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| NPRR Number | [1014](http://www.ercot.com/mktrules/issues/NPRR1014) | NPRR Title | BESTF-4 Energy Storage Resource Single Model |
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| Date | | June 19, 2020 | |
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| Submitter’s Information | | | |
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| Cell Number | |  | |
| Market Segment | | Not applicable | |

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| Comments |

ERCOT submits these comments to Nodal Protocol Revision Request (NPRR) 1014 to incorporate the following:

* Consensus items from discussions with the Battery Energy Storage Task Force (BESTF), and resulting desktop edits made at BESTF meetings on May 1, 2020, May 21, 2020, and June 12, 2020;
* Modifications to the following sections to enable ERCOT to accommodate DC-Coupled Resources in the future single model era;
  + Section 5.7.4.1.1, Capacity Shortfall Ratio Share, as that section is also being modified by NPRR1009, RTC — NP 5: Transmission Security Analysis and Reliability Unit Commitment;
  + Grey-boxed Sections 6.6.5.5, Energy Storage Resource Base Point Deviation Charge for Over Performance, and 6.6.5.5.1, ESR Base Point Deviation Charge for Under Performance; and
* Revisions to additional subsections within Section 4, Day-Ahead Operations, to include purchases and sales of energy from ESRs in Day-Ahead Energy Payments, Day-Ahead Energy Charges, Day-Ahead Make-Whole Settlements and Day-Ahead Make-Whole Charges.

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| Revised Cover Page Language |

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| Nodal Protocol Sections Requiring Revision | 2.1, Definitions  3.1.4.3, Reporting for Planned Outages, Maintenance Outages, and Rescheduled Outages of Resource and Transmission Facilities  3.2.1, Calculation of Aggregate Resource Capacity  3.2.5, Publication of Resource and Load Information  3.3.2.1, Information to Be Provided to ERCOT  3.9.1, Current Operating Plan (COP) Criteria  4.3, QSE Activities and Responsibilities in the Day-Ahead  4.4.7.2, Ancillary Service Offers  4.4.7.2.1, Ancillary Service Offer Criteria  4.4.7.3.1, Ancillary Service Trade Criteria  4.4.9.2, Startup Offer and Minimum-Energy Offer  4.4.9.3, Energy Offer Curve  4.4.9.4.1, Mitigated Offer Cap  4.4.9.4.2, Mitigated Offer Floor  4.4.9.7, Energy Bid/Offer Curve (new)  4.4.9.7.1, Energy Bid/Offer Curve Criteria (new)  4.4.9.7.2, Energy Bid/Offer Curve Validation (new)  4.4.10, Credit Requirements for DAM Bids and Offers  4.5.1, DAM Clearing Process  4.5.3, Communicating DAM Results  4.6.2.1, Day-Ahead Energy Payment  4.6.2.2, Day-Ahead Energy Charge  4.6.2.3, Day-Ahead Make-Whole Settlements  4.6.2.3.2, Day-Ahead Make-Whole Charge  5.3, ERCOT Security Sequence Responsibilities  5.4, QSE Security Sequence Responsibilities  5.7.1, RUC Make-Whole Payment  5.7.2, RUC Clawback Charge  5.7.3, Payment When ERCOT Decommits a QSE-Committed Resource  5.7.4.1.1, Capacity Shortfall Ratio Share  6.3, Adjustment Period and Real-Time Operations Timeline  6.3.1, Activities for the Adjustment Period  6.4.2, Output Schedules  6.4.2.1, Output Schedules for Resources Other than Dynamically Scheduled Resources  6.4.2.3, Output Schedule Criteria  6.4.4, Energy Offer Curve  6.5.1.2, Centralized Dispatch  6.5.5.2, Operational Data Requirements  6.5.7.1.10, Network Security Analysis Processor and Security Violation Alarm  6.5.7.1.12, Resource Limits  6.5.7.2, Resource Limit Calculator  6.5.7.3, Security Constrained Economic Dispatch  6.5.7.3.1, Determination of Real-Time On-Line Reliability Deployment Price Adder  6.5.7.5, Ancillary Services Capacity Monitor  6.6.3.1, Real-Time Energy Imbalance Payment or Charge at a Resource Node  6.6.5.1, Resource Base Point Deviation Charge  6.6.5.1.1.3, Controllable Load Resource Base Point Deviation Charge for Over Consumption  6.6.5.1.1.4, Controllable Load Resource Base Point Deviation Charge for Under Consumption  6.6.5.5, Energy Storage Resource Base Point Deviation Charge for Over Performance  6.6.5.5.1, Energy Storage Resource Base Point Deviation Charge for Under Performance  6.6.5.3, Resources Exempt from Deviation Charges  6.6.7.1, Voltage Support Service Payments  7.9.1.3, Minimum and Maximum Resource Prices  8.1.1.2.1.1, Regulation Service Qualification  8.1.1.2.1.2, Responsive Reserve Service Qualification  8.1.1.4.1, Regulation Service and Generation Resource/Controllable Load Resource Energy Deployment Performance |

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| Revised Proposed Protocol Language |

2.1 DEFINITIONS

Energy Bid/Offer Curve

A proposal from an Energy Storage Resource (ESR) to buy and sell energy at a Settlement Point in the form of a single monotonically non-decreasing price curve that covers both the charging and discharging MW range and provides a bid price for charging and an offer price for discharging.

High Sustained Limit (HSL)

***High Sustained Limit (HSL) for an Energy Storage Resource (ESR)***

The limit established by the QSE, expressed as a MW value that may be less than, equal to, or greater than zero, continuously updated in Real-Time, that describes the maximum sustained energy discharging capability of an Energy Storage Resource (ESR).

High Sustained Limit (HSL) for a Generation Resource

The limit established by the QSE, continuously updated in Real-Time, that describes the maximum sustained energy production capability of the Resource.

High Sustained Limit (HSL) for a Load Resource

The limit calculated by ERCOT, using the QSE-established Maximum Power Consumption (MPC).

Low Sustained Limit (LSL)

Low Sustained Limit (LSL) for an Energy Storage Resource (ESR)

The limit established by the QSE, expressed as a MW value that may be less than, equal to, or greater than zero, continuously updatable in Real-Time, that describes the minimum sustained energy charging capability of an Energy Storage Resource (ESR).

Low Sustained Limit (LSL) for a Generation Resource

The limit established by the QSE, continuously updatable in Real-Time, that describes the minimum sustained energy production capability of a Resource.

Low Sustained Limit (LSL) for a Load Resource

The limit calculated by ERCOT, using the QSE-established LPC.

