

Total charge of infeasible Ancillary Service Supply Responsibility for Reg-Down

RDINFQAMTTOT =  RDINFQAMT *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| RDCOSTTOT | $ | *Reg-Down Cost Total*—The net total costs for Reg-Down, for the hour. |
| RTPCRDAMTTOT *m* | $ | *Procured Capacity for Reg-Down Amount Total by market—*The total payments to all QSEs for the Ancillary Service Offers cleared in the market *m* for Reg-Down, for the hour. |
| RTPCRDAMT *q, m* | $ | *Procured Capacity for Reg-Down Amount per QSE by market*—The payment to QSE *q* for its Ancillary Service Offers cleared in the market *m* for Reg-Down, for the hour. |
| RDFQAMTTOT | $ | *Reg-Down Failure Quantity Amount Total*—The total charges to all QSEs for their capacity associated with failures on their Ancillary Service Supply Responsibilities for Reg-Down, for the hour. |
| RDFQAMTQSETOT *q* | $ | *Reg-Down Failure Quantity Amount Total per QSE*—The charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Down, for the hour. |
| RTPCRDAMTQSETOT *q* | $ | *Procured Capacity for Reg-Down Amount Total per QSE*—The total payments to a QSE *q* in all SASMs and RSASMs for the Ancillary Service Offers cleared for Reg-Down, for the hour. |
| PCRDAMT *q* | $ | *Procured Capacity for Reg-Down Amount per QSE for DAM*—The DAM Reg-Down payment for QSE *q*, for the hour. |
| PCRDAMTTOT | $ | *Procured Capacity for Reg-Down Amount Total in DAM*—The total of the DAM Reg-Down payments for all QSEs for the hour. |
| RDINFQAMTTOT | $ | *Reg-Down Infeasible Quantity Amount Total* — The charge to all QSEs for their total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Reg-Down, for the hour. |
| RDINFQAMT *q* | $ | *Reg-Down Infeasible Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with infeasible deployment of its Ancillary Service Supply Responsibilities for Reg-Down, for the hour. |
| *q* | none | A QSE. |
| *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [NPRR841: Replace paragraph (a) above with the following upon system implementation:]  (a) The net total costs for Reg-Down for a given Operating Hour is calculated as follows:  **RDCOSTTOT = (-1) \* ((RTPCRDAMTTOT *m*) + PCRDAMTTOT + RDFQAMTTOT +**  **RDINFQAMTTOT** + **RDMWINFATOT)**  Where:  Total payment of SASM- and RSASM-procured capacity for Reg-Down by market  RTPCRDAMTTOT *m* = RTPCRDAMT *q, m*  Total payment of DAM-procured capacity for Reg-Down  PCRDAMTTOT= PCRDAMT *q*  Total charge of failure on Ancillary Service Supply Responsibility for Reg-Down  RDFQAMTTOT = RDFQAMTQSETOT *q*  Total payment of SASM- and RSASM-procured capacity for Reg-Down by QSE  RTPCRDAMTQSETOT *q* = RTPCRDAMT *q, m*  Total charge of infeasible Ancillary Service Supply Responsibility for Reg-Down  RDINFQAMTTOT =  RDINFQAMT *q*  Total Real-Time Day-Ahead Make-Whole Payment for Reg-Down  RDMWINFATOT =  RDMWINFA *q, h*  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | RDCOSTTOT | $ | *Reg-Down Cost Total*—The net total costs for Reg-Down, for the hour. | | RTPCRDAMTTOT *m* | $ | *Procured Capacity for Reg-Down Amount Total by market—*The total payments to all QSEs for the Ancillary Service Offers cleared in the market *m* for Reg-Down, for the hour. | | RTPCRDAMT *q, m* | $ | *Procured Capacity for Reg-Down Amount per QSE by market*—The payment to QSE *q* for its Ancillary Service Offers cleared in the market *m* for Reg-Down, for the hour. | | RDFQAMTTOT | $ | *Reg-Down Failure Quantity Amount Total*—The total charges to all QSEs for their capacity associated with failures on their Ancillary Service Supply Responsibilities for Reg-Down, for the hour. | | RDMWINFATOT | $ | *Reg-Down Make-Whole Infeasible Amount total*⎯ The total Real-Time calculated payment to all QSEs*,* for their contribution of Reg-Down, to make-whole the Startup and energy costs of all Resources committed in the DAM, for the hour. | | RDMWINFA *q, h* | $ | *Reg-Down Make-Whole Infeasible Amount per QSE per hour*⎯ The total Real-Time calculated payment to QSE *q,* for its contribution of Reg-Down, to make-whole the Startup and energy costs of all Resources committed in the DAM, for the hour *h*. | | RDFQAMTQSETOT *q* | $ | *Reg-Down Failure Quantity Amount Total per QSE*—The charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Down, for the hour. | | RTPCRDAMTQSETOT *q* | $ | *Procured Capacity for Reg-Down Amount Total per QSE*—The total payments to a QSE *q* in all SASMs and RSASMs for the Ancillary Service Offers cleared for Reg-Down, for the hour. | | PCRDAMT *q* | $ | *Procured Capacity for Reg-Down Amount per QSE for DAM*—The DAM Reg-Down payment for QSE *q*, for the hour. | | PCRDAMTTOT | $ | *Procured Capacity for Reg-Down Amount Total in DAM*—The total of the DAM Reg-Down payments for all QSEs for the hour. | | RDINFQAMTTOT | $ | *Reg-Down Infeasible Quantity Amount Total* — The charge to all QSEs for their total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Reg-Down, for the hour. | | RDINFQAMT *q* | $ | *Reg-Down Infeasible Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with infeasible deployment of its Ancillary Service Supply Responsibilities for Reg-Down, for the hour. | | *q* | none | A QSE. | | *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. | |

(b) Each QSE’s share of the net total costs for Reg-Down for the Operating Hour is calculated as follows:

**RDCOST *q* = RDPR \* RDQ *q***

Where:

RDPR = RDCOSTTOT / RDQTOT

RDQTOT = RDQ *q*

RDQ *q* = RDO *q* – SARDQ *q*

RDO *q* = (SARDQ *q* + (RTPCRD *q, m*) + PCRD *q* –

RDFQ *q* – RRDFQ *q*) \* HLRS *q*

SARDQ *q* = DASARDQ *q* + RTSARDQ *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| RDCOST *q* | $ | *Reg-Down Cost per QSE*—QSE *q*’s share of the net total costs for Reg-Down, for the hour. |
| RDPR | $/MW per hour | *Reg-Down Price—*The price for Reg-Down calculated based on the net total costs for Reg-Down, for the hour. |
| RDCOSTTOT | $ | *Reg-Down Cost Total*—The net total costs for Reg-Down, for the hour. See item (3)(a) above. |
| RDQTOT | MW | *Reg-Down Quantity Total*—The sum of every QSE’s Ancillary Service Obligation minus its self-arranged Reg-Down quantity in the DAM and any and all SASMs for the hour. |
| RDQ *q* | MW | *Reg-Down Quantity per QSE*—The QSE *q*’s Ancillary Service Obligation minus its self-arranged Reg-Down quantity in the DAM and any and all SASMs, for the hour. |
| RDO *q* | MW | *Reg-Down Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour. |
| DASARDQ *q* | MW | *Self-Arranged Reg-Down Quantity per QSE for DAM*—The self-arranged Reg-Down quantity submitted by QSE *q* before 1000 in the Day-Ahead. |
| RTSARDQ *q* | MW | *Self-Arranged Reg-Down Quantity per QSE for all SASMs*—The sum of all self-arranged Reg-Down quantities submitted by QSE *q* for all SASMs due to an increase in the Ancillary Service Plan per Section 4.4.7.1. |
| RTPCRD *q, m* | MW | *Procured Capacity for Reg-Down per QSE by market—*The MW portion of QSE *q*’s Ancillary Service Offers cleared in the market *m* to provide Reg-Down, for the hour. |
| RDFQ *q* | MW | *Reg-Down Failure Quantity per QSE—*QSE *q*’s total capacity associated with failures on its Ancillary Service Supply Responsibility for Reg-Down, for the hour. |
| RRDFQ *q* | MW | *Reconfiguration Reg-Down Failure Quantity per QSE*—QSE *q*’s total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for Reg-Down, for the hour. |
| HLRS *q* |  | *The Hourly Load Ratio Share calculated for QSE q for the hour*. See Section 6.6.2.4. |
| PCRD *q* | MW | *Procured Capacity for Reg-Down per QSE in DAM*—The total Reg-Down capacity quantity awarded to QSE *q* in the DAM for all the Resources represented by the QSE, for the hour. |
| SARDQ *q* | MW | *Total Self-Arranged Reg-Down Quantity per QSE for all markets*—The sum of all self-arranged Reg-Down quantities submitted by QSE *q* for DAM and all SASMs. |
| *q* | none | A QSE. |
| *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. |

(c) The adjustment to each QSE’s DAM charge for the Reg-Down for the Operating Hour, due to changes during the Adjustment Period or Real-Time operations, is calculated as follows:

**RTRDAMT *q* = RDCOST *q* – DARDAMT *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RTRDAMT *q* | $ | *Real-Time Reg-Down Amount per QSE*—The adjustment to QSE *q*’s share of the costs for Reg-Down, for the hour. |
| RDCOST *q* | $ | *Reg-Down Cost per QSE*—QSE *q*’s share of the net total costs for Reg-Down, for the hour. |
| DARDAMT *q* | $ | *Day-Ahead Reg-Down Amount per QSE*—QSE *q*’s share of the DAM cost for Reg-Down, for the hour. |
| *q* | none | A QSE. |

(4) For RRS, if applicable:

(a) The net total costs for RRS for a given Operating Hour is calculated as follows:

**RRCOSTTOT = (-1) \* ((RTPCRRAMTTOT *m*) + PCRRAMTTOT + RRFQAMTTOT +**

**RRINFQAMTTOT)**

Where:

Total payment of SASM- and RSASM-procured capacity for RRS by market

RTPCRRAMTTOT *m* = RTPCRRAMT *q, m*

Total payment of DAM-procured capacity for RRS

PCRRAMTTOT= PCRRAMT *q*

Total charge of failure on Ancillary Service Supply Responsibility for RRS

RRFQAMTTOT = RRFQAMTQSETOT *q*

Total payment of SASM- and RSASM-procured capacity RRS Service by QSE

RTPCRRAMTQSETOT *q* = RTPCRRAMT *q, m*

Total charge of infeasible Ancillary Service Supply Responsibility for RRS

RRINFQAMTTOT =  RRINFQAMT *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| RRCOSTTOT | $ | *Responsive Reserve Cost Total*—The net total costs for RRS, for the hour. |
| RTPCRRAMTTOT *m* | $ | *Procured Capacity for Responsive Reserve Amount Total by market—*The total payments to all QSEs for the Ancillary Service Offers cleared in the market *m* for RRS, for the hour. |
| RTPCRRAMT *q, m* | $ | *Procured Capacity for Responsive Reserve Amount per QSE by market*—The payment to QSE *q* for its Ancillary Service Offers cleared in the market *m* for RRS, for the hour. |
| RRFQAMTTOT | $ | *Responsive Reserve Failure Quantity Amount Total*—The total charges to all QSEs for their capacity associated with failures and reconfiguration reductions on their Ancillary Service Supply Responsibilities for RRS, for the hour. |
| RRFQAMTQSETOT *q* | $ | *Responsive Reserve Failure Quantity Amount Total per QSE*—The charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for RRS, for the hour. |
| RTPCRRAMTQSETOT *q* | $ | *Procured Capacity for Responsive Reserve Amount Total per QSE*—The total payments to a QSE *q* in all SASMs and RSASMs for the Ancillary Service Offers cleared for RRS, for the hour. |
| PCRRAMT *q* | $ | *Procured Capacity for Responsive Reserve Amount per QSE for DAM*—The DAM RRS payment for QSE *q*, for the hour. |
| PCRRAMTTOT | $ | *Procured Capacity for Responsive Reserve Amount Total in DAM*—The total of the DAM RRS payments for all QSEs, for the hour. |
| RRINFQAMTTOT | $ | *Responsive Reserve Infeasible Quantity Amount Total* — The charge to all QSEs for their total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for RRS, for the hour. |
| RRINFQAMT *q* | $ | *Responsive Reserve Infeasible Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for RRS, for the hour. |
| *q* | none | A QSE. |
| *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [NPRR841: Replace paragraph (a) above with the following upon system implementation:]  (a) The net total costs for RRS for a given Operating Hour is calculated as follows:  **RRCOSTTOT = (-1) \* ((RTPCRRAMTTOT *m*) + PCRRAMTTOT + RRFQAMTTOT +**  **RRINFQAMTTOT + RRMWINFATOT)**  Where:  Total payment of SASM- and RSASM-procured capacity for RRS by market  RTPCRRAMTTOT *m* = RTPCRRAMT *q, m*  Total payment of DAM-procured capacity for RRS  PCRRAMTTOT= PCRRAMT *q*  Total charge of failure on Ancillary Service Supply Responsibility for RRS  RRFQAMTTOT = RRFQAMTQSETOT *q*  Total payment of SASM- and RSASM-procured capacity RRS Service by QSE  RTPCRRAMTQSETOT *q* = RTPCRRAMT *q, m*  Total charge of infeasible Ancillary Service Supply Responsibility for RRS  RRINFQAMTTOT =  RRINFQAMT *q*  Total Real-Time Day-Ahead Make-Whole Payment for RRS  RRMWINFATOT =  RRMWINFA *q, h*  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | RRCOSTTOT | $ | *Responsive Reserve Cost Total*—The net total costs for RRS, for the hour. | | RTPCRRAMTTOT *m* | $ | *Procured Capacity for Responsive Reserve Amount Total by market—*The total payments to all QSEs for the Ancillary Service Offers cleared in the market *m* for RRS, for the hour. | | RTPCRRAMT *q, m* | $ | *Procured Capacity for Responsive Reserve Amount per QSE by market*—The payment to QSE *q* for its Ancillary Service Offers cleared in the market *m* for RRS, for the hour. | | RRFQAMTTOT | $ | *Responsive Reserve Failure Quantity Amount Total*—The total charges to all QSEs for their capacity associated with failures and reconfiguration reductions on their Ancillary Service Supply Responsibilities for RRS, for the hour. | | RRMWINFATOT | $ | *Responsive Reserve Make-Whole Infeasible Amount total*⎯ The total Real-Time calculated payment to all QSEs*,* for their contribution of RRS, to make-whole the Startup and energy costs of all Resources committed in the DAM, for the hour. | | RRMWINFA *q, h* | $ | *Responsive Reserve Make-Whole Infeasible Amount per QSE per hour*⎯ The total Real-Time calculated payment to QSE *q,* for its contribution of RRS, to make-whole the Startup and energy costs of all Resources committed in the DAM, for the hour *h*. | | RRFQAMTQSETOT *q* | $ | *Responsive Reserve Failure Quantity Amount Total per QSE*—The charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for RRS, for the hour. | | RTPCRRAMTQSETOT *q* | $ | *Procured Capacity for Responsive Reserve Amount Total per QSE*—The total payments to a QSE *q* in all SASMs and RSASMs for the Ancillary Service Offers cleared for RRS, for the hour. | | PCRRAMT *q* | $ | *Procured Capacity for Responsive Reserve Amount per QSE for DAM*—The DAM RRS payment for QSE *q*, for the hour. | | PCRRAMTTOT | $ | *Procured Capacity for Responsive Reserve Amount Total in DAM*—The total of the DAM RRS payments for all QSEs, for the hour. | | RRINFQAMTTOT | $ | *Responsive Reserve Infeasible Quantity Amount Total* — The charge to all QSEs for their total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for RRS, for the hour. | | RRINFQAMT *q* | $ | *Responsive Reserve Infeasible Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for RRS, for the hour. | | *q* | none | A QSE. | | *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. | |

(b) Each QSE’s share of the net total costs for RRS for the Operating Hour is calculated as follows:

**RRCOST *q* = RRPR \* RRQ *q***

Where:

RRPR = RRCOSTTOT / RRQTOT

RRQTOT = RRQ *q*

RRQ *q* = RRO *q* – SARRQ *q*

RRO *q* = (SARRQ*q* + (RTPCRR *q, m*) + PCRR *q* –

RRFQ *q* – RRRFQ *q*) \* HLRS *q*

SARRQ *q* = DASARRQ *q* + RTSARRQ *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| RRCOST *q* | $ | *Responsive Reserve Cost per QSE*—QSE *q*’s share of the net total costs for RRS, for the hour. |
| RRPR | $/MW per hour | *Responsive Reserve Price—*The price for RRS calculated based on the net total costs for RRS, for the hour. |
| RRCOSTTOT | $ | *Responsive Reserve Cost Total*—The net total costs for RRS, for the hour. See item (4)(a) above. |
| RRQTOT | MW | *Responsive Reserve Quantity Total*—The sum of every QSE’s Ancillary Service Obligation minus its self-arranged RRS quantity in the DAM and any and all SASMs for the hour. |
| RRQ *q* | MW | *Responsive Reserve Quantity per QSE*—The QSE *q*’s Ancillary Service Obligation minus its self-arranged RRS quantity in the DAM and any and all SASMs, for the hour. |
| RRO *q* | MW | *Responsive Reserve Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour. |
| 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 Day-Ahead. |
| RTSARRQ *q* | MW | *Self-Arranged Responsive Reserve Quantity per QSE for all SASMs*—The sum of all self-arranged RRS quantities submitted by QSE *q* for all SASMs due to an increase in the Ancillary Service Plan per Section 4.4.7.1. |
| RTPCRR *q, m* | MW | *Procured Capacity for Responsive Reserve per QSE by market—*The MW portion of QSE *q*’s Ancillary Service Offers cleared in the market *m* to provide RRS, for the hour. |
| RRFQ *q* | MW | *Responsive Reserve Failure Quantity per QSE—*QSE *q*’s total capacity associated with failures on its Ancillary Service Supply Responsibility for RRS, for the hour. |
| RRRFQ *q* | MW | *Reconfiguration Responsive Reserve Failure Quantity per QSE—*QSE *q*’s total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for RRS, for the hour. |
| HLRS *q* | none | *The Hourly Load Ratio Share calculated for QSE q for the hour*. See Section 6.6.2.4. |
| PCRR *q* | MW | *Procured Capacity for Responsive Reserve per QSE in DAM*—The total RRS capacity quantity awarded to QSE *q* in the DAM for all the Resources represented by the QSE, for the hour. |
| SARRQ *q* | MW | *Total Self-Arranged Responsive Reserve Quantity per QSE for all markets*—The sum of all self-arranged RRS quantities submitted by QSE *q* for DAM and all SASMs. |
| *q* | none | A QSE. |
| *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. |

(c) The adjustment to each QSE’s DAM charge for the RRS for the Operating Hour, due to changes during the Adjustment Period or Real-Time operations, is calculated as follows:

**RTRRAMT *q* = RRCOST *q* – DARRAMT *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RTRRAMT *q* | $ | *Real-Time Responsive Reserve Amount per QSE*—The adjustment to QSE *q*’s share of the costs for RRS, for the hour. |
| RRCOST *q* | $ | *Responsive Reserve Cost per QSE*—QSE *q*’s share of the net total costs for RRS, for the hour. |
| DARRAMT *q* | $ | *Day-Ahead Responsive Reserve Amount per QSE*—QSE *q*’s share of the DAM cost for RRS, for the hour. |
| *q* | none | A QSE. |

(5) For Non-Spin, if applicable:

(a) The net total costs for Non-Spin for a given Operating Hour is calculated as follows:

**NSCOSTTOT = (-1) \* ((RTPCNSAMTTOT *m***) **+ PCNSAMTTOT + NSFQAMTTOT +**

**NSINFQAMTTOT)**

Where:

Total payment of SASM- and RSASM-procured capacity for Non-Spin by market

RTPCNSAMTTOT *m* = RTPCNSAMT *q, m*

Total payment of DAM-procured capacity for Non-Spin

PCNSAMTTOT = PCNSAMT *q*

Total charge of failure on Ancillary Service Supply Responsibility for Non-Spin

NSFQAMTTOT = NSFQAMTQSETOT *q*

Total payment of SASM- and RSASM-procured capacity for Non-Spin by QSE

RTPCNSAMTQSETOT *q* = RTPCNSAMT *q, m*

Total charge of infeasible Ancillary Service Supply Responsibility for Non-Spin

NSINFQAMTTOT =  NSINFQAMT *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| NSCOSTTOT | $ | *Non-Spin Cost Total*—The net total costs for Non-Spin, for the hour. |
| RTPCNSAMTTOT *m* | $ | *Procured Capacity for Non-Spin Amount Total by market—*The total payments to all QSEs for the Ancillary Service Offers cleared in the market *m* for Non-Spin, for the hour. |
| RTPCNSAMT *q, m* | $ | *Procured Capacity for Non-Spin Amount per QSE by market*—The payment to QSE *q* for its Ancillary Service Offers cleared in the market *m* for Non-Spin, for the hour. |
| NSFQAMTTOT | $ | *Non-Spin Failure Quantity Amount Total*—The total charges to all QSEs for their capacity associated with failures and reconfiguration reductions on their Ancillary Service Supply Responsibilities for Non-Spin, for the hour. |
| NSFQAMTQSETOT *q* | $ | *Non-Spin Failure Quantity Amount Total per QSE*—The charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for Non-Spin, for the hour. |
| RTPCNSAMTQSETOT *q* | $ | *Procured Capacity for Non-Spin Amount Total per QSE*—The total payments to a QSE *q* in all SASMs and RSASMs for the Ancillary Service Offers cleared for Non-Spin, for the hour. |
| PCNSAMT *q* | $ | *Procured Capacity for Non-Spin Amount per QSE in DAM—*The DAM Non-Spin payment for QSE *q*, for the hour. |
| PCNSAMTTOT | $ | *Procured Capacity for Non-Spin Amount Total in DAM*—The total of the DAM Non-Spin payments for all QSEs, for the hour. |
| NSINFQAMTTOT | $ | *Non-Spin Infeasible Quantity Amount Total* — The charge to all QSEs for their total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Non-Spin, for the hour. |
| NSINFQAMT *q* | $ | *Non-Spin Infeasible Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Non-Spin, for the hour. |
| *q* | none | A QSE. |
| *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [NPRR841: Replace paragraph (a) above with the following upon system implementation:]  (a) The net total costs for Non-Spin for a given Operating Hour is calculated as follows:  **NSCOSTTOT = (-1) \* ((RTPCNSAMTTOT *m***) **+ PCNSAMTTOT + NSFQAMTTOT +**  **NSINFQAMTTOT + NSMWINFATOT)**  Where:  Total payment of SASM- and RSASM-procured capacity for Non-Spin by market  RTPCNSAMTTOT *m* = RTPCNSAMT *q, m*  Total payment of DAM-procured capacity for Non-Spin  PCNSAMTTOT = PCNSAMT *q*  Total charge of failure on Ancillary Service Supply Responsibility for Non-Spin  NSFQAMTTOT = NSFQAMTQSETOT *q*  Total payment of SASM- and RSASM-procured capacity for Non-Spin by QSE  RTPCNSAMTQSETOT *q* = RTPCNSAMT *q, m*  Total charge of infeasible Ancillary Service Supply Responsibility for Non-Spin  NSINFQAMTTOT =  NSINFQAMT *q*  Total Real-Time Day-Ahead Make-Whole Payment for Non-Spin  NSMWINFATOT =  NSMWINFA *q, h*  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | NSCOSTTOT | $ | *Non-Spin Cost Total*—The net total costs for Non-Spin, for the hour. | | RTPCNSAMTTOT *m* | $ | *Procured Capacity for Non-Spin Amount Total by market—*The total payments to all QSEs for the Ancillary Service Offers cleared in the market *m* for Non-Spin, for the hour. | | RTPCNSAMT *q, m* | $ | *Procured Capacity for Non-Spin Amount per QSE by market*—The payment to QSE *q* for its Ancillary Service Offers cleared in the market *m* for Non-Spin, for the hour. | | NSFQAMTTOT | $ | *Non-Spin Failure Quantity Amount Total*—The total charges to all QSEs for their capacity associated with failures and reconfiguration reductions on their Ancillary Service Supply Responsibilities for Non-Spin, for the hour. | | NSMWINFATOT | $ | *Non Spin Make-Whole Infeasible Amount total*⎯ The total Real-Time calculated payment to all QSEs*,* for their contribution of Non-Spin, to make-whole the Startup and energy costs of all Resources committed in the DAM, for the hour. | | NSMWINFA *q, h* | $ | *Non Spin Make-Whole Infeasible Amount per QSE per hour*⎯ The total Real-Time calculated payment to QSE *q,* for its contribution of Non-Spin, to make-whole the Startup and energy costs of all Resources committed in the DAM, for the hour *h*. | | NSFQAMTQSETOT *q* | $ | *Non-Spin Failure Quantity Amount Total per QSE*—The charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for Non-Spin, for the hour. | | RTPCNSAMTQSETOT *q* | $ | *Procured Capacity for Non-Spin Amount Total per QSE*—The total payments to a QSE *q* in all SASMs and RSASMs for the Ancillary Service Offers cleared for Non-Spin, for the hour. | | PCNSAMT *q* | $ | *Procured Capacity for Non-Spin Amount per QSE in DAM—*The DAM Non-Spin payment for QSE *q*, for the hour. | | PCNSAMTTOT | $ | *Procured Capacity for Non-Spin Amount Total in DAM*—The total of the DAM Non-Spin payments for all QSEs, for the hour. | | NSINFQAMTTOT | $ | *Non-Spin Infeasible Quantity Amount Total* — The charge to all QSEs for their total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Non-Spin, for the hour. | | NSINFQAMT *q* | $ | *Non-Spin Infeasible Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for Non-Spin, for the hour. | | *q* | none | A QSE. | | *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. | |

(b) Each QSE’s share of the net total costs for Non-Spin for the Operating Hour is calculated as follows:

**NSCOST *q* = NSPR \* NSQ *q***

Where:

NSPR = NSCOSTTOT / NSQTOT

NSQTOT = NSQ *q*

NSQ *q* = NSO *q* – SANSQ *q*

NSO *q* = (SANSQ *q* + (RTPCNS *q, m*) + PCNS *q* –

NSFQ *q* – RNSFQ *q*) \* HLRS *q*

SANSQ *q* = DASANSQ *q* + RTSANSQ *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| NSCOST *q* | $ | *Non-Spin Cost per QSE*—QSE *q*’s share of the net total costs for Non-Spin, for the hour. |
| NSPR | $/MW per hour | *Non-Spin Price—*The price for Non-Spin calculated based on the net total costs for Non-Spin, for the hour. |
| NSCOSTTOT | $ | *Non-Spin Cost Total*—The net total costs for Non-Spin for the hour. See item (5)(a) above. |
| NSQTOT | MW | *Non-Spin Quantity Total*—The sum of every QSE’s Ancillary Service Obligation minus its self-arranged Non-Spin quantity in the DAM and any and all SASMs, for the hour. |
| NSQ *q* | MW | *Non-Spin Quantity per QSE*—The difference in QSE *q*’s Ancillary Service Obligation minus its self-arranged Non-Spin quantity in the DAM and any and all SASMs, for the hour. |
| NSO *q* | MW | *Non-Spin Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour. |
| DASANSQ *q* | MW | *Day-Ahead Self-Arranged Non-Spin Quantity per QSE for DAM*—The self-arranged Non-Spin quantity submitted by QSE *q* before 1000 in the Day-Ahead. |
| RTSANSQ *q* | MW | *Self-Arranged Non-Spin Quantity per QSE for all SASMs*—The sum of all self-arranged Non-Spin quantities submitted by QSE *q* for all SASMs due to an increase in the Ancillary Service Plan per Section 4.4.7.1. |
| RTPCNS *q, m* | MW | *Procured Capacity for Non-Spin per QSE by market—*The MW portion of QSE *q*’s Ancillary Service Offers cleared in the market *m* to provide Non-Spin, for the hour. |
| NSFQ *q* | MW | *Non-Spin Failure Quantity per QSE—*QSE *q*’s total capacity associated with failures on its Ancillary Service Supply Responsibility for Non-Spin, for the hour. |
| RNSFQ *q* | MW | *Reconfiguration Non-Spin Failure Quantity per QSE—*QSE *q*’s total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for Non-Spin, for the hour. |
| HLRS *q* | none | *The Hourly Load Ratio Share calculated for QSE q for the hour*. See Section 6.6.2.4. |
| PCNS *q* | MW | *Procured Capacity for Non-Spin Service per QSE in DAM*—The total Non-Spin capacity quantity awarded to QSE *q* in the DAM for all the Resources represented by the QSE, for the hour. |
| SANSQ *q* | MW | *Total Self-Arranged Non-Spin Supplied Quantity per QSE for all markets*—The sum of all self-arranged Non-Spin quantities submitted by QSE *q* for DAM and all SASMs. |
| *q* | none | A QSE. |
| *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. |

(c) The adjustment to each QSE’s DAM charge for the Non-Spin for the Operating Hour, due to changes during the Adjustment Period or Real-Time operations, is calculated as follows:

**RTNSAMT *q* = NSCOST *q* – DANSAMT *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RTNSAMT *q* | $ | *Real-Time Non-Spin Amount per QSE*—The adjustment to QSE *q*’s share of the costs for Non-Spin, for the hour. |
| NSCOST *q* | $ | *Non-Spin Cost per QSE*—QSE *q*’s share of the net total costs for Non-Spin, for the hour. |
| DANSAMT *q* | $ | *Day-Ahead Non-Spin Amount per QSE*—QSE *q*’s share of the DAM cost for Non-Spin, for the hour. |
| *q* | none | A QSE. |

(6) For FRS, if applicable:

(a) The net total costs for FRS for a given Operating Hour is calculated as follows:

**FRCOSTTOT = (-1) \* ((RTPCFRAMTTOT *m*) + PCFRAMTTOT + FRFQAMTTOT +**

**FRINFQAMTTOT)**

Where:

Total payment of SASM- and RSASM-procured capacity for FRS by market

RTPCFRAMTTOT *m* = RTPCFRAMT *q, m*

Total payment of DAM-procured capacity for FRS

PCFRAMTTOT= PCFRAMT *q*

Total charge of failure on Ancillary Service Supply Responsibility for FRS

FRFQAMTTOT = FRFQAMTQSETOT *q*

Total payment of SASM- and RSASM-procured capacity FRS by QSE

RTPCFRAMTQSETOT *q* = RTPCFRAMT *q, m*

Total charge of infeasible Ancillary Service Supply Responsibility for FRS

FRINFQAMTTOT =  FRINFQAMT *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| FRCOSTTOT | $ | *Frequency Response Service Cost Total*—The net total costs for FRS, for the hour. |
| RTPCFRAMTTOT *m* | $ | *Procured Capacity for Frequency Response Service Amount Total by market—*The total payments to all QSEs for the Ancillary Service Offers cleared in the market *m* for FRS, for the hour. |
| RTPCFRAMT *q, m* | $ | *Procured Capacity for Frequency Response Service Amount per QSE by market*—The payment to QSE *q* for its Ancillary Service Offers cleared in the market *m* for FRS, for the hour. |
| FRFQAMTTOT | $ | *Frequency Response Service Failure Quantity Amount Total*—The total charges to all QSEs for their capacity associated with failures and reconfiguration reductions on their Ancillary Service Supply Responsibilities for FRS, for the hour. |
| FRFQAMTQSETOT *q* | $ | *Frequency Response Service Failure Quantity Amount Total per QSE*—The charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for FRS, for the hour. |
| RTPCFRAMTQSETOT *q* | $ | *Procured Capacity for Frequency Response Service Amount Total per QSE*—The total payments to a QSE *q* in all SASMs and RSASMs for the Ancillary Service Offers cleared for FRS, for the hour. |
| PCFRAMT *q* | $ | *Procured Capacity for Frequency Response Service Amount per QSE for DAM*—The DAM FRS payment for QSE *q*, for the hour. |
| PCFRAMTTOT | $ | *Procured Capacity for Frequency Response Service Amount Total in DAM*—The total of the DAM FRS payments for all QSEs, for the hour. |
| FRINFQAMTTOT | $ | *Frequency Response Service Infeasible Quantity Amount Total* — The charge to all QSEs for their total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for FRS, for the hour. |
| FRINFQAMT *q* | $ | *Frequency Response Service Infeasible Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for FRS, for the hour. |
| *q* | none | A QSE. |
| *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [NPRR841: Replace paragraph (a) above with the following upon system implementation:]  (a) The net total costs for FRS for a given Operating Hour is calculated as follows:  **FRCOSTTOT = (-1) \* ((RTPCFRAMTTOT *m***) **+ PCFRAMTTOT + FRFQAMTTOT + FRINFQAMTTOT + FRMWINFATOT)**  Where:  Total payment of SASM- and RSASM-procured capacity for FRS by market  RTPCFRAMTTOT *m* = RTPCFRAMT *q, m*  Total payment of DAM-procured capacity for FRS  PCFRAMTTOT = PCFRAMT *q*  Total charge of failure on Ancillary Service Supply Responsibility for FRS  FRFQAMTTOT = FRFQAMTQSETOT *q*  Total payment of SASM- and RSASM-procured capacity for FRS by QSE  RTPCFRAMTQSETOT *q* = RTPCFRAMT *q, m*  Total charge of infeasible Ancillary Service Supply Responsibility for FRS  FRINFQAMTTOT =  FRINFQAMT *q*  Total Real-Time Day-Ahead Make-Whole Payment for FRS  FRMWINFATOT =  FRMWINFA *q, h*  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | FRCOSTTOT | $ | *Frequency Response Service Cost Total*—The net total costs for FRS, for the hour. | | RTPCFRAMTTOT *m* | $ | *Procured Capacity for Frequency Response Service Amount Total by market—*The total payments to all QSEs for the Ancillary Service Offers cleared in the market *m* for FRS, for the hour. | | RTPCFRAMT *q, m* | $ | *Procured Capacity for Frequency Response Service Amount per QSE by market*—The payment to QSE *q* for its Ancillary Service Offers cleared in the market *m* for FRS, for the hour. | | FRFQAMTTOT | $ | *Frequency Response Service Failure Quantity Amount Total*—The total charges to all QSEs for their capacity associated with failures and reconfiguration reductions on their Ancillary Service Supply Responsibilities for FRS, for the hour. | | FRMWINFATOT | $ | *Frequency Response Service Make-Whole Infeasible Amount total*⎯ The total Real-Time calculated payment to all QSEs*,* for their contribution of FRS, to make-whole the Startup and energy costs of all Resources committed in the DAM, for the hour. | | FRMWINFA *q, h* | $ | *Frequency Response Service Make-Whole Infeasible Amount per QSE per hour*⎯ The total Real-Time calculated payment to QSE *q,* for its contribution of FRS, to make-whole the Startup and energy costs of all Resources committed in the DAM, for the hour *h*. | | FRFQAMTQSETOT *q* | $ | *Frequency Response Service Failure Quantity Amount Total per QSE*—The charge to QSE *q* for its total capacity associated with failures and reconfiguration reductions on its Ancillary Service Supply Responsibility for FRS, for the hour. | | RTPCFRAMTQSETOT *q* | $ | *Procured Capacity for Frequency Response Service Amount Total per QSE*—The total payments to a QSE *q* in all SASMs and RSASMs for the Ancillary Service Offers cleared for FRS, for the hour. | | PCFRAMT *q* | $ | *Procured Capacity for Frequency Response Service Amount per QSE in DAM—*The DAM FRS payment for QSE *q*, for the hour. | | PCFRAMTTOT | $ | *Procured Capacity for Frequency Response Service Amount Total in DAM*—The total of the DAM FRS payments for all QSEs, for the hour. | | FRINFQAMTTOT | $ | *Frequency Response Service Infeasible Quantity Amount Total* — The charge to all QSEs for their total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for FRS, for the hour. | | FRINFQAMT *q* | $ | *Frequency Response Service Infeasible Quantity Amount per QSE*—The total charge to QSE *q* for its total capacity associated with infeasible deployment of Ancillary Service Supply Responsibilities for FRS, for the hour. | | *q* | none | A QSE. | | *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. | |

(b) Each QSE’s share of the net total costs for FRS for the Operating Hour is calculated as follows:

**FRCOST *q* = FRPR \* FRQ *q***

Where:

FRPR = FRCOSTTOT / FRQTOT

FRQTOT = FRQ *q*

FRQ *q* = FRO *q* – SAFRQ *q*

FRO *q* = (SAFRQ*q* + (RTPCFR *q, m*) + PCFR *q* –

FRFQ *q* – RFRFQ *q*) \* HLRS *q*

SAFRQ *q* = DASAFRQ *q* + RTSAFRQ *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| FRCOST *q* | $ | *Frequency Response Service Cost per QSE*—QSE *q*’s share of the net total costs for FRS, for the hour. |
| FRPR | $/MW per hour | *Frequency Response Service Price—*The price for FRS calculated based on the net total costs for FRS, for the hour. |
| FRCOSTTOT | $ | *Frequency Response Service Cost Total*—The net total costs for FRS, for the hour. See item (6)(a) above. |
| FRQTOT | MW | *Frequency Response Service Quantity Total*—The sum of every QSE’s Ancillary Service Obligation minus its self-arranged FRS quantity in the DAM and any and all SASMs for the hour. |
| FRQ *q* | MW | *Frequency Response Service Quantity per QSE*—The QSE *q*’s Ancillary Service Obligation minus its self-arranged FRS quantity in the DAM and any and all SASMs, for the hour. |
| FRO *q* | MW | *Frequency Response Service Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour. |
| DASAFRQ *q* | MW | *Day-Ahead Self-Arranged Frequency Response Service Quantity per QSE*—The self-arranged FRS quantity submitted by QSE *q* before 1000 in the Day-Ahead. |
| RTSAFRQ *q* | MW | *Self-Arranged Frequency Response Service Quantity per QSE for all SASMs*—The sum of all self-arranged FRS quantities submitted by QSE *q* for all SASMs due to an increase in the Ancillary Service Plan per Section 4.4.7.1. |
| RTPCFR *q, m* | MW | *Procured Capacity for Frequency Response Service per QSE by market—*The MW portion of QSE *q*’s Ancillary Service Offers cleared in the market *m* to provide FRS, for the hour. |
| FRFQ *q* | MW | *Frequency Response Service Failure Quantity per QSE—*QSE *q*’s total capacity associated with failures on its Ancillary Service Supply Responsibility for FRS, for the hour. |
| RFRFQ *q* | MW | *Reconfiguration Frequency Response Service Failure Quantity per QSE—*QSE *q*’s total capacity associated with reconfiguration reductions on its Ancillary Service Supply Responsibility for FRS, for the hour. |
| HLRS *q* | none | *The Hourly Load Ratio Share calculated for QSE q for the hour*. See Section 6.6.2.4. |
| PCFR *q* | MW | *Procured Capacity for Frequency Response Service per QSE in DAM*—The total FRS capacity quantity awarded to QSE *q* in the DAM for all the Resources represented by the QSE, for the hour. |
| SAFRQ *q* | MW | *Total Self-Arranged Frequency Response Service Quantity per QSE for all markets*—The sum of all self-arranged FRS quantities submitted by QSE *q* for DAM and all SASMs. |
| *q* | none | A QSE. |
| *m* | none | An Ancillary Service market (SASM or RSASM) for the given Operating Hour. |

(c) The adjustment to each QSE’s DAM charge for the FRS for the Operating Hour, due to changes during the Adjustment Period or Real-Time operations, is calculated as follows:

**RTFRAMT *q* = FRCOST *q* – DAFRAMT *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| RTFRAMT *q* | $ | *Real-Time Frequency Response Service Amount per QSE*—The adjustment to QSE *q*’s share of the costs for FRS, for the hour. |
| FRCOST *q* | $ | *Frequency Response Service Cost per QSE*—QSE *q*’s share of the net total costs for FRS, for the hour. |
| DAFRAMT *q* | $ | *Day-Ahead Frequency Response Service Amount per QSE*—QSE *q*’s share of the DAM cost for FRS, for the hour. |
| *q* | None | A QSE. |

6.7.5 Real-Time Ancillary Service Imbalance Payment or Charge

(1) Based on the Real-Time On-Line Reliability Deployment Price Adders, Real-Time On-Line Reserve Price Adders and a Real-Time Off-Line Reserve Price Adders, ERCOT shall calculate Ancillary Service imbalance Settlement, which will make Resources indifferent to the utilization of their capacity for energy or Ancillary Service reserves, as set forth in this Section.