Resource Node

Either a logical construct that creates a virtual pricing point required to model a Combined-Cycle Configuration or an Electrical Bus defined in the Network Operations Model, at which a Settlement Point Price for a Generation Resource, Energy Storage Resource (ESR), or WSL is calculated and used in Settlement. All Resource Nodes shall be identified in accordance with the Other Binding Document titled “Procedure for Identifying Resource Nodes.” For a Generation Resource or ESR that is connected to the ERCOT Transmission Grid only by one or more radial transmission lines that all originate at the Resource and terminate in a single substation switchyard, the Resource Node is an Electrical Bus in that substation. For all other Generation Resources and ESRs, the Resource Node is the Resource’s side of the Electrical Bus at which the Resource is connected to the ERCOT Transmission Grid.

**Regulation Service**

An Ancillary Service that consists of either Regulation Down Service (Reg-Down) or Regulation Up Service (Reg-Up).

***Fast Responding Regulation Service (FRRS)***

A subset of Regulation Service that consists of either Fast Responding Regulation Down Service (FRRS-Down) or Fast Responding Regulation Up Service (FRRS-Up). Except where otherwise specified, all requirements that apply to Regulation Service also apply to FRRS.

***Regulation Down Service (Reg-Down)***

An Ancillary Service that provides capacity that can respond to signals from ERCOT within five seconds to respond to changes in system frequency. Such capacity is the amount available below any Base Point but above the LSL of a Generation Resource and may be called on to change output as necessary throughout the range of capacity available to maintain proper system frequency. An Energy Storage Resource (ESR) providing Reg-Down must be able to modify its energy withdrawal or injection as deployed for Reg-Down across the full range of capacity available to maintain proper system frequency. A Load Resource providing Reg-Down must be able to increase and decrease Load as deployed within its Ancillary Service Schedule for Reg-Down below the Load Resource’s MPC limit.

***Fast Responding Regulation Down Service (FRRS-Down)***

A subset of Reg-Down in which the participating Resource provides Reg-Down capacity to ERCOT within 60 cycles of either its receipt of an ERCOT Dispatch Instruction or its detection of a trigger frequency independent of an ERCOT Dispatch Instruction. Except where otherwise specified, all requirements that apply to Reg-Down also apply to FRRS-Down.

***Regulation Up Service (Reg-Up)***

An Ancillary Service that provides capacity that can respond to signals from ERCOT within five seconds to respond to changes in system frequency. Such capacity is the amount available above any Base Point but below the HSL of a Generation Resource and may be called on to change output as necessary throughout the range of capacity available to maintain proper system frequency. An Energy Storage Resource (ESR) providing Reg-Up must be able to modify its energy withdrawal or injection as deployed for Reg-Up across the full range of capacity available to maintain proper system frequency. A Load Resource providing Reg-Up must be able to increase and decrease Load as deployed within its Ancillary Service Schedule for Reg-Up above the Load Resource’s LPC limit.

***Fast Responding Regulation Up Service (FRRS-Up)***

A subset of Reg-Up in which the participating Resource provides Reg-Up capacity to ERCOT within 60 cycles of either its receipt of an ERCOT Dispatch Instruction or its detection of a trigger frequency independent of an ERCOT Dispatch Instruction. Except where otherwise specified, all requirements that apply to Reg-Up also apply to FRRS-Up.

**Security-Constrained Economic Dispatch (SCED)**

The determination of desirable output and/or consumption levels of Generation Resources, Energy Storage Resources (ESRs), and Controllable Load Resources using Energy Offer Curves, Energy Bid/Offer Curves, and/or RTM Energy Bids while considering State Estimator (SE) output for Load at transmission-level Electrical Buses, Resource limits, and transmission limits to maximize bid-based revenues less offer-based costs.

**3.1.4.3 Reporting for Planned Outages, Maintenance Outages, and Rescheduled Outages of Resource and Transmission Facilities**

(1) Each Resource Entity and TSP shall submit information regarding proposed Planned Outages, Maintenance Outages, and Rescheduled Outages of Transmission Facilities or Planned Outages and Maintenance Outages of Generation Resources or Energy Storage Resources (ESRs) under procedures adopted by ERCOT. The obligation to submit that information applies to each Resource Entity that is responsible to operate or maintain a Generation Resource or ESR that is part of or that affects the ERCOT System. The obligation to submit that information applies to each TSP or Resource Entity that is responsible to operate or maintain Transmission Facilities that are part of or affect the ERCOT System. A Resource Entity or TSP is also obligated to submit information for Transmission Facilities or Generation Resources or ESRs that are not part of the ERCOT System or that do not affect the ERCOT System if that information is required for regional security coordination as determined by ERCOT.

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| ***[NPRR857: Replace paragraph (1) above with the following upon system implementation:]***  (1) Each Resource Entity, TSP, and DCTO shall submit information regarding proposed Planned Outages, Maintenance Outages, and Rescheduled Outages of Transmission Facilities or Planned Outages and Maintenance Outages of Generation Resources or Energy Storage Resources (ESRs) under procedures adopted by ERCOT. The obligation to submit that information applies to each Resource Entity that is responsible to operate or maintain a Generation Resource or ESR that is part of or that affects the ERCOT System. The obligation to submit that information applies to each TSP, DCTO, or Resource Entity that is responsible to operate or maintain Transmission Facilities that are part of or affect the ERCOT System. A Resource Entity, TSP, or DCTO is also obligated to submit information for Transmission Facilities or Generation Resources or ESRs that are not part of the ERCOT System or that do not affect the ERCOT System if that information is required for regional security coordination as determined by ERCOT. |

(2) Before taking an RMR or Black Start Resource (“Reliability Resources”) out of service for a Planned Outage or Maintenance Outage, the Single Point of Contact for that Reliability Resource must obtain ERCOT’s approval of the schedule of the Planned Outage or Maintenance Outage. ERCOT shall review and approve or reject each proposed Planned Outage or Maintenance Outage Schedule under this Section and the applicable Agreements.

***3.2.1 Calculation of Aggregate Resource Capacity***

(1) ERCOT shall use Outages in the Outage Scheduler and, when applicable, the Resource Status from the Current Operating Plan (COP) to calculate the aggregate capacity from Generation Resources, Energy Storage Resources (ESRs), and Load Resources projected to be available in the ERCOT Region and in Forecast Zones in ERCOT. “Forecast Zones” have the same boundaries as the 2003 ERCOT Congestion Management Zones (CMZs). Each Resource will be mapped to a Forecast Zone during the registration process.