(2) The payment or charge to each QSE for Ancillary Service imbalance is calculated based on the price calculation set forth in paragraph (11) of Section 6.5.7.3, Security Constrained Economic Dispatch, and applied to the following amounts for each QSE:

(a) The amount of Real-Time Metered Generation from all Generation Resources, represented by the QSE for the 15-minute Settlement Interval;

(b) The amount of On-Line capacity based on the telemetered High Sustained Limit (HSL) for all On-Line Generation Resources, the telemetered consumption from Load Resources with a validated Ancillary Service Schedule for RRS or FRS controlled by high-set under-frequency relay, and the capacity from Controllable Load Resources available to SCED;

(c) The amount of Ancillary Service Resource Responsibility for Reg-Up, RRS, FRS, and Non-Spin for all Generation and Load Resources represented by the QSE for the 15-minute Settlement Interval.

(3) Resources meeting one or more of the following conditions will be excluded from the amounts calculated pursuant to paragraphs (2)(a) and (b) above:

(a) Intermittent Renewable Resources (IRRs) excluding Wind-powered Generation Resources (WGRs);

(b) Nuclear Resources;

(c) Resources with a telemetered ONTEST, STARTUP (except Resources with Non-Spin Ancillary Service Resource Responsibility greater than zero), or SHUTDOWN Resource Status excluding Resources telemetering both STARTUP Resource Status and greater than zero Non-Spin Ancillary Service Responsibility; or

(d) Resources with a telemetered net real power (in MW) less than 95% of their telemetered Low Sustained Limit (LSL) excluding Resources telemetering both STARTUP Resource Status and greater than zero Non-Spin Ancillary Service Responsibility.

(4) Reliability Must-Run (RMR) Units and Reliability Unit Commitment (RUC) Resources On-Line during the hour due to an ERCOT instruction, except for any RUC Resource committed by a RUC Dispatch Instruction where that Resource’s QSE subsequently opted out of RUC Settlement pursuant to paragraph (11) of Section 5.5.2, Reliability Unit Commitment (RUC) Process, will be excluded from the amounts calculated for the 15-minute Settlement Interval pursuant to paragraphs (2)(a), (b), and (c) above.

(5) The Real-Time Off-Line Reserve Capacity for the QSE (RTOFFCAP) shall be administratively set to zero when the SCED snapshot of the Physical Responsive Capability (PRC) is less than or equal to the PRC MW at which Energy Emergency Alert (EEA) Level 1 is initiated.

(6) Resources that have a Under Generation Volume (UGEN) greater than zero, and are not-exempt from a Base Point Deviation Charge, as set forth in Section 6.6.5, Base Point Deviation Charge, or are not already excluded in paragraphs (3) or (4) above, for the 15-minute Settlement Interval will have the UGEN amounts removed from the amounts calculated pursuant to paragraphs (2)(a) and (b) above.

(7) The payment or charge to each QSE for the Ancillary Service Imbalance for a given 15-minute Settlement Interval is calculated as follows:

RTASIAMT *q* = (-1) \* [(RTASOLIMB *q* \* RTRSVPOR) + (RTASOFFIMB *q* \* RTRSVPOFF)]

RTRDASIAMT *q*= (-1) \* (RTASOLIMB *q* \* RTRDP)

Where:

RTASOLIMB *q*= RTOLCAP *q* – [((SYS\_GEN\_DISCFACTOR \* RTASRESP *q* ) \* ¼) – RTASOFF *q* – RTRUCNBBRESP *q*– RTCLRNSRESP *q* – RTRMRRESP *q*]

Where:

RTASOFF *q* = SYS\_GEN\_DISCFACTOR \* RTASOFFR *q, r, p*

RTRUCNBBRESP *q*= SYS\_GEN\_DISCFACTOR \*  RTRUCASA *q, r* \* ¼

RTCLRNSRESP *q* = SYS\_GEN\_DISCFACTOR \*  RTCLRNSRESPR *q, r, p*

RTRMRRESP *q* = SYS\_GEN\_DISCFACTOR \* (HRRADJ *q, r, p* + HRUADJ *q, r, p* + HNSADJ *q, r, p*) \* ¼

RTOLCAP *q* = (RTOLHSL *q* – RTMGQ *q* – SYS\_GEN\_DISCFACTOR \* (UGENA *q, r, p*)) + RTCLRCAP *q* + RTNCLRCAP *q*

Where:

RTNCLRCAP *q* = Min(Max(RTNCLRNPC *q* – RTNCLRLPC *q*, 0.0), RTNCLRRRS *q* \* 1.5)

RTNCLRRRS *q =* SYS\_GEN\_DISCFACTOR \*  RTNCLRRRSR *q, r, p*

RTNCLRNPC *q =* SYS\_GEN\_DISCFACTOR \* RTNCLRNPCR *q, r, p*

RTNCLRLPC *q =* SYS\_GEN\_DISCFACTOR \* RTNCLRLPCR *q, r, p*

RTOLHSL *q* = SYS\_GEN\_DISCFACTOR \* RTOLHSLRA *q, r, p*

RTMGQ *q* = SYS\_GEN\_DISCFACTOR \* RTMGA *q, r, p*

If RTMGA *q, r, p* > RTOLHSLRA *q, r, p*

Then RTMGA *q, r, p* = RTOLHSLRA *q, r, p*

RTCLRCAP *q*= RTCLRNPC *q* – RTCLRLPC *q* – RTCLRNS *q* + RTCLRREG *q*

Where:

RTCLRNPC *q*= SYS\_GEN\_DISCFACTOR \* RTCLRNPCR ***q, r, p***

RTCLRLPC *q* = SYS\_GEN\_DISCFACTOR \* RTCLRLPCR ***q, r, p***

RTCLRNS *q* = SYS\_GEN\_DISCFACTOR \*  RTCLRNSR ***q, r, p***

RTCLRREG *q* = SYS\_GEN\_DISCFACTOR \*  RTCLRREGR *q, r, p*

RTRSVPOR = image010(RNWF  *y* \* RTORPA *y*)

RTASOFFIMB *q* = RTOFFCAP *q* – (RTASOFF *q* + RTCLRNSRESP *q*)

RTOFFCAP *q* = (SYS\_GEN\_DISCFACTOR \* RTCST30HSL *q*) + (SYS\_GEN\_DISCFACTOR \* RTOFFNSHSL *q*)+ RTCLRNS *q*

RTRSVPOFF = image010(RNWF  *y* \* RTOFFPA *y*)

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

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

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTASIAMT *q* | $ | *Real-Time Ancillary Service Imbalance Amount*—The total payment or charge to QSE *q* for the Real-Time Ancillary Service imbalance associated with Operating Reserve Demand Curve (ORDC) for each 15-minute Settlement Interval. |
| RTRDASIAMT *q* | $ | *Real-Time Reliability Deployment Ancillary Service Imbalance Amount*—The total payment or charge to QSE *q* for the Real-Time Ancillary Service imbalance associated with Reliability Deployments for each 15-minute Settlement Interval. |
| RTASOLIMB *q* | MWh | *Real Time Ancillary Service On-Line Reserve Imbalance for the QSE* ⎯The Real-Time Ancillary Service On-Line reserve imbalance for the QSE *q*, for each 15-minute Settlement Interval. |
| RTORPA*y* | $/MWh | *Real-Time On-Line Reserve Price Adder per interval*⎯The Real-Time Price Adder for On-Line Reserves for the SCED interval *y*. |
| RTOFFPA *y* | $/MWh | *Real-Time Off-Line Reserve Price Adder per interval*⎯The Real-Time Price Adder for Off-Line Reserves 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 On-Line Reliability Deployment Price*⎯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 On-Line Reliability Deployment Price Adder. |
| RTORDPA*y* | $/MWh | *Real-Time On-Line Reliability Deployment Price Adder*⎯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 15-minute Settlement Interval. |
| RTRSVPOR | $/MWh | *Real-Time Reserve Price for On-Line Reserves*⎯The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval. |
| RTRSVPOFF | $/MWh | *Real-Time Reserve Price for Off-Line Reserves*⎯The Real-Time Reserve Price for Off-Line Reserves for the 15-minute Settlement Interval. |
| RTOLCAP *q* | MWh | *Real-Time On-Line Reserve Capacity for the QSE*⎯The Real-Time reserve capacity of On-Line Resources available for the QSE *q*, for the 15-minute Settlement Interval. |
| RTOLHSLRA *q, r, p* | MWh | *Real-Time Adjusted On-Line High Sustained Limit for the Resource*⎯The Real-Time telemetered HSL for the Resource *r* represented by QSE *q* at Resource Node *p* that is available to SCED, integrated over the 15-minute Settlement Interval, and adjusted pursuant to paragraphs (3) and (4) above. |
| RTOLHSL *q* | MWh | *Real-Time On-Line High Sustained Limit for the QSE*⎯The Real-Time telemetered HSL for all Generation Resources available to SCED, pursuant to paragraphs (3) and (4) above, integrated over the 15-minute Settlement Interval for the QSE *q*, discounted by the system-wide discount factor. |
| RTASRESP *q* | MW | *Real-Time Ancillary Service Supply Responsibility for the QSE*⎯The Real-Time Ancillary Service Supply Responsibility for Reg-Up, RRS, FRS and Non-Spin pursuant to Section 4.4.7.4, Ancillary Service Supply Responsibility, for all Generation and Load Resources for the QSE *q*, for the 15-minute Settlement Interval. |
| RTCLRCAP *q* | MWh | *Real-Time Capacity from Controllable Load Resources for the QSE*—The Real-Time capacity and Reg-Up minus Non-Spin available from all Controllable Load Resources available to SCED for the QSE *q*, integrated over the 15-minute Settlement Interval. |
| RTNCLRCAP ***q*** | MWh | *Real-Time Capacity from Non-Controllable Load Resources carrying Responsive Reserve or Frequency Response for the QSE*—The Real-Time capacity for all Load Resources other than Controllable Load Resources that have a validated Real-Time RRS or FRS Ancillary Service Schedule for the QSE *q*, integrated over the 15-minute Settlement Interval. |
| RTNCLRRRS *q* | MWh | *Real-Time Non-Controllable Load Resources Responsive Reserve or Frequency Response for the QSE—*The validated Real-Time telemetered RRS or FRS Ancillary Service Supply Responsibility for all Load Resources other than Controllable Load Resources for QSE *q* discounted by the system-wide discount factor, integrated over the 15-minute Settlement Interval. |
| RTNCLRRRSR *q, r, p* | MWh | *Real-Time Non-Controllable Load Resource Responsive Reserve or Frequency Response—*The validated Real-Time telemetered RRS or FRS Ancillary Service Resource Responsibility for the Load Resource *r* (which is not a Controllable Load Resource) represented by QSE *q* at Resource Node *p*, integrated over the 15-minute Settlement Interval. |
| RTNCLRNPCR *q, r, p* | MWh | *Real-Time Non-Controllable Load Resource Net Power Consumption—*The Real-Time net real power consumption from the Load Resource *r* (which is not a Controllable Load Resource)represented by QSE *q* at Resource Node *p* that has a validated Real-Time RRS or FRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval. |
| RTNCLRLPCR *q, r, p* | MWh | *Real-Time Non-Controllable Load Resource Low Power Consumption—*The Real-Time Low Power Consumption (LPC) from the Load Resource *r* (which is not a Controllable Load Resource)represented by QSE *q* at Resource Node *p* that has a validated Real-Time RRS or FRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval |
| RTNCLRNPC *q* | MWh | *Real-Time Non-Controllable Load Resource Net Power Consumption for the QSE—*The Real-Time net real power consumption from all Load Resources other than Controllable Load Resources for QSE *q* that have a validated Real-Time RRS or FRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. |
| RTNCLRLPC *q* | MWh | *Real-Time Non-Controllable Load Resource Low Power Consumption for the QSE—*The Real-Time LPC from all Load Resources other than Controllable Load Resourcesfor QSE *q* that have a validated Real-Time RRS or FRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. |
| RTCLRNPCR *q, r, p* | MWh | *Real-Time Net Power Consumption from the Controllable Load Resource—*The Real-Time net real power consumption from the Controllable Load Resource *r* represented by QSE *q* at Resource Node *p* available to SCED integrated over the 15-minute Settlement Interval. |
| RTCLRNPC *q* | MWh | *Real-Time Net Power Consumption from Controllable Load Resources for the QSE*—The Real-Time net real power consumption from all Controllable Load Resources available to SCED integrated over the 15-minute Settlement Interval for the QSE *q* discounted by the system-wide discount factor. |
| RTCLRLPCR *q, r, p* | MWh | *Real-Time Low Power Consumption for the Controllable Load Resource—*The Real-Time LPC from the Controllable Load Resource *r* represented by QSE *q* at Resource Node *p* available to SCED integrated over the 15-minute Settlement Interval. |
| RTCLRLPC *q* | MWh | *Real-Time Low Power Consumption from Controllable Load Resources for the QSE*—The Real-Time LPC from Controllable Load Resources available to SCED integrated over the 15-minute Settlement Interval for the QSE *q* discounted by the system-wide discount factor. |
| RTCLRREG *q* | MWh | *Real-Time Controllable Load Resources Regulation-Up Schedule for the QSE*—The Real-Time Reg-Up Ancillary Service Schedule from all Controllable Load Resources with Primary Frequency Response for the QSE *q*, integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. |
| RTCLRREGR*q, r, p* | MWh | *Real-Time Controllable Load Resource Regulation-Up Schedule for the Resource*—The validated Real-Time Reg-Up Ancillary Service Schedule for the Controllable Load Resource *r* represented by QSE *q* at Resource Node *p* with Primary Frequency Response, integrated over the 15-minute Settlement Interval. |
| RTMGA *q, r, p* | MWh | *Real-Time Adjusted Metered Generation per QSE per Settlement Point per Resource*—The adjusted metered generation, pursuant to paragraphs (3) and (4) above, of Generation Resource *r* represented by QSE *q* at Resource Node *p* in Real-Time for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTMGQ *q* | MWh | *Real-Time Metered Generation per QSE*—The metered generation, discounted by the system-wide discount factor, of all generation Resources represented by QSE *q* in Real-Time for the 15-minute Settlement Interval, pursuant to paragraphs (3) and (4) above. |
| RTASOFFIMB *q* | MWh | *Real-Time Ancillary Service Off-Line Reserve Imbalance for the QSE*⎯The Real-Time Ancillary Service Off-Line reserve imbalance for the QSE *q*, for each 15-minute Settlement Interval. |
| RTOFFCAP *q* | MWh | *Real-Time Off-Line Reserve Capacity for the QSE*⎯The Real-Time reserve capacity of Off-Line Resources available for the QSE *q*, for the 15-minute Settlement Interval. |
| RTCST30HSL *q* | MWh | *Real-Time Generation Resources with Cold Start Available in 30 Minutes*⎯The Real-Time telemetered HSLs of Generation Resources, excluding IRRs, that have telemetered an OFF Resource Status and can be started from a cold temperature state in 30 minutes for the QSE *q*, time-weighted over the 15-minute Settlement Interval. |
| RTOFFNSHSL *q* | MWh | *Real-Time Generation Resources with Off-Line Non-Spin Schedule*⎯The Real-Time telemetered HSLs of Generation Resources that have telemetered an OFFNS Resource Status for the QSE *q*, time-weighted over the 15-minute Settlement Interval. |
| RTASOFFR *q, r, p* | MWh | *Real-Time Ancillary Service Schedule for the Off-Line Generation Resource*⎯The validated Real-Time telemetered Ancillary Service Schedule for the Off-Line Generation Resource *r* represented by QSE *q* at Resource Node *p*, integrated over the 15-minute Settlement Interval. |
| RTASOFF *q* | MWh | *Real-Time Ancillary Service Schedule for Off-Line Generation Resources for the QSE*⎯The Real-Time telemetered Ancillary Service Schedule for all Off-Line Generation Resources discounted by the system-wide discount factor for the QSE *q*, integrated over the 15-minute Settlement Interval. |
| HRRADJ *q, r, p* | MW | *Ancillary Service Resource Responsibility Capacity for Responsive Reserve at Adjustment Period—*The Responsive Reserve Ancillary Service Resource Responsibility for the Resource *r* represented by QSE *q* at Resource Node *p* as seen in the last Current Operating Plan (COP) and Trades Snapshot at the end of the Adjustment Period, for the hour that includes the 15-minute Settlement Interval. |
| HRUADJ *q, r, p* | MW | *Ancillary Service Resource Responsibility Capacity for Reg-Up at Adjustment Period—*The Regulation Up Ancillary Service Resource Responsibility for the Resource *r* represented by QSE *q* at Resource Node *p* as seen in the last COP and Trades Snapshot at the end of the Adjustment Period, for the hour that includes the 15-minute Settlement Interval. |
| HNSADJ *q, r, p* | MW | *Ancillary Service Resource Responsibility Capacity for Non-Spin at Adjustment Period—*The Non-Spin Ancillary Service Resource Responsibility for the Resource *r* represented by QSE *q* at Resource Node *p* as seen in the last COP and Trades Snapshot at the end of the Adjustment Period, for the hour that includes the 15-minute Settlement Interval. |
| RTRUCNBBRESP *q* | MWh | *Real-Time RUC Ancillary Service Supply Responsibility for the QSE in Non-Buy-Back hours*⎯The Real-Time Ancillary Service Supply Responsibility for Reg-Up, RRS, FRS, and Non-Spin pursuant to the Ancillary Service awards, for the 15-minute Settlement Interval that falls within a RUC-Committed Hour, discounted by the system-wide discount factor for the QSE *q.* |
| RTRUCASA *q, r* | MW | *Real-Time RUC Ancillary Service Awards*⎯The Real-Time Ancillary Service award to the RUC Resource *r* for Reg-Up, RRS, FRS, and Non-Spin for the hour that includes the 15-minute Settlement Interval that falls within a RUC-Committed Hour for the QSE *q.* |
| RTCLRNSRESP *q* | MWh | *Real-Time Controllable Load Resource Non-Spin Responsibility for the QSE*⎯The Real Time telemetered Non-Spin Ancillary Service Supply Responsibility for all Controllable Load Resources available to SCED discounted by the system-wide discount factor for the QSE *q*, integrated over the 15-minute Settlement Interval. |
| RTCLRNSRESPR *q, r, p* | MWh | *Real-Time Controllable Load Resource Non-Spin Responsibility for the Resource*⎯The Real-Time telemetered Non-Spin Ancillary Service Resource Responsibility for the Controllable Load Resource *r* represented by QSE *q* at Resource Node *p* available to SCED, integrated over the 15-minute Settlement Interval. |
| RTRMRRESP *q* | MWh | *Real-Time Ancillary Service Supply Responsibility for RMR Units represented by the QSE*⎯The Real-Time Ancillary Service Supply Responsibility as set forth in the end of the Adjustment Period COP for Reg-Up, RRS, FRS, and Non-Spin for all RMR Units discounted by the system-wide discount factor for the QSE *q*, integrated over the 15-minute Settlement Interval. |
| RTCLRNSR *q, r, p* | MWh | *Real-Time Non-Spin Schedule for the Controllable Load Resource ⎯*The validated Real Time telemetered Non-Spin Ancillary Service Schedule for the Controllable Load Resource *r* represented by QSE *q* at Resource Node *p*, integrated over the 15-minute Settlement Interval. |
| RTCLRNS *q* | MWh | *Real-Time Non-Spin Schedule for Controllable Load Resources for the QSE*⎯The Real-Time telemetered Non-Spin Ancillary Service Schedule for all Controllable Load Resources for the QSE *q*, integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. |
| SYS\_GEN\_DISCFACTOR | none | *System-Wide Discount Factor* – The system-wide discount factor used to discount inputs used in the calculation of Real-Time Ancillary Services Imbalance payment or charge is calculated as the average of the currently approved Reserve Discount Factors (RDFs) applied to the temperatures from the current Season from the year prior. |
| UGEN *q, r, p* | 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. |
| UGENA *q, r, p* | MWh | *Adjusted 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 adjusted pursuant to paragraph (6) above. |
| *r* | none | A Generation or 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. |
| *q* | none | A QSE. |
| *p* | none | A Resource Node Settlement Point. |