(2) Monthly, ERCOT shall calculate the aggregate weekly Generation Resource capacity and ESR capacity for the ERCOT Region and the Forecast Zones projected to be available during the ERCOT Region peak Load hour of each week for the following 36 months, starting with the second week and the aggregate weekly Load Resource capacity for the ERCOT Region projected to be available during the ERCOT Region peak Load hour of each week for the following 36 months, starting with the second week.

(3) On a rolling hourly basis, ERCOT shall calculate the aggregate hourly Generation Resource capacity, ESR capacity, and Load Resource capacity in the ERCOT Region and Forecast Zones projected to be available during each hour for the following seven days.

(4) Projections of Generation Resource capacity from Intermittent Renewable Resources (IRRs) shall be consistent with capacity availability estimates, such as the effective Load carrying capability of wind, developed jointly between ERCOT and the appropriate Technical Advisory Committee (TAC) subcommittee and approved by the ERCOT Board or typical production expectations consistent with expected wind profiles as appropriate for the scenario being studied.

(5) ERCOT shall publish procedures describing the IRR forecasting process on the Market Information System (MIS) Public Area.

***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 each execution of SCED. The Disclosure Area is the 2003 ERCOT CMZs. Posting requirements will be applicable to Generation Resources, ESRs, and Controllable Load Resources physically located in the defined Disclosure Area. This information shall not be posted if the posting of the information would reveal any individual Market Participant’s Protected Information. The information posted by ERCOT shall include:

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

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

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

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

(e) The sum of LSLs, sum of Output Schedules, and sum of HSLs for Generation Resources without Energy Offer Curves and ESRs without Energy Bid/Offer Curves;

(f) The sum of the Base Points of non-IRR Generation Resources with Energy Offer Curves, sum of the Base Points of WGRs with Energy Offer Curves, sum of the Base Points of PVGRs with Energy Offer Curves, sum of the Base Points of ESRs with Energy Bid/Offer Curves, and the sum of the Base Points of all remaining Resources dispatched in SCED;

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

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

(i) The sum of the Base Points of ESRs in discharge mode; and

(j) The sum of the Base Points of ESRs in charge mode.

(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, including the offer portion of Energy Bid/Offer Curves submitted for ESRs, not taking into consideration Resource Startup Offer or Minimum-Energy Offer or any physical limitations of the ERCOT System. The result will represent the energy supply curve at various pricing points for energy offers available in the DAM;

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

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

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

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

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| ***[NPRR863: Replace paragraph (e) above with the following upon system implementation:]***  (e) The aggregate Ancillary Service Offers (prices and quantities) in the DAM, for each type of Ancillary Service regardless of a Resource’s On-Line or Off-Line status and including Ancillary Service Only Offers. For RRS and ECRS, ERCOT shall separately post aggregated offers from Generation Resources (including Ancillary Service Only Offers) and ESRs, and from Controllable Load Resources and other 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 Load Resource name and the Load Resource’s bid to buy (prices and quantities);

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

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

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

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

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

(i) The Generation Resource name;

(ii) The Generation Resource status;

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

(iv) The Generation Resource Base Point from SCED;

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

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

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

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

(i) The Load Resource name;

(ii) The Load Resource status;

(iii) The MPC for a Load Resource;

(iv) The LPC for a Load Resource;

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

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

(vii) The telemetered real power consumption; and

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

(i) The ESR name and the ESR’s Energy Bid/Offer Curve (prices and quantities):

(i) As submitted; and

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

(j) The following ESR data using a snapshot from each execution of SCED:

(i) The ESR name;

(ii) The ESR status;

(iii) The ESR HSL, LSL, High Dispatch Limit (HDL), and Low Dispatch Limit (LDL);

(iv) The ESR Base Point from SCED;

(v) The telemetered ESR net output used in SCED;

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

(vii) The telemetered Normal Ramp Rates;

(viii) The telemetered Ancillary Service capabilities; and

(ix) The telemetered State of Charge in MWh.

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

(6) If any Market Clearing Price for Capacity (MCPC) for an Ancillary Service exceeds 50 times the FIP for any Operating Hour in a DAM or Supplemental Ancillary Services Market (SASM) for the applicable Operating Day, ERCOT shall post on the 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.

(7) 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.

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| ***[NPRR978: Replace paragraph (7) above with the following upon system implementation:]***  (7) 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 three days after the end of the applicable Operating Day. If multiple Entities submitted the highest-priced offers selected, all Entities shall be identified on the MIS Public Area. |

(8) 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.

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| ***[NPRR978: Replace paragraph (8) above with the following upon system implementation:]***  (8) 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 three days after the end of the applicable Operating Day. If multiple Entities submitted the highest-priced bids selected, all Entities shall be identified on the MIS Public Area. |

(9) 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.

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| ***[NPRR978: Replace paragraph (9) above with the following upon system implementation:]***  (9) 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 three days after the end of the applicable Operating Day. This same report shall also include the highest-priced Ancillary Service Offer selected for any SASMs cleared for that same Operating Day. If multiple Entities submitted the highest-priced offers selected, all Entities shall be identified on the MIS Public Area. The report shall specify whether the Ancillary Service Offer was selected in a DAM or a SASM. |

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

(a) The Resource name;

(b) The name of the Resource Entity;

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

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

(11) ERCOT shall post on the 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;

(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;

(l) The ESR name and the ESR’s Energy Bid/Offer Curve (prices and quantities), available for the DAM;

(m) The awards for each Ancillary Service from the DAM for each ESR; and

(n) The award of each Energy Bid/Offer Curve from the DAM and the name of the QSE receiving the award.

(12) ERCOT shall post on the 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.

**3.3.2.1 Information to Be Provided to ERCOT**

(1) The energization or removal of a Transmission Facility, Generation Resource, or Energy Storage Resource (ESR) in the Network Operations Model requires an entry into the Outage Scheduler by a TSP or Resource Entity. For TSP requests, the TSPs shall enter such requests in the Outage Scheduler. For Resource Entity requests, the Resource Entity shall enter such requests in the Outage Scheduler. If any changes in system topology or telemetry are expected, then the TSP or Resource Entity shall notify ERCOT in accordance with the schedule in Section 3.3.1, ERCOT Approval of New or Relocated Facilities. Information submitted pursuant to this subsection for Transmission Facilities within a Private Use Network shall not be publicly posted.