(8) The payment to each QSE for the Ancillary Service reserves associated with RUC Resources that have received a RUC Dispatch to provide Ancillary Services in which the 15-minute Settlement Interval is part of a RUC Buy-Back Hour based on the RUC opt out provision set forth in paragraph (11) of Section 5.5.2 for a given 15-minute Settlement Interval is calculated as follows:

**RTRUCRSVAMT *q* = (-1) \* (RTRUCRESP *q* \* RTRSVPOR)**

**RTRDRUCRSVAMT *q* = (-1) \* (RTRUCRESP *q* \* RTRDP)**

Where:

RTRUCRESP *q* =  RTRUCASA *q, r* \* ¼

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTRUCRSVAMT*q* | $ | *Real-Time RUC Ancillary Service Reserve Amount*—The total payment |to QSE *q* for the Real-Time RUC Ancillary Service Reserve payment associated with ORDC for each 15-minute Settlement Interval. |
| RTRDRUCRSVAMT *q* | $ | *Real-Time Reliability Deployment RUC Ancillary Service Reserve Amount*—The total payment |to QSE *q* for the Real-Time RUC Ancillary Service Reserve payment associated with reliability deployments for each 15-minute Settlement Interval. |
| RTRUCRESP *q* | MWh | *Real-Time RUC Ancillary Service Supply Responsibility for the QSE*⎯The Real-Time Ancillary Service Supply Responsibility pursuant to the Ancillary Service awards for Reg-Up, RRS, FRS, and Non-Spin for all RUC Resources that have opted out per paragraph (11) of Section 5.5.2 for the QSE *q*, for the 15-minute Settlement Interval. |
| RTRUCASA *q, r* | MW | *Real-Time RUC Ancillary Service Awards*⎯The Real-Time Ancillary Service award to the RUC Resource *r* for Reg-Up, RRS, FRS, and Non-Spin for the 15-minute Settlement Interval that falls within a RUC-Committed Hour for the QSE *q.* |
| RTRSVPOR | $/MWh | *Real-Time Reserve Price for On-Line Reserves*⎯The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval. |
| RTRDP | $/MWh | *Real-Time On-Line Reliability Deployment Price* ⎯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 On-Line Reliability Deployment Price Adder. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |

***6.7.7 Adjustments to Net Cost Allocations for Real-Time Ancillary Services***

If ERCOT assigns Ancillary Service during a Watch, the incremental cost for assigned Ancillary Service is calculated in this section.

(1) For Reg-Up, if applicable:

(a) The total costs for Reg-Up for a given Operating Hour during a Watch is calculated as follows:

**ARUCOSTTOT = (-1) \* RTAURUAMTTOT + RUCOSTTOT**

Where:

Total payment of Real-Time Ancillary Service Assignment procured capacity for un-deployed Reg-Up

RTAURUAMTTOT = RTAURUAMT*q,r,p, i*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| ARUCOSTTOT | $ | *Reg-Up Cost Total*—The total costs for Reg-Up that includes costs of assigned Ancillary Service during a Watch for the hour. |
| RUCOSTTOT | $ | *Reg-Up Cost Total*—The net total costs for Reg-Up for the hour. |
| RTAURUAMTTOT | $ | *Real-Time Assigned Un-Deployed Regulation Up Payment Amount Total for all QSEs*—The payments to all QSEs for the Real-Time un-deployed Reg-Up Ancillary Service Assignment for the hour. |
| RTAURUAMT *q,r,p,i* | $ | *Real-Time Assigned Un-Deployed Regulation Up Payment Amount per QSE*—The payment to QSE *q* for a Real-Time un-deployed Reg-Up Ancillary Service Assignment to Resource *r* at Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource that was allocated Reg-Up Ancillary Service Assignment by the QSE. |
| *p* | none | A Settlement Point for the Resource Node that was allocated Reg-Up Ancillary Service Assignment by the QSE. |
| *i* | none | A 15-minute Settlement Interval in the Operating Hour. |

(b) Each QSE’s share of the total costs for Reg-Up for the Operating Hour, including Ancillary Service costs assigned during a Watch is calculated as follows:

ARUCOST *q* = ARUPR \* ARUQ *q*

Where:

ARUPR = ARUCOSTTOT / ARUQTOT

ARUQTOT = ARUQ *q*

ARUQ *q* = ARUO *q* – SARUQ *q*

ARUO *q* = WAURUTOT \* HLRS *q* + RUO *q*

WAURUTOT = RTAURUR *q,r,p*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| ARUCOST *q* | $ | *Reg-Up Cost per QSE*—QSE *q*’s share of the net total costs for Reg-Up that includes costs of assigned Ancillary Service during a Watch, for the hour. |
| ARUPR | $/MW per hour | *Reg-Up Price—*The price for Reg-Up calculated based on the net total costs for Reg-Up, for the hour. |
| ARUCOSTTOT | $ | *Reg-Up Cost Total*—The total costs for Reg-Up that includes costs of assigned Ancillary Service during a Watch for the hour. |
| ARUQTOT | MW | *Reg-Up Quantity Total*—The sum of every QSE’s portion of its Ancillary Service Obligation that is not self-arranged in either DAM or any SASM that includes assigned Ancillary Service, during a Watch, for the hour. |
| ARUQ *q* | MW | *Reg-Up Quantity per QSE*—The portion of QSE *q*’s total Ancillary Service Obligation that is not self-arranged in either DAM or any SASM, that includes assigned Ancillary Service, during a Watch for the hour. |
| WAURUTOT | MW | *Watch Assigned Un-Deployed Regulation Up Quantity-* The total market wide quantity of un-deployed Reg-Up Ancillary Service Assignment for the hour. |
| RTAURUR *q,r* | MW | *Real-Time Assigned Un-Deployed Regulation Up Quantity per Resource per QSE -* The quantity of un-deployedReg-Up Ancillary Service Assignment to a QSE *q* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| ARUO *q* | MW | *Reg-Up Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour during a Watch. |
| RUO *q* | MW | *Reg-Up Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour. |
| HLRS *q* | none | *The Hourly Load Ratio Share calculated for QSE q for the hour*. See Section 6.6.2.4, QSE Load Ratio Share for an Operating Hour. |
| SARUQ*q* | MW | *Total Self-Arranged Reg-Up Quantity per QSE for all markets*—The sum of all self-arranged Reg-Up quantities submitted by QSE *q* for DAM and all SASMs. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resourcethat was allocated Reg-Up Ancillary Service Assignment by the QSE. |
| *p* | none | A Settlement Point for the Resource Node that was allocated Reg-Up Ancillary Service Assignment by the QSE. |

(c) The incremental cost to each QSE’s for assigned Reg-Up for the Operating Hour, is calculated as follows:

**NETARTRUAMT *q* = ARUCOST *q* – RUCOST *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| NETARTRUAMT*q* | $ | *Real-Time Reg-Up Amount per QSE*—The net adjustment to QSE *q*’s share of the costs for assigned Reg-Up, for the hour. |
| ARUCOST*q* | $ | *Reg-Up Cost per QSE*—QSE *q*’s share of the net total costs for Reg-Up that includes costs of assigned Ancillary Service during a Watch, for the hour. |
| RUCOST *q* | $ | *Reg-Up Cost per QSE*—QSE *q*’s share of the net total costs for Reg-Up, for the hour. |
| *q* | none | A QSE. |

(2) For RRS Service, if applicable:

(a) The total costs for RRS Service for a given Operating Hour during a Watch is calculated as follows:

ARRCOSTTOT = (-1) \* RTAURRAMTTOT + RRCOSTTOT

Where:

Total payment of Real-Time Ancillary Service Assignment procured capacity for un-deployed RRS

RTAURRAMTTOT = RTAURRAMT *q,r,p, i*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| ARRCOSTTOT | $ | *Responsive Reserve Cost Total*—The net total costs for RRS that includes costs of assigned Ancillary Service during a Watch for the hour. |
| RRCOSTTOT | $ | *Responsive Reserve Cost Total*—The net total costs for RRS for the hour. |
| RTAURRAMTTOT | $ | *Real-Time Assigned Un-Deployed Responsive Reserve Payment Amount Total for all QSEs -* The payments to all QSEs for the Real-Time un-deployed RRS Ancillary Service Assignment for the hour. |
| RTAURRAMT*q, r,p,i* | $ | *Real-Time Assigned Un-Deployed Responsive Reserve Payment Amount per QSE -* The payment to QSE *q* for a Real-Time un-deployed RRS Ancillary Service Assignment to Resource *r* at Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource that was allocated RRS Ancillary Service Assignment by the QSE. |
| *p* | none | A Settlement Point for the Resource Node that was allocated RRS Ancillary Service Assignment by the QSE. |
| *i* | none | A 15-minute Settlement Interval in the Operating Hour. |

(b) Each QSE’s share of the net total costs for RRS for the Operating Hour, including Ancillary Service costs assigned during a Watch is calculated as follows:

ARRCOST *q* = ARRPR \* ARRQ *q*

Where:

ARRPR = ARRCOSTTOT / ARRQTOT

ARRQTOT = ARRQ *q*

ARRQ *q* = ARRO *q* – SARRQ *q*

ARRO *q* = WAURRTOT \* HLRS + RRO *q*

WAURRTOT = RTAURRR *q ,r,p*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| ARRCOST *q* | $ | *Responsive Reserve Cost per QSE*—QSE *q*’s share of the net total costs for RRS, that includes costs of assigned Ancillary Service during a Watch for the hour. |
| ARRPR | $/MW per hour | *Responsive Reserve Price—*The price for RRS calculated based on the net total costs for RRS that includes costs of assigned Ancillary Service during a Watch for the hour. |
| ARRCOSTTOT | $ | *Responsive Reserve Cost Total*—The net total costs for RRS that includes costs of assigned Ancillary Service during a Watch for the hour. |
| ARRQTOT | MW | *Responsive Reserve Quantity Total*—The sum of every QSE’s portion of its Ancillary Service Obligation that is not self-arranged in either DAM or any SASM that includes assigned Ancillary Service, during a Watch,, for the hour. |
| WAURRTOT | MW | *Watch Assigned Un-Deployed Responsive Reserve Quantity*—The total market wide quantity of un-deployed RRS Ancillary Service Assignment for the hour. |
| RTAURRR *q,r* | MW | *Real-Time Assigned Un-Deployed Responsive Reserve Quantity per Resource per QSE*—The quantity of un-deployed RRS Ancillary Service Assignment to a QSE *q* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| ARRQ *q* | MW | *Responsive Reserve Quantity per QSE*—The portion of QSE *q*’s Ancillary Service Obligation that is not self-arranged in either DAM or any SASM, for the hour. |
| ARRO *q* | MW | *Responsive Reserve Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour. |
| RRO *q* | MW | *Responsive Reserve Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour. |
| HLRS *q* | none | *The Hourly Load Ratio Share calculated for QSE q for the hour*. See Section 6.6.2.4. |
| SARRQ *q* | MW | *Total Self-Arranged Responsive Reserve Quantity per QSE for all markets*—The sum of all self-arranged RRS quantities submitted by QSE *q* for DAM and all SASMs. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource that was allocated RRS Ancillary Service Assignment by the QSE. |
| *p* | none | A Settlement Point for the Resource Node that was allocated RRS Ancillary Service Assignment by the QSE. |

(c) The incremental cost to each QSE’s for assigned RRS for the Operating Hour, is calculated as follows:

**NETARTRRAMT *q* = ARRCOST *q* – RRCOST *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| NETARTRRAMT *q* | $ | *Real-Time Responsive Reserve Amount per QSE*—The net adjustment to QSE *q*’s share of the costs for assigned RRS, for the hour. |
| RRCOST *q* | $ | *Responsive Reserve Cost per QSE*—QSE *q*’s share of the net total costs for RRS, for the hour. |
| ARRCOST *q* | $ | *Responsive Reserve Cost per QSE*—QSE *q*’s share of the net total costs for RRS that includes costs of assigned Ancillary Service during a Watch, for the hour. |
| *q* | none | A QSE. |

(3) For FRS, if applicable:

(a) The total costs for FRS for a given Operating Hour during a Watch is calculated as follows:

AFRCOSTTOT = (-1) \* RTAUFRAMTTOT + FRCOSTTOT

Where:

Total payment of Real-Time Ancillary Service Assignment procured capacity for un-deployed FRS

RTAUFRAMTTOT = RTAUFRAMT *q, r, p, i*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| AFRCOSTTOT | $ | *Frequency Response Service Cost Total*—The net total costs for FRS that includes costs of assigned Ancillary Service during a Watch for the hour. |
| FRCOSTTOT | $ | *Frequency Response Service Cost Total*—The net total costs for FRS for the hour. |
| RTAUFRAMTTOT | $ | *Real-Time Assigned Un-Deployed Frequency Response Service Payment Amount Total for all QSEs -* The payments to all QSEs for the Real-Time un-deployed FRS Ancillary Service Assignment for the hour. |
| RTAUFRAMT*q, r,p,i* | $ | *Real-Time Assigned Un-Deployed Frequency Response Service Payment Amount per QSE -* The payment to QSE *q* for a Real-Time un-deployed FRS Ancillary Service Assignment to Resource *r* at Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource that was allocated FRS Ancillary Service Assignment by the QSE. |
| *p* | none | A Settlement Point for the Resource Node that was allocated FRS Ancillary Service Assignment by the QSE. |
| *i* | none | A 15-minute Settlement Interval in the Operating Hour. |

(b) Each QSE’s share of the net total costs for FRS for the Operating Hour, including Ancillary Service costs assigned during a Watch is calculated as follows:

AFRCOST *q* = AFRPR \* AFRQ *q*

Where:

AFRPR = AFRCOSTTOT / AFRQTOT

AFRQTOT = AFRQ *q*

AFRQ *q* = AFRO *q* – SAFRQ *q*

AFRO *q* = WAUFRTOT \* HLRS + FRO *q*

WAUFRTOT = RTAUFRR *q ,r, p*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| AFRCOST *q* | $ | *Frequency Response Service Cost per QSE*—QSE *q*’s share of the net total costs for FRS, that includes costs of assigned Ancillary Service during a Watch for the hour. |
| AFRPR | $/MW per hour | *Frequency Response Service Price—*The price for FRS calculated based on the net total costs for FRS that includes costs of assigned Ancillary Service during a Watch for the hour. |
| AFRCOSTTOT | $ | *Frequency Response Service Cost Total*—The net total costs for FRS that includes costs of assigned Ancillary Service during a Watch for the hour. |
| AFRQTOT | MW | *Frequency Response Service Quantity Total*—The sum of every QSE’s portion of its Ancillary Service Obligation that is not self-arranged in either DAM or any SASM that includes assigned Ancillary Service, during a Watch, for the hour. |
| WAUFRTOT | MW | *Watch Assigned Un-Deployed Frequency Response Service Quantity*—The total market wide quantity of un-deployed FRS Ancillary Service Assignment for the hour. |
| RTAUFRR *q,r* | MW | *Real-Time Assigned Un-Deployed Frequency Response Service Quantity per Resource per QSE*—The quantity of un-deployed FRS Ancillary Service Assignment to a QSE *q* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| AFRQ *q* | MW | *Frequency Response Service Quantity per QSE*—The portion of QSE *q*’s Ancillary Service Obligation that is not self-arranged in either DAM or any SASM, for the hour. |
| AFRO *q* | MW | *Frequency Response Service Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour. |
| FRO *q* | MW | *Frequency Response Service Obligation per QSE*—The Ancillary Service Obligation of QSE *q*, for the hour. |
| HLRS *q* | none | *The Hourly Load Ratio Share calculated for QSE q for the hour*. See Section 6.6.2.4. |
| SAFRQ *q* | MW | *Total Self-Arranged Frequency Response Service Quantity per QSE for all markets*—The sum of all self-arranged FRS quantities submitted by QSE *q* for DAM and all SASMs. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource that was allocated FRS Ancillary Service Assignment by the QSE. |
| *p* | none | A Settlement Point for the Resource Node that was allocated FRS Ancillary Service Assignment by the QSE. |

(c) The incremental cost to each QSE’s for assigned FRS for the Operating Hour, is calculated as follows:

**NETARTFRAMT *q* = AFRCOST *q* –FRCOST *q***

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| NETARTFRAMT *q* | $ | *Real-Time Frequency Response Service Amount per QSE*—The net adjustment to QSE *q*’s share of the costs for assigned FRS, for the hour. |
| FRCOST *q* | $ | *Frequency Response Service Cost per QSE*—QSE *q*’s share of the net total costs for FRS, for the hour. |
| AFRCOST *q* | $ | *Frequency Response Service Cost per QSE*—QSE *q*’s share of the net total costs for FRS that includes costs of assigned Ancillary Service during a Watch, for the hour. |
| *q* | none | A QSE. |

8.1 QSE and Resource Performance Monitoring

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

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

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

(a) Real-Time data, for QSEs:

(i) Telemetry performance

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

(c) Hydro responsive testing for Generation Resources;

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

(e) Outage scheduling and coordination, for QSEs and Resources;

(f) Resource-specific Responsive Reserve (RRS) performance for QSEs and Resources;

(g) Resource-specific Non-Spinning Reserve (Non-Spin) performance, for QSEs and Resources;

(h) Resource-specific Frequency Response Service (FRS) performance, for QSEs and Resources;

(i) Outage reporting, by QSEs for Resources;

(i) Current Operating Plan (COP) metrics, for QSEs; and

(j) Day-Ahead Reliability Unit Commitment (DRUC) and Hourly Reliability Unit Commitment (HRUC) commitment performance by QSEs and Generation Resources.

|  |
| --- |
| [NPRR257: Replace paragraph (3) above with the following upon system implementation:]  (3) ERCOT shall monitor and post the following categories of performance:  (a) Net dependable real power capability testing, for Resources;  (b) Reactive testing, for Generation Resources, to validate Corrected Unit Reactive Limit (CURL) and Unit Reactive Limit (URL);  (c) Real-Time data, for QSEs:  (i) Telemetry performance;  (ii) Communications system performance;  (iii) Operational data requirements required under Section 6.5.5.2, Operational Data Requirements.  (d) Regulation control performance, for QSEs and as applicable, Resource-specific performance (see also Section 8.1.1, QSE Ancillary Service Performance Standards);  (e) Hydro responsive testing for Generation Resources;  (f) Black Start Service (BSS) test results for QSEs and Generation Resources posted to the Market Information System (MIS) Certified Area;  (g) Supplying and validating data for generator models, as requested by ERCOT, for Generation Resources;  (h) Outage scheduling and coordination, for QSEs and Resources;  (i) Resource-specific Responsive Reserve (RRS) performance for QSEs and Resources;  (j) The QSE backup control plan for Resource energy deployment in the event of the loss of a communication path with ERCOT. ERCOT will test these plans randomly at least once a year for QSEs representing Resources;  (k) Resource-specific Non-Spinning Reserve (Non-Spin) performance, for QSEs and Resources;  (l) Resource-specific Frequency Response Service (FRS) performance, for QSEs and Resources;  (m) 24 hours per day, seven days per week qualified staffing requirement, as described in the Operating Guides, for QSEs;  (n) Automatic Voltage Regulator (AVR) requirements, for QSEs and Generation Resources;  (o) Staffing plan for a backup control facility or procedures in the event that the primary facility is unusable, for QSEs;  (p) Outage reporting, by QSEs for Resources;  (q) Current Operating Plan (COP) metrics, for QSEs; and  (r) Day-Ahead Reliability Unit Commitment (DRUC) and Hourly Reliability Unit Commitment (HRUC) commitment performance by QSEs and Generation Resources. |

8.1.1.1 Ancillary Service Qualification and Testing

(1) Each QSE and the Resource providing Ancillary Service must meet qualification criteria to operate satisfactorily with ERCOT. ERCOT shall use the Ancillary Service qualification and testing program that is approved by TAC and included in the Operating Guides. Each QSE for the Resources that it represents may only provide Ancillary Services on those Resources for which it has met the qualification criteria.

(2) General capacity testing must be used to verify a Resource’s Net Dependable Capability. Qualification tests allow the Resource and QSE to demonstrate the minimum capabilities necessary to deploy an Ancillary Service.

(3) A Resource may be provisionally qualified for a period of 90 days and may be eligible to participate as a Resource providing Ancillary Service. Resources that have installed the appropriate equipment with verifiable testing data may be provisionally qualified as providers of Ancillary Service.