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| ***[NPRR857: Replace paragraph (1) above with the following upon system implementation:]***  (1) The energization or removal of a Transmission Facility, Generation Resource, or Energy Storage Resource (ESR) in the Network Operations Model requires an entry into the Outage Scheduler by a TSP, DCTO, or Resource Entity. For any TSP or DCTO request, the TSP or DCTO shall enter the request in the Outage Scheduler. For any Resource Entity request, the Resource Entity shall enter the request in the Outage Scheduler. If any changes in system topology or telemetry are expected, then the TSP, DCTO, or Resource Entity shall notify ERCOT in accordance with the schedule in Section 3.3.1, ERCOT Approval of New or Relocated Facilities. Information submitted pursuant to this subsection for Transmission Facilities within a Private Use Network shall not be publicly posted. |

(2) If a Resource Entity within a Private Use Network is adding or removing a Transmission Facility at the Point of Interconnection (POI), it shall inform and determine with ERCOT whether any corresponding Network Operations Model updates are necessary. If ERCOT and the Resource Entity determine that updates are needed, the process set forth in paragraph (1) above shall be used to incorporate the update into the Network Operations Model. Information submitted pursuant to paragraph (1) above shall not be publicly posted.

(3) TSPs and Resource Entities shall submit any changes in system topology or telemetry in accordance with the Network Operations Model Change Request (NOMCR) process or other ERCOT-prescribed process applicable to Resource Entities and according to the requirements of Section 3.10.1, Time Line for Network Operations Model Changes. The submittal shall include the following:

(a) Proposed energize date;

(b) TSPs or Resource Entities performing work;

(c) TSPs or Resource Entities responsible for rating affected Transmission Element(s);

(d) For Resource Entities, data and information required by Section 16.5, Registration of a Resource Entity;

(e) Station identification code;

(f) Identification of existing Transmission Facilities involved and new Transmission Facilities (if any) being added or existing Transmission Facilities being permanently removed from service;

(g) Ratings of existing Transmission Facilities involved and new Transmission Facilities (if any) being added;

(h) Outages required (clearly identify each Outage if multiple Outages are required), including sequence of Outage and estimate of Outage duration;

(i) General statement of work to be completed with intermediate progress dates and events identified;

(j) SCADA modification work, including descriptions of the telemetry points or changes to existing telemetry, providing information on equipment being installed, changed, or monitored;

(k) Additional data determined by ERCOT and TSPs, or Resource Entities as needed to complete the ERCOT model representation of existing Transmission Facilities involved and new Transmission Facilities (if any) being added;

(l) Statement of completion, including:

(i) Statement to be made at the completion of each intermediate stage of project; and

(ii) Statement to be made at completion of total project.

(m) Drawings, including:

(i) Existing status;

(ii) Each intermediate stage; and

(iii) Proposed final configuration.

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| ***[NPRR857: Replace paragraph (3) above with the following upon system implementation:]***  (3) Each TSP, DCTO, and Resource Entity shall submit any changes in system topology or telemetry in accordance with the Network Operations Model Change Request (NOMCR) process or other ERCOT-prescribed process applicable to Resource Entities and according to the requirements of Section 3.10.1, Time Line for Network Operations Model Changes. The submittal shall include the following:  (a) Proposed energize date;  (b) TSPs, DCTOs, or Resource Entities performing work;  (c) TSPs, DCTOs, or Resource Entities responsible for rating affected Transmission Element(s);  (d) For Resource Entities, data and information required by Section 16.5, Registration of a Resource Entity;  (e) Station identification code;  (f) Identification of existing Transmission Facilities involved and new Transmission Facilities (if any) being added or existing Transmission Facilities being permanently removed from service;  (g) Ratings of existing Transmission Facilities involved and new Transmission Facilities (if any) being added;  (h) Outages required (clearly identify each Outage if multiple Outages are required), including sequence of Outage and estimate of Outage duration;  (i) General statement of work to be completed with intermediate progress dates and events identified;  (j) SCADA modification work, including descriptions of the telemetry points or changes to existing telemetry, providing information on equipment being installed, changed, or monitored;  (k) Additional data determined by ERCOT, TSPs, DCTOs, or Resource Entities as needed to complete the ERCOT model representation of existing Transmission Facilities involved and new Transmission Facilities (if any) being added;  (l) Statement of completion, including:  (i) Statement to be made at the completion of each intermediate stage of project; and  (ii) Statement to be made at completion of total project.  (m) Drawings, including:  (i) Existing status;  (ii) Each intermediate stage; and  (iii) Proposed final configuration. |

***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) ONRR – On-Line as a synchronous condenser providing Responsive Reserve (RRS) but unavailable for Dispatch by SCED and available for commitment by RUC;

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| ***[NPRR863: Insert paragraph (L) below upon system implementation and renumber accordingly:]***  (L) ONECRS – On-Line as a synchronous condenser providing ERCOT Contingency Response Service (ECRS) but unavailable for Dispatch by SCED and available for commitment by RUC; |

(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; and

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

(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;

(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

(E) EMRSWGR – Switchable Generation Resource (SWGR) operating in a non-ERCOT Control Area, or in the case of a Combined Cycle Train with one or more SWGRs, a configuration in which one or more of the physical units in that configuration are operating in a non-ERCOT Control Area; 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, excluding Controllable Load Resources;

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| ***[NPRR863: Insert paragraph (F) below upon system implementation and renumber accordingly:]***  (F) ONECL – Available for Dispatch of ECRS, excluding Controllable Load Resources; |

(F) OUTL – Not available;

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| ***[NPRR863: Insert paragraph (H) below upon system implementation:]***  (H) ONFFRRRSL – Available for Dispatch of RRS, excluding Controllable Load Resources. This Resource Status is only to be used for Real-Time telemetry purposes; |

(iv) Select one of the following for Energy Storage Resources (ESRs). Unless otherwise provided below, these Resource Statuses are to be used for COP and Real-Time telemetry purposes:

(A) ON – On-Line Resource with Energy Bid/Offer Curve;

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

(C) ONTEST – On-Line blocked from SCED for operations testing (while ONTEST, an Energy Storage Resource (ESR) may be shown on Outage in the Outage Scheduler);

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

(E) ONHOLD – Resource is On-Line but temporarily unavailable for Dispatch by SCED or Ancillary Service awards. ESRs shall not be discharging into or charging from the grid. This Resource Status is only to be used for Real-Time telemetry purposes; and

(F) OUT – Off-Line and unavailable; and

(c) The HSL;

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

(ii) For ESRs, the HSL may be negative;

(d) The LSL;

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

(ii) For ESRs, the LSL may be positive;

(e) The High Emergency Limit (HEL);

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

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

(i) Regulation Up (Reg-Up);

(ii) Regulation Down (Reg-Down);

(iii) RRS; and

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| ***[NPRR863: Insert paragraph (iv) below upon system implementation and renumber accordingly:]***  (iv) ECRS; and |

(iv) 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.