(4) A Load Resource may be provisionally qualified for a period of 90 days to participate as a Resource providing Ancillary Service, if the Load Resource is metered with an Interval Data Recorder (IDR) to ERCOT’s reasonable satisfaction. A Load Resource providing Ancillary Service in Real-Time must meet the following requirements:

(a) Electric Service Identifier (ESI ID) registration of Load Resources providing Ancillary Service by the QSE; and

(b) Load Resource telemetry is installed and tested between QSE and ERCOT.

(5) Provisional qualification as described herein may be revoked by ERCOT at any time for any non-compliance with provisional qualification requirements.

(6) For those Settlement Intervals during which a Generation Resource or Load Resource behind the Generation Resource Node is engaged in testing in accordance with this Section, the provisions of Section 6.6.5, Generation Resource Base-Point Deviation Charge, will not apply to the Resource being tested beginning with the Settlement Interval immediately preceding the Settlement Interval in which ERCOT issues a Dispatch Instruction that begins the test and continuing until the end of the Settlement Interval in which the test completes. During the same Settlement Intervals for the testing period, the Generation Resource Energy Deployment Performance (GREDP) calculated in accordance with Section 8.1.1.4.1, Regulation Service and Generation Resource/Controllable Load Resource Energy Deployment Performance, will not apply.

(7) ERCOT may reduce the amount a Resource may contribute toward Ancillary Service if it determines unsatisfactory performance of the Resource as defined in Section 8.1.1, QSE Ancillary Service Performance Standards.

(8) To maintain qualification with ERCOT to provide RRS service, each Load Resource, excluding Controllable Load Resources, will be subject to a Load interruption test at a date and time determined by ERCOT and known only to ERCOT and the affected Transmission Service Provider (TSP), to verify the ability to respond to an ERCOT Dispatch Instruction. To successfully pass this test, within ten minutes of the receipt of the ERCOT Dispatch Instruction by the Load Resource’s QSE, the Load Resource’s response shall not be less than 95% of the requested MW deployment, nor more than 150% of the lesser of the following:

(a) The Resource’s Responsibility for RRS, or

(b) The requested MW deployment.

The requested MW deployment will be the sum of the Resource’s Responsibility for RRS and the telemetered additional capacity between the net power consumption and the Low Power Consumption (LPC). If a Load Resource has responded to an actual ERCOT Dispatch Instruction in compliance with (a) and (b) above in the rolling 365-day period, ERCOT will use that response in lieu of a Load interruption test. If a Load Resource has not responded to an ERCOT Dispatch Instruction in compliance with (a) and (b) above, either in a deployment event or a Load interruption test, in any rolling 365-day period, it is subject to a Load interruption test by ERCOT. QSEs may request to have individual Load Resources aggregated for the purposes of Load interruption tests. All performance evaluations will apply on an individual Resource basis.

(9) ERCOT may revoke the Ancillary Service qualification of any Load Resource, excluding Controllable Load Resources, for failure to comply with the required performance standards, based on the evaluation it performed under paragraph (c) of Section 8.1.1.4.2, Responsive Reserve Service Energy Deployment Criteria. Specifically, if a Load Resource that is providing RRS fails to respond with at least 95% of its Ancillary Service Resource Responsibility for RRS within ten minutes of an ERCOT Dispatch Instruction, that response shall be considered a failure. Two Load Resource performance failures, either in a deployment event or a Load interruption test, within any rolling 365-day period shall result in disqualification of that Load Resource. After six months of disqualification, the Load Resource may reapply for qualification provided it submits a corrective action plan to ERCOT that identifies actions taken to correct performance deficiencies and the disqualified Load Resource successfully passes a new Load interruption test as specified in this Section 8.1.1.1.

(10) To maintain qualification with ERCOT to provide FRS from Fast Frequency Response (FFR), each Resource will be subject to an FFR qualification test at a date and time determined by ERCOT and known only to ERCOT and the affected Transmission Service Provider (TSP) as applicable, to verify the ability to respond to an ERCOT Dispatch Instruction. To successfully pass this test, within ten minutes of the receipt of the ERCOT Dispatch Instruction by the Resource’s QSE, the Resource’s response shall not be less than 95% of the requested MW deployment, nor more than 105% of the lesser of the following:

(a) The Resource’s Ancillary Service Resource Responsibility for FRS; or

(b) The MW deployment.

The requested MW deployment for Resources capable of FFR will be the sum of the Resource’s Ancillary Service Resource Responsibility for FRS and the additional capacity between the telemetered HSL and the telemetered LSL. If a Resource has responded to an actual event in compliance with items (a) and (b) above in the rolling 365-day period, ERCOT will use that response in lieu of an FFR test. If a Resource has not responded to an ERCOT Dispatch Instruction in compliance with items (a) and (b) above, in either a deployment event or an FFR test, in any rolling 365-day period, it is subject to an FFR test by ERCOT. All performance evaluations will apply on an individual Resource basis.

(11) ERCOT may revoke the Ancillary Service qualification of any Resource providing FFR if that Resource has two Resource performance failures, either in a manual deployment event or a frequency triggered event, within any rolling 365-day period. A performance failure is defined as a response less than 95% or more than 105% of the Resource’s Ancillary Service Resource Responsibility for RRS or FRS within 15 cycles of a triggering event or within ten minutes of an ERCOT Dispatch Instruction. This shall result in disqualification of that Resource. After six months of disqualification, a Resource may reapply for qualification provided it submits a corrective action plan to ERCOT that identifies actions taken to correct performance deficiencies and the disqualified Resource successfully passes a new test as specified in Section 8.1.1.2.1.6, Frequency Response Service Qualification.

**8.1.1.2.1.2 Responsive Reserve Service Qualification**

(1) RRS may be provided by:

(a) Unloaded Generation Resources that are On-Line;

(b) Quick Start Generation Resources (QSGRs);

(c) Load Resources that may or may not be controlled by high-set under-frequency relays;

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

(e) Controllable Load Resources.

(2) The amount of RRS provided by individual Generation Resources and Load Resources is limited to ten times its telemetered emergency ramp rate. Each Resource providing RRS must be capable of ramping the Resource’s Ancillary Service Resources Responsibility for RRS within ten minutes of the notice to deploy RRS, and must be able to maintain the scheduled level of deployment for the period of service commitment. The amount of RRS on a Generation Resource may be further limited by requirements of the Operating Guides.

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

(4) Any QSE providing RRS shall provide communications equipment to receive ERCOT telemetered control deployments of RRS.

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

(6) Load Resources on high-set under-frequency relays providing RRS must provide a telemetered output signal, including breaker status and status of the under-frequency relay.

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

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

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

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

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

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

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

8.1.1.2.1.6 Frequency Response Service Qualification

(1) FRS may be provided by:

(a) On-Line Generation Resource capacity;

(b) Resources capable of providing FFR;

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

(c) Load Resources controlled by high-set under-frequency relays.

(2) The amount of FRS provided by individual Generation Resources is limited by the ERCOT-calculated maximum MW amount of FRS for the Generation Resource subject to its verified droop performance as described in the Operating Guide. The default value for any newly qualified generator shall be 20% of its HSL;.

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

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

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

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

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

8.1.1.3.2 Responsive Reserve Service Capacity Monitoring Criteria

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

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

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

8.1.1.3.4 Frequency Response Service Capacity Monitoring Criteria

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

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

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

**8.1.1.4.2 Responsive Reserve Service Energy Deployment Criteria**

(1) Each QSE providing RRS shall so indicate by appropriate entries in the Resource’s Ancillary Service Schedule and the Ancillary Service Resource Responsibility providing that service. ERCOT shall adjust the Generation Resource’s Base Point for any requested RRS energy in the next cycle of SCED as specified in Section 6.5.7.6.2.2, Deployment of Responsive Reserve Service. For Controllable Load Resources, the QSE shall control its Resources to operate to the Resource’s Scheduled Power Consumption minus any Ancillary Service deployments. Control performance during periods in which ERCOT has deployed RRS shall be based on the requirements below and failure to meet any one of these requirements shall be reported to the Reliability Monitor as non-compliance:

(a) Within one minute following a deployment instruction, the QSE must update the telemetered Ancillary Service Schedule for RRS for Generation Resources, and Load Resources to reflect the deployment amount. The difference between the sum of the QSE’s Resource RRS schedules and the sum of the QSE’s Resource RRS responsibilities must be equal to the QSE’s total RRS deployment instruction, excluding the deployment to Load Resources which are not Controllable Load Resources.

(b) ERCOT shall evaluate the Primary Frequency Response of all RRS providers as calculated in Nodal Operating Guide Section 8, Attachment J, Initial and Sustained Measurements for Primary Frequency Response.

(c) For QSEs with Load Resources, excluding Controllable Load Resources, ten minutes following deployment instruction the sum of the QSE’s Load Resource response shall not be less than 95% of the requested MW deployment, nor more than 150% of the lesser of the following:

(i) The QSE’s Responsibility for RRS from non-Controllable Load Resources; or

(ii) The requested MW deployment.

The QSE’s portfolio shall maintain this response until recalled or the Resource’s obligation to provide RRS expires. The combination of the QSE’s RRS responsibility and additional available capacity shall not exceed 150% of the sum of the QSE’s Ancillary Service Resource Responsibility for RRS from non-Controllable Load Resources. Any additional available capacity from Load Resources other than Controllable Load Resources shall be deployed concurrently with RRS.

(d) For Load Resources, excluding Controllable Load Resources, associated with a QSE that does not successfully deploy as defined under this Section, ERCOT shall evaluate, identify and investigate each Load Resource that contributed to such failure, in order to determine failure under paragraph (9) of Section 8.1.1.1, Ancillary Service Qualification and Testing.

(e) A Load Resource providing RRS excluding Controllable Load Resources must return to at least 95% of its Ancillary Service Resource Responsibility for RRS within three hours following a recall instruction unless replaced by another Resource as described below. However, the Load Resource should attempt to return to at least 95% of its Ancillary Service Resource Responsibility for RRS as soon as practical considering process constraints. For a Load Resource that is not a Controllable Load Resource that is unable to return to its Ancillary Service Resource Responsibility within three hours of recall instruction, its QSE may replace the quantity of deficient RRS capacity within that same three hours using other Generation Resources or other Load Resources not previously committed to provide RRS.

(f) During periods when the Load level of a Load Resource (excluding Controllable Load Resources) has been affected by a Dispatch Instruction from ERCOT, the performance of a Load Resource in response to a Dispatch Instruction must be determined by subtracting the Load Resource’s actual Load response from its Baseline. “Baseline” capacity is calculated by measuring the average of the real power consumption for five minutes before the Dispatch Instruction if the Load level of a Load Resource had not been affected by a Dispatch Instruction from ERCOT. The actual Load response is the average of the real power consumption data being telemetered to ERCOT during the Settlement Interval indicated in the Dispatch Instruction.

(2) For all Frequency Measurable Events (FMEs), ERCOT shall use the recorded data for each two-second scan rate value of real power output for each All-Inclusive Generation Resource, and Controllable Load Resource. ERCOT shall use the recorded MW data beginning one minute before the start of the frequency excursion event until ten minutes after the start of the frequency excursion event. Satisfactory performance must be measured by comparing actual Primary Frequency Response delivered to the expected Primary Frequency Response as required in the Operating Guides.

(3) ERCOT shall monitor the Primary Frequency Response that is delivered during FMEs of All-Inclusive Generation Resources and Controllable Load Resources using the methodology specified in the Operating Guides. ERCOT shall monitor the Primary Frequency Response that is delivered during FMEs of Controllable Load Resources, relay response for Loads and Generation Resources operating in the synchronous condenser fast-response mode providing FRS at the frequency specified in paragraph (3)(b) of Section 3.18, Resource Limits in Providing Ancillary Service.

**8.1.1.4.4 Frequency Response Service Energy Deployment Criteria**

(1) Each QSE providing FRS shall so indicate by appropriate entries in the Resource’s Ancillary Service Schedule and the Ancillary Service Resource Responsibility providing that service. For Controllable Load Resources, the QSE shall control its Resources to operate to the Resource’s Scheduled Power Consumption minus any Ancillary Service deployments. Control performance during periods in which FRS has been self-deployed shall be based on the requirements below and failure to meet any one of these requirements may be reported to the Reliability Monitor as non-compliance:

(a) A QSE providing FRS must reserve sufficient PFR capable capacity on each Generation Resource with a FRS responsibility or must reserve sufficient capacity capable of FFR to supply the full amount of FRS scheduled for that Resource. The QSE shall not use NFRC, such as power augmentation capacity on a Generation Resource, to provide FRS.

(b) ERCOT shall evaluate the Primary Frequency Response of all FRS providers as calculated in Nodal Operating Guide Section 8, Attachment J, Initial and Sustained Measurements for Primary Frequency Response.

(2) For all Frequency Measurable Events (FMEs), ERCOT shall use the recorded data for each two-second scan rate value of real power output for each All-Inclusive Generation Resource, Resource capable of FFR providing FRS, and Controllable Load Resource. ERCOT shall use the recorded MW data beginning one minute before the start of the frequency excursion event until ten minutes after the start of the frequency excursion event. Satisfactory performance for those Resources with a FRS responsibility must be measured by comparing actual Primary Frequency Response to the expected Primary Frequency Response as required in the Operating Guides.

(3) ERCOT shall monitor the Primary Frequency Response that is delivered during FMEs of All-Inclusive Generation Resources, Resources capable of FFR, and Controllable Load Resources with FRS responsibilities using the methodology specified in the Operating Guides. ERCOT shall monitor the Primary Frequency Response that is delivered during FMEs of Controllable Load Resources, relay response for Loads and Generation Resources operating in the synchronous condenser fast-response mode providing RRS at the frequency specified in paragraph (3)(b) of Section 3.18, Resource Limits in Providing Ancillary Service.