(15) A QSE representing a Resource may use the Resource Status code of EMRSWGR only for an SWGR.

4.3 QSE Activities and Responsibilities in the Day-Ahead

(1) During the Day-Ahead, a Qualified Scheduling Entity (QSE):

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

(b) May submit Three-Part Supply Offers, Day-Ahead Market (DAM) Energy-Only Offers, DAM Energy Bids, Energy Bid/Offer Curves, Energy Trades, Self-Schedules, Capacity Trades, Direct Current (DC) Tie Schedules, Resource-Specific Ancillary Service Offers, DAM Ancillary Service Only Offers, Ancillary Service Trades, Self-Arranged Ancillary Service Quantities, and Point-to-Point (PTP) Obligation bids as specified in this Section.

(2) By 0600 in the Day-Ahead, each QSE representing Reliability Must-Run (RMR) Units or Black Start Resources shall submit its Availability Plan to ERCOT indicating availability of RMR Units and Black Start Resources for the Operating Day and any other information that ERCOT may need to evaluate use of the units as set forth in the applicable Agreements and this Section.

4.4.7.2 Ancillary Service Offers

(1) By 1000 in the Day-Ahead, a QSE may submit Resource-Specific Ancillary Service Offers from Generation Resources and ESRs to ERCOT for the DAM and may offer the same Generation Resource or ESR capacity for any or all of the Ancillary Service products simultaneously with any Energy Offer Curves from that Generation Resource or Energy Bid/Offer Curves from that ESR in the DAM. 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. Offers of more than one Ancillary Service product from one ESR may be inclusive or exclusive of each other, 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 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.

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| ***[NPRR863: Replace paragraph (2) above with the following upon system implementation:]***  (2) By 1000 in the Day-Ahead, a QSE may submit Load Resource-specific Ancillary Service Offers for Regulation Service, Non-Spin, RRS, and ECRS 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 RRS may only be procured by ERCOT as a block.

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| ***[NPRR863: Insert paragraph (5) below upon system implementation and renumber accordingly:]***  (5) A Load Resource that is not a Controllable Load Resource may specify whether its Ancillary Service Offer for ECRS may only be procured by ERCOT as a block. |

(5) A QSE that submits an On-Line Resource-Specific 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 a Resource-Specific Ancillary Service Offer for Off-Line Non-Spin was not also submitted for that hour. A QSE that submits an On-Line ESR-specific Ancillary Service Offer or Energy Bid/Offer Curve for the DAM will be considered to be On-Line. A QSE may not submit an Off-Line Ancillary Service Offer for an ESR. 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; however, for an ESR, the DAM will consider LSL and HSL. A Combined Cycle Generation Resource will be considered by the DAM to be self-committed based on an On-Line Resource-Specific 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) A Resource-Specific Ancillary Service Offer linked to other Resource-Specific Ancillary Service Offers or an Energy Offer Curve or Energy Bid/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 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

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| ***[NPRR863: Replace paragraph (i) above with the following upon system implementation:]***  (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 RRS or ECRS, 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, an ESR, 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. This variable quantity block indicator will only be considered in the DAM and will be ignored for awarding of Ancillary Services in the RTM; 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.

4.4.7.3.1 Ancillary Service Trade Criteria

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

(a) The buying QSE;

(b) The selling QSE;

(c) The type of Ancillary Service;

(d) The quantity in MW; and

(e) The first and last hours of the trade.

(f) For RRS, the QSE shall indicate the quantity of the service that is provided from:

(i) Resources capable of providing PFR;

(ii) ESRs and Load Resources providing Fast Frequency Response (FFR); and

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

(2) An Ancillary Service Trade must be confirmed by both the buying QSE and selling QSE to be considered valid and to be used in an ERCOT process.

4.4.9.2 Startup Offer and Minimum-Energy Offer

(1) The Startup Offer component represents all costs incurred by a Generation Resource in starting up and reaching its LSL. The Minimum-Energy Offer component represents a proxy for the costs incurred by a Resource in producing energy at the Resource’s LSL. Startup Offers and Minimum-Energy Offers are not applicable to ESRs.

4.4.9.3 Energy Offer Curve

(1) The Energy Offer Curve represents the QSE’s willingness to sell energy at or above a certain price and at a certain quantity in the DAM or its willingness to be dispatched by SCED in Real-Time Operations.

(2) A QSE may submit Resource-specific Energy Offer Curves to ERCOT. Such Energy Offer Curves will be bounded in the DAM for each Operating Hour by the LSL and HSL of the Generation Resource specified in the COP, and bounded in SCED by the LSL and HSL of the Generation Resource as shown by telemetry.

(3) Energy Offer Curves remain active for the offered period until either:

(a) Selected by ERCOT; or

(b) Automatically inactivated by the software at the offer expiration time selected by the QSE.

(4) For any Operating Hour, the QSE for a Resource may submit or change Energy Offer Curves in the Adjustment Period and a QSE may withdraw an Energy Offer Curve if:

(a) An Output Schedule is submitted for all intervals for which an Energy Offer Curve is withdrawn; or

(b) The Resource is forced Off-Line and notifies ERCOT of the Forced Outage by changing the Resource Status appropriately and updating its COP.

(5) For any Operating Hour that is a RUC-Committed Interval or a DAM-Committed Interval for a Resource, a QSE for that Resource may not change a Startup Offer or Minimum-Energy Offer.

(6) If a valid Energy Offer Curve or an Output Schedule does not exist for a Resource that has a status of On-Line at the end of the Adjustment Period, then ERCOT shall notify the QSE 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.



***4.4.9.4.1 Mitigated Offer Cap***

(1) Energy Offer Curves and Energy Bid/Offer Curves may be subject to mitigation in Real-Time operations under Section 6.5.7.3, Security Constrained Economic Dispatch, using a Mitigated Offer Cap (MOC). For Generation Resources, ERCOT shall construct an incremental MOC curve in accordance with Section 6.5.7.3 such that each point on the MOC curve is calculated as follows:

MOC *q, r, h* = Max [GIHR *q, r* \* Max(FIP, WAFP *q, r, h*), (IHR *q, r* \* FPRC *q, r* + OM *q, r*) \* CFMLT *q, r*]

Where,

If a QSE has submitted an Energy Offer Curve on behalf of a Generation Resource and the Generation Resource has approved verifiable costs, then

FPRC *q, r* = Max(WAFP *q, r, h*, FIP + FA *q, r*) \* RTPERFIP *q, r* / 100 + FOP \* RTPERFOP *q, r* / 100

If a QSE has not submitted an Energy Offer Curve on behalf of a Generation Resource and the Generation Resource has approved verifiable costs, then

FPRC *q, r* = Max(WAFP *q, r, h*, FIP + FA *q, r*) \* GASPEROL *q, r* / 100 + FOP \* OILPEROL *q, r* / 100 + (SFP + FA *q, r*) \* SFPEROL *q, r* / 100

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| MOC *q, r, h* | $/MWh | *Mitigated Offer Cap per Resource*—The MOC 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. |
| GIHR *q, r* | MMBtu/MWh | *Generic Incremental Heat Rate*—The generic, single-value, incremental heat rate. For Generation Resources with a Commercial Operations Date on or before January 1, 2004, the generic incremental heat rate shall be set to 10.5. For Generation Resources that have a Commercial Operations Date after January 1, 2004, this value shall be set to 14.5. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| IHR *q, r* | MMBtu/MWh | *Verifiable Incremental Heat Rate per Resource*—The verifiable incremental heat rate curve for Resource *r,* as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| FIP | $/MMBtu | *Fuel Index Price*—The natural gas index price as defined in Section 2.1, Definitions. |
| RTPERFIP *q, r* | none | *Fuel Index Price Percentage*—The percentage of natural gas used by Resource *r* to operate above LSL, as submitted with the energy offer curve. |
| FOP | $/MMBtu | *Fuel Oil Price*—The fuel oil index price as defined in Section 2.1. |
| RTPERFOP *q, r* | none | *Fuel Oil Price Percentage*—The percentage of fuel oil used by Resource *r* to operate above LSL, as submitted with the energy offer curve. |
| SFP | $/MMBtu | *Solid Fuel Price—*The solid fuel index price is $1.50. |
| FPRC *q, r* | $/MMBtu | *Fuel Price Calculated per Resource*—The calculated index price for fuel for the Resource based on the Resources fuel mix. Where for a Combined Cycle Train, the Resource r is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| GASPEROL *q, r* | none | *Percent of Natural Gas to Operate Above LSL*—The percentage of natural gas used by Resource *r* to operate above LSL, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource r is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| OILPEROL *q, r* | none | *Percent of Oil to Operate Above LSL*—The percentage of fuel oil used by Resource *r* to operate above LSL, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource r is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| SFPEROL *q, r* | none | *Percent of Solid Fuel to Operate Above LSL*—The percentage of solid fuel used by Resource *r* to operate above LSL, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource r is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| FA *q, r* | $/MMBtu | *Fuel Adder*—The fuel adder is the average cost above the index price Resource *r* has paid to obtain fuel. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. See the Verifiable Cost Manual for additional information. |
| OM *q, r* | $/MWh | *Variable Operations and Maintenance Cost above LSL*—The O&M cost for Resource *r* to operate above LSL, including an adjustment for emissions costs, as approved in the verifiable cost process. Where for a Combined Cycle Train, the Resource r is a Combined Cycle Generation Resource within the Combined Cycle Train. See the Verifiable Cost Manual for additional information. |
| CFMLT *q, r* | none | *Capacity Factor Multiplier*—A multiplier based on the corresponding monthly capacity factor as described in paragraph (1)(d) below. |
| WAFP *q, r, h* | $/MMBtu | *Weighted Average Fuel Price*—The volume-weighted average intraday, same-day and spot price of fuel submitted to ERCOT during the Adjustment Period for a specific Resource and specific hour within the Operating Day, as described in paragraph (1)(f) below. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |
| *h* | none | The Operating Hour. |

(a) For a Resource contracted by ERCOT under paragraph (2) of Section 6.5.1.1, ERCOT Control Area Authority, ERCOT shall increase the O&M cost such that every point on the MOC curve is greater than the SWCAP in $/MWh.

(b) The MOC for Energy Storage Resources shall be calculated in accordance with Verifiable Cost Manual Appendix 10, Procedures for Evaluating Costs and Caps for Energy Storage Resources.

|  |
| --- |
| ***[NPRR986: Replace paragraph (b) above with the following upon system implementation:]***  (b) Notwithstanding the MOC calculation described in paragraph (1) above, the MOC for ESRs shall be set at the RTSWCAP. No later than December 31, 2023, ERCOT and stakeholders shall submit a report to TAC that includes a recommendation to continue the existing approach or a proposal to implement an alternative approach to determine the MOC for ESRs. |

(c) For Quick Start Generation Resources (QSGRs) the MOC shall be adjusted in accordance with Verifiable Cost Manual Appendix 7, Calculation of the Variable O&M Value and Incremental Heat Rate used in Real Time Mitigation for Quick Start Generation Resources (QSGRs).

(d) The multipliers for the MOC calculation above are as follows:

(i) 1.10 for Resources running at a ≥ 50% capacity factor for the previous 12 months;

(ii) 1.15 for Resources running at a ≥ 30 and < 50% capacity factor for the previous 12 months;

(iii) 1.20 for Resources running at a ≥ 20 and < 30% capacity factor for the previous 12 months;

(iv) 1.25 for Resources running at a ≥ 10 and < 20% capacity factor for the previous 12 months;

(v) 1.30 for Resources running at a ≥ 5 and < 10% capacity factor for the previous 12 months;

(vi) 1.40 for Resources running at a ≥ 1 and < 5% capacity factor for the previous 12 months; and

(vii) 1.50 for Resources running at a less than 1% capacity factor for the previous 12 months.

(e) The previous 12 months’ capacity factor must be updated by ERCOT by the 20th day of each month using the most recent data for use in the next month. ERCOT shall post to the MIS Secure Area the capacity factor for each Resource before the start of the effective month.

(f) During the Adjustment Period, a QSE representing a Resource may submit Exceptional Fuel Cost as a volume-weighted average fuel price for use in the MOC calculation for that Resource. To qualify as Exceptional Fuel Cost, the submission must meet the following conditions:

(i) For all Resources, the weighted average fuel price must exceed FIP for the applicable Operating Day, plus a threshold parameter value of $1/MMBtu, plus the applicable fuel adder. For Resources without approved verifiable costs, the fuel adder will be set to the default value assigned to Resources with approved verifiable costs, as defined in the Verifiable Cost Manual. The threshold parameter value in this paragraph shall be recommended by the Wholesale Market Subcommittee (WMS) and approved by the Technical Advisory Committee (TAC). ERCOT shall update the threshold value on the first day of the month following TAC approval unless otherwise directed by the TAC. ERCOT shall provide a Market Notice prior to implementation of a revised parameter value.

(ii) Fixed cost (fees, penalties and similar non-gas costs) may not be included in the calculation of the weighted average fuel price.