**8.5.1.1 Governor in Service**

(1) At all times an All-Inclusive Generation Resource is On-Line, its Governor must remain in service and be allowed to respond to all changes in system frequency except during startup, shutdown, or testing. A Generation Entity may not reduce Primary Frequency Response on an individual All-Inclusive Generation Resource even during abnormal conditions without ERCOT’s consent (conveyed by way of the Resource Entity’s Qualified Scheduling Entity (QSE)) unless equipment damage is imminent. All All-Inclusive Generation Resources that have capacity available to either increase output or decrease output in Real-Time must provide Primary Frequency Response, which may make use of that available capacity. Only Generation Resources providing Frequency Response Service (FRS), Regulation Up (Reg-Up), Regulation Down (Reg-Down), Responsive Reserve (RRS), or Non-Spinning Reserve (Non-Spin) from On-Line Resources, as specified in Section 8.1.1, QSE Ancillary Service Performance Standards, shall be required to reserve capacity that may also be used to provide Primary Frequency Response. All-inclusive Generation Resources that do not have a FRS Ancillary Service Resource Responsibility or Regulation Ancillary Service Resource Responsibility shall set their Governor Dead-Band no greater than ±0.036 Hz from nominal frequency of 60 Hz. All-inclusive Generation Resource that chooses to widen its Governor Dead-Band greater than what is prescribed in Nodal Operating Guide Section 2.2.7, Turbine Speed Governors, must update its Resource Asset Registration Form with the new dead-band value. .**8.5.1.3 Wind-powered Generation Resource (WGR) Primary Frequency Response**

(1) Wind-powered Generation Resources (WGRs) with Standard Generation Interconnection Agreements (SGIAs) signed after January 1, 2010 shall provide Primary Frequency Response to frequency deviations from 60 Hz. The WGR automatic control system design shall have an adjustable dead band that can be set as specified in the Operating Guides. The Primary Frequency Response shall be specified in the Operating Guides. For WGRs with SGIAs executed on or prior to January 1, 2010, those not already equipped with Primary Frequency Response shall by December 1, 2011 acquire that capability. Those WGRs that cannot technically be retrofitted with Primary Frequency Response capability shall submit an attestation to ERCOT by June 1, 2010 explaining the technical infeasibility. At ERCOT’s sole discretion, those WGRs for which Primary Frequency Response is technically infeasible may be granted a permanent exemption from the requirement. ERCOT shall make a determination within 180 days of receipt of the attestation. If ERCOT does not grant an exemption, the WGR shall acquire the capability to provide Primary Frequency Response within 24 months of being notified of that determination. If ERCOT grants the exemption, then ERCOT may require the WGR to install alternate measures, such as over-frequency relays, that are technically feasible and would approximate Primary Frequency Response to events above 60.1 Hz.

***8.5.2 Primary Frequency Response Measurements***

(1) ERCOT, with the assistance of the appropriate Technical Advisory Committee (TAC) subcommittee, shall analyze the performance of All-Inclusive Generation Resources, Resources capable of Fast Frequency Response (FFR), and Controllable Load Resources for all Frequency Measurable Events (FMEs) in accordance with the Operating Guides. In support of this analysis, ERCOT shall post the following:

(a) ERCOT shall post on the Market Information System (MIS) Public Area the occurrence of an FME within 14 calendar days of occurrence.

(b) ERCOT shall post on the MIS Certified Area for Performance, Disturbance, Compliance Working Group (PDCWG) analysis, the Primary Frequency Response Unit Performance for each All-Inclusive Generation Resource and Controllable Load Resource that is measured in the FME.

(c) ERCOT shall post on the MIS Public Area a monthly report that displays the frequency response of the ERCOT System for a rolling average of the last six FMEs.

(d) ERCOT shall post on the MIS Public Area an annual report that displays the minimum frequency response computation methodology of the ERCOT System.

(e) ERCOT shall post on the MIS Certified Area the Primary Frequency Response 12-month rolling average for each All-Inclusive Generation Resource, Resources capable of FFR, and Controllable Load Resource.

**8.5.2.1 ERCOT Required Primary Frequency Response**

(1) All All-Inclusive Generation Resources, Resources capable of FFR, and Controllable Load Resources shall provide Primary Frequency Response in accordance with the requirements established in the Operating Guides.

(2) ERCOT shall evaluate, with the assistance of the appropriate TAC subcommittee, Primary Frequency Response during FMEs. The actual Generation Resource response must be compiled to determine if adequate Primary Frequency Response was provided.

(3) ERCOT and the appropriate TAC subcommittee shall review each FME, verifying the accuracy of data. Data that is in question may be requested from the QSE for comparison or individual Generation Resource data may be retrieved from ERCOT’s database.

9.2.3 DAM Settlement Charge Types

(1) ERCOT shall provide, on each Settlement Statement, the dollar amount for each DAM Settlement charge and payment. The DAM settlement “Charge Types” are:

(a) Section 4.6.2.1, Day-Ahead Energy Payment;

(b) Section 4.6.2.2, Day-Ahead Energy Charge;

(c) Section 4.6.2.3.1, Day-Ahead Make-Whole Payment;

(d) Section 4.6.2.3.2, Day-Ahead Make-Whole Charge;

(e) Section 4.6.3, Settlement for PTP Obligations Bought in DAM;

(f) Section 4.6.4.1.1, Regulation Up Service Payment;

(g) Section 4.6.4.1.2, Regulation Down Service Payment;

(h) Section 4.6.4.1.3, Responsive Reserve Service Payment;(i) Section 4.6.4.1.4, Non-Spinning Reserve Service Payment;

(j) Section 4.6.4.1.5, Frequency Response Service Payment;

(k) Section 4.6.4.2.1, Regulation Up Service Charge;

(l) Section 4.6.4.2.2, [Regulation Down Service Charge](#_Toc109527549);

(m) Section 4.6.4.2.3, Responsive Reserve Service Charge;

(n) Section 4.6.4.2.4, Non-Spinning Reserve Service Charge;

(o) Section 4.6.4.2.5, Frequency Response Service Charge;

(p) Section 7.9.1.1, Payments and Charges for PTP Obligations Settled in DAM;

(q) Section 7.9.1.2, Payments for PTP Options Settled in DAM;

(r) Section 7.9.1.4, Payments for FGRs Settled in DAM;

(s) Section 7.9.1.5, Payments and Charges for PTP Obligations with Refund Settled in DAM;

(t) Section 7.9.1.6, Payments for PTP Options with Refund Settled in DAM; and

(u) Paragraph (2) of Section 7.9.3.3, Shortfall Charges to CRR Owners.

9.5.3 Real-Time Market Settlement Charge Types

(1) ERCOT shall provide, on each RTM Settlement Statement, the dollar amount for each RTM Settlement charge and payment. The RTM Settlement “Charge Types” are:

(a) Section 5.7.1, RUC Make-Whole Payment;

(b) Section 5.7.2, RUC Clawback Charge;

(c) Section 5.7.3, Payment When ERCOT Decommits a QSE-Committed Resource;

(d) Section 5.7.4.1, RUC Capacity-Short Charge;

(e) Section 5.7.4.2, RUC Make-Whole Uplift Charge;

(f) Section [5.7.5, RUC Clawback Payment](#_Toc109528011);

(g) Section [5.7.6, RUC Decommitment Charge](#_Toc109528014);

(h) Section 6.6.3.1, Real-Time Energy Imbalance Payment or Charge at a Resource Node;

(i) Section 6.6.3.2, Real-Time Energy Imbalance Payment or Charge at a Load Zone;

(j) Section 6.6.3.3, Real-Time Energy Imbalance Payment or Charge at a Hub;

(k) Section 6.6.3.4, Real-Time Energy Payment for DC Tie Import;

(l) Section 6.6.3.5, Real-Time Payment for a Block Load Transfer Point;

(m) Section 6.6.3.6, Real-Time Energy Charge for DC Tie Export Represented by the QSE Under the Oklaunion Exemption;

|  |
| --- |
| ***[NPRR664: Insert items (n) and (o) below upon system implementation and renumber accordingly:]***  (n) Section 6.6.3.7, Real-Time Make-Whole Payment for Exceptional Fuel Cost;  (o) Section 6.6.3.8, Real-Time Make-Whole Charge for Exceptional Fuel Cost; |

(n) Section 6.6.3.7, Real-Time High Dispatch Limit Override Energy Payment;

(o) Section 6.6.3.8, Real-Time High Dispatch Limit Override Energy Charge;

(p) Section 6.6.4, Real-Time Congestion Payment or Charge for Self-Schedules;

(q) Section 6.6.5.1.1.1, Base Point Deviation Charge for Over Generation;

(r) Section 6.6.5.1.1.2, Base Point Deviation Charge for Under Generation;

(s) Section 6.6.5.2, IRR Generation Resource Base Point Deviation Charge;

(t) Section 6.6.5.4, Base Point Deviation Payment;

(u) Section 6.6.6.1, RMR Standby Payment;

(v) Section 6.6.6.2, RMR Payment for Energy;

(w) Section 6.6.6.3, RMR Adjustment Charge;

(x) Section 6.6.6.4, RMR Charge for Unexcused Misconduct;

(y) Section 6.6.6.5, RMR Service Charge;

(z) Paragraph (2) of Section 6.6.7.1, Voltage Support Service Payments;

(aa) Paragraph (4) of Section 6.6.7.1;

(bb) Section 6.6.7.2, Voltage Support Charge;

(cc) Section 6.6.8.1, Black Start Hourly Standby Fee Payment;

(dd) Section 6.6.8.2, Black Start Capacity Charge;

(ee) Section 6.6.9.1, Payment for Emergency Power Increase Directed by ERCOT;

(ff) Section 6.6.9.2, Charge for Emergency Power Increases;

(gg) Section 6.6.10, Real-Time Revenue Neutrality Allocation;

(hh) Paragraph (1)(a) of Section 6.7.1, Payments for Ancillary Service Capacity Sold in a Supplemental Ancillary Services Market (SASM) or Reconfiguration Supplemental Ancillary Services Market (RSASM);

(ii) Paragraph (1)(b) of Section 6.7.1;

(jj) Paragraph (1)(c) of Section 6.7.1;

(kk) Paragraph (1)(d) of Section 6.7.1;

(ll) Paragraph (1)(e) of Section 6.7.1;

(mm) Paragraph (1)(a) of Section 6.7.2, Payments for Ancillary Service Capacity Assigned in Real-Time Operations;

(nn) Paragraph (1)(b) of Section 6.7.2;

(oo) Paragraph (1)(c) of Section 6.7.2;

(pp) Paragraph (1)(a) of Section 6.7.2.1, Charges for Infeasible Ancillary Service Capacity Due to Transmission Constraints;

(qq) Paragraph (1)(b) of Section 6.7.2.1;

(rr) Paragraph (1)(c) of Section 6.7.2.1;

(ss) Paragraph (1)(d) of Section 6.7.2.1;

(tt) Paragraph (1)(e) of Section 6.7.2.1;

|  |
| --- |
| ***[NPRR841: Insert item (uu) below upon system implementation and renumber accordingly:]***  (uu) Paragraph (3) of Section 6.7.2.2, Real-Time Adjustments to Day-Ahead Make-Whole Payments due to Ancillary Services Infeasibility Charges; |

(uu) Paragraph (1)(a) of Section 6.7.3, Charges for Ancillary Service Capacity Replaced Due to Failure to Provide;

(vv) Paragraph (1)(b) of Section 6.7.3;

(ww) Paragraph (1)(c) of Section 6.7.3;

(xx) Paragraph (1)(d) of Section 6.7.3;

(yy) Paragraph (1)(e) of Section 6.7.3;

(zz) Paragraph (2) of Section 6.7.4, Adjustments to Cost Allocations for Ancillary Services Procurement;

(aaa) Paragraph (3) of Section 6.7.4;

(bbb) Paragraph (4) of Section 6.7.4;

(ccc) Paragraph (5) of Section 6.7.4;

(ddd) Paragraph (6) of Section 6.7.4;

(eee) Paragraph (7) of Section 6.7.5, Real-Time Ancillary Service Imbalance Payment or Charge (Real-Time Ancillary Service Imbalance Amount);

(fff) Paragraph (7) of Section 6.7.5, (Real-Time Reliability Deployment Ancillary Service Imbalance Amount);

(ggg) Paragraph (8) of Section 6.7.5, (Real-Time RUC Ancillary Service Reserve Amount);

(hhh) Paragraph (8) of Section 6.7.5, (Real-Time Reliability Deployment RUC Ancillary Service Reserve Amount);

(iii) Section 6.7.6, Real Time Ancillary Service Imbalance Revenue Neutrality Allocation (Load-Allocated Ancillary Service Imbalance Revenue Neutrality Amount);

(jjj) Section 6.7.6, (Load-Allocated Reliability Deployment Ancillary Service Imbalance Revenue Neutrality Amount);

(kkk) Section 7.9.2.1, Payments and Charges for PTP Obligations Settled in Real-Time; and

(lll) Section 9.16.1, ERCOT System Administration Fee.

(2) In the event that ERCOT is unable to execute the Day-Ahead Market (DAM), ERCOT shall provide, on each RTM Settlement Statement, the dollar amount for the following RTM Congestion Revenue Right (CRR) Settlement charges and payments:

(a) Section 7.9.2.4, Payments for FGRs in Real-Time; and

(b) Section 7.9.2.5, Payments and Charges for PTP Obligations with Refund in Real-Time.