(iii) All intra-day, same day, and spot fuel purchases must be included in the calculation of the weighted average fuel price in paragraph (1) above. These must account for at least 10% of the total fuel volume burned by the applicable Resource for the hour for which the weighted average fuel price is computed. As noted in paragraph (l) below, the methodology used in the allocation of the cost and volume of purchased fuel to the Resource for the hour is subject to validation by ERCOT.

(iv) Weighted average fuel prices must be submitted individually for each Operating Hour for which they are applicable. Values submitted outside of the Adjustment Period will be rejected and not used in the calculation of the MOC for the designated Operating Hour.

(g) ERCOT may notify the Independent Market Monitor (IMM) if a QSE submits an Exceptional Fuel Cost.

(h) No later than five Business Days after an Operating Day for which an Exceptional Fuel Cost is submitted, ERCOT shall issue a Market Notice indicating the affected Operating Hours and the number of Resources for which a QSE submitted Exceptional Fuel Cost for a particular Operating Day.

(i) No later than 1700 Central Prevailing Time (CPT) on the 15th day following an Exceptional Fuel Cost submission, the submitting QSE shall provide ERCOT with the calculation of the weighted average fuel price, intraday or same-day fuel purchases, and any available supporting documentation. Such information may include, but is not be limited to, documents of the following nature: relevant contracts between the QSE or Resource Entity and fuel supplier, trade logs, transportation, storage, balancing and distribution agreements, calculation of the weighted average fuel price, or any other documentation necessary to support the Exceptional Fuel Cost price and volume for the applicable period(s).

(j) No later than 1700 Central Prevailing Time (CPT) on the 60th day following an Exceptional Fuel Cost submission, the submitting QSE shall provide ERCOT with all supporting documentation not previously provided to ERCOT. No supporting documentation will be accepted after the 60th day.

(k) The accuracy of submitted Exceptional Fuel Cost and the need for purchasing intraday or same-day gas must be attested to by a duly authorized officer or agent of the QSE representing the Resource. The attestation must be provided in a standardized format acceptable to ERCOT and submitted with the other documentation described in paragraph (i) above.

(l) ERCOT will use the supporting documentation to validate the Exceptional Fuel Cost for the applicable period. Validation will include, but not be limited to, the cost and the quantity of purchased fuel, Resource-specific heat rates, and the methodology used in the allocation of the cost and volume of purchased fuel to the Resource for the applicable hour used in the weighted average fuel price calculation. In connection with the validation process ERCOT may request additional documentation or clarification of previously submitted documentation. Such requests must be honored within ten Business Days.

(m) At ERCOT’s sole discretion, submission and follow-up information deadlines may be extended on a case-by-case basis.

4.4.9.4.2 Mitigated Offer Floor

(1) Energy Offer Curves and Energy Bid/Offer Curves may be subject to mitigation in the RTM under Section 6.5.7.3, Security Constrained Economic Dispatch, using a Mitigated Offer Floor. The Mitigated Offer Floor is:

| Resource Category | Mitigated Offer Floor |
| --- | --- |
| Nuclear and Hydro | -$250/MWh |
| Coal and Lignite | -$20/MWh |
| Combined Cycle | -$20/MWh |
| Gas/Oil Steam and Combustion Turbine | -$20/MWh |
| Qualifying Facility (QF) | -$50/MWh |
| Wind | -$100/MWh |
| PhotoVoltaic (PV) | -$50/MWh |
| Energy Storage Resource (ESR) | -$250/MWh |
| Other | -$50/MWh |

**4.4.9.7 Energy Bid/Offer Curve**

(1) The Energy Bid/Offer Curve represents the willingness of a QSE representing an Energy Storage Resource (ESR) to buy energy at or below a certain price and sell energy at or above a certain price and at a certain quantity in the DAM or its willingness to be dispatched by SCED in Real-Time Operations. ERCOT must validate each Energy Bid/Offer Curve in accordance with Section 4.4.9.7.2, Energy Bid/Offer Curve Validation, before it can be used in any ERCOT process.

(2) A QSE may submit Resource-Specific Energy Bid/Offer Curves to ERCOT. Such Energy Bid/Offer Curves will be bounded in the DAM for each Operating Hour by the LSL and HSL of the Energy Storage Resource (ESR) specified in the COP, and bounded in SCED by the LSL and HSL of the ESR as shown by telemetry.

(3) In the DAM, ERCOT will not consider COP Resource Status when evaluating Energy Bid/Offer Curves. In the Real-Time Market (RTM), SCED will consider an ESR unavailable for SCED Dispatch when the ESR’s Resource Status is OUT.

(4) Energy Bid/Offer Curves remain active for the offered period until either:

(a) Selected by ERCOT; or

(b) Automatically inactivated by the software at the offer expiration time selected by the QSE.

(5) In the RTM, a QSE may submit or change an Energy Bid/Offer Curve at any time prior to SCED execution, and SCED will use the latest updated Energy Bid/Offer Curve available in the system. If a new Energy Bid/Offer Curve is not deemed to be valid, then the most recent valid Energy Bid/Offer Curve available in the system at the time of SCED execution will be used and ERCOT will notify the QSE that the invalid Energy Bid/Offer Curve was rejected. Once an Operating Hour ends, an Energy Bid/Offer Curve for that hour cannot be submitted, updated, or canceled.

(6) A QSE may withdraw an Energy Bid/Offer Curve if:

(a) An Output Schedule is submitted for all intervals for which an Energy Bid/Offer Curve is withdrawn; or

(b) The ESR is forced Off-Line and notifies ERCOT of the Forced Outage by changing the Resource Status appropriately and updating its COP.

(7) At the time of SCED execution, if a valid Energy Bid/Offer Curve or Output Schedule does not exist for an ESR that has a status of On-Line, then ERCOT shall notify the QSE and create a proxy Energy Bid/Offer Curve priced at -$250/MWh for the portion of the curve less than zero MW, and priced at the RTSWCAP for the portion of the curve greater than zero MW.

***4.4.9.7.1 Energy Bid/Offer Curve Criteria***

(1) Each Energy Bid/Offer Curve must be reported by a QSE representing an ESR and must include the following information:

(a) The selling QSE;

(b) The ESR represented by the QSE from which the bid and offer would be provided;

(c) A monotonically non-decreasing curve for both price (in $/MWh) and quantity (in MW) with no more than ten price/quantity pairs. Negative MW values cover the charging MW range, and the positive MW values cover the discharging MW range. The price points corresponding to the charging MW range represent the not-to-exceed bid prices to consume energy, and the price points corresponding to the discharging MW range represent the offer prices to sell energy;

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

(e) The expiration time and date of the offer;

(2) An Energy Bid/Offer Curve shall be bounded by -$250.00 per MWh and either the DASWCAP or RTSWCAP depending on the timing of the submission in dollars per MWh. The ERCOT systems must allow ERCOT to enter ESR-specific Energy Bid/Offer Curve floors and caps.

(3) In Day-Ahead Market (DAM) and Real-Time Market (RTM), an Energy Bid/Offer Curve shall be considered to be inclusive of Ancillary Service Offers.

***4.4.9.7.2 Energy Bid/Offer Curve Validation***

(1) A valid Energy Bid/Offer Curve is a curve that ERCOT has determined meets the criteria listed in Section 4.4.9.7.1, Energy Bid/Offer Curve Criteria.

(2) ERCOT shall notify the QSE submitting an Energy Bid/Offer Curve by the Messaging System if the offer was rejected or was considered invalid for any reason. The QSE may then resubmit the Energy Bid/Offer Curve within the appropriate market timeline.

(3) ERCOT shall continuously validate Energy Bid/Offer Curves and continuously display on the MIS Certified Area information that allows any QSE to view its valid Energy Bid/Offer Curves.

4.4.10 Credit Requirement for DAM Bids and Offers

(1) Each QSE’s ability to bid and offer in the DAM is subject to credit exposure from the QSE’s bids and offers being within the credit limit for DAM participation established for the entire Counter-Party of which the QSE is part, as specified in item (1) of Section 16.11.4.6.2, Credit Requirements for DAM Participation, and taking into account the credit exposure of accepted DAM bid and offers of the Counter-Party’s other QSEs.

(2) DAM bids and offers of all QSEs of the Counter-Party are accepted in the order submitted while ensuring that the credit exposure from accepted bids and offers do not exceed the Counter-Party’s credit limit for DAM participation.

(3) ERCOT shall reject the QSE’s individual bids and offers whose credit exposure, as calculated in item (6) below, exceeds the Counter-Party’s credit limit for DAM participation as described in items (1) and (2) above, and shall notify the QSE through the MIS Certified Area as soon as practicable.

(4) The QSE may revise and resubmit such rejected bids and offers described in item (3) above, provided that the resubmitted bids and offers are valid and within the Counter-Party’s credit limit for DAM participation adjusted for all accepted DAM bids and offers of the Counter-Party’s QSE’s limit and that such resubmission occurs prior to 1000 of the Operating Day.

(5) The DAM shall use the Counter-Party’s credit limit for DAM participation provided and adjusted for accepted bids and offers for DAM transactions cleared, until a new credit limit for DAM participation is available.

(6) ERCOT shall calculate credit exposure for bids and offers in the DAM as follows:

(a) For a DAM Energy Bid or for each MW portion of the bid portion of an Energy Bid/Offer Curve, the credit exposure shall be calculated as the quantity of the bid multiplied by a bid exposure price that is calculated as follows:

(i) If the price of the DAM Energy Bid or the price on the bid portion of an Energy Bid/Offer Curve is less than or equal to zero, the bid exposure price for that quantity will equal zero.

(ii) If the price of the DAM Energy Bid or the price on the bid portion of an Energy Bid/Offer Curve is greater than zero, the bid exposure price for that quantity will equal the greater of zero or the sum of (A) and (B):

(A) The lesser of:

(1) The *d*th percentile of the Day-Ahead Settlement Point Price (DASPP) for the hour over the previous 30 days; and

(2) The bid price.

(B) The value *e1* multiplied by (bid price minus (A)) when the bid price is greater than (A).

(1) The value *e1* is computed as the *ep1*th percentile of Ratio1 for the 30 days prior to the Operating Day, where Ratio1 is calculated daily as follows:

Ratio1 = Min[1, Max[0, (∑h=1,24 (Qcleared Bids\*PDAM - Qcleared Offers\*PDAM))/ (∑ h=1,24 Qcleared Bids\*PDAM)]]

except Ratio1 = 1 when ∑ h=1,24 Qcleared Bids\*PDAM = 0

(2) ERCOT may adjust *e1* by changing the quantity of bids or offers to the values reported by the Counter-Party in paragraph (8) below or based on information available to ERCOT.

(iii) For DAM Energy Bids or bid portions of Energy Bid/Offer Curves of curve quantity type, the credit exposure shall be the credit exposure, as calculated above, at the price and MW quantity of the bid curve that produces the maximum credit exposure for the DAM Energy Bid or bid portions of Energy Bid/Offer Curves.

(b) For each MW portion of a DAM Energy-Only Offer:

(i) That has an offer price that is less than or equal to the *a*th percentile of the DASPP for the hour over the previous 30 days, the sum of (A) and (B) shall apply.

(A) Credit exposure will be:

(1) Reduced (when the *b*th percentile Settlement Point Price for the hour is positive). The reduction shall be the quantity of the offer multiplied by the *b*th percentile of the DASPP for the hour over the previous 30 days multiplied by the value *e2.*

(a) The value *e2* is computed as the *ep2*th percentile of Ratio2 for the 30 days prior to the Operating Day, where Ratio2 is calculated daily as follows:

Ratio2 = 1 -Max[0, (∑h=1,24 (Qcleared Offers - Qcleared-Bids))/(∑ h=1,24 (Qcleared Offers))]

except Ratio2 = 0 when ∑ h=1,24 Qcleared Offers = 0

(b) ERCOT may adjust the value of *e2* by changing the quantity of bids or offers to the values reported by the Counter-Party in paragraph (7) below or based on information available to ERCOT; or

(2) Increased (when the *b*th percentile Settlement Point Price for the hour is negative). The increase shall be the quantity of the offer multiplied by the *b*th percentile of the DASPP for the hour over the previous 30 days.

(B) Credit exposure will be increased by the product of the quantity of the offer multiplied by the *dp*th percentile of any positive hourly difference of Real-Time Settlement Point Price and DASPP over the previous 30 days for the hour multiplied by *e3*.

(ii) That has an offer price that is greater than the *a*th percentile of the DASPP for the hour over the previous 30 days, credit exposure will be increased by the product of the quantity of the offer multiplied by the *dp*th percentile of any positive hourly difference of Real-Time Settlement Point Price and DASPP over the previous 30 days for the hour multiplied by *e3*.

(iii) ERCOT may, in its sole discretion, use a percentile other than the *dp*th percentile of any positive hourly difference of Real-Time Settlement Point Price and DASPP over the previous 30 days of the hour in determining credit exposure per this paragraph (6)(b) in evaluating DAM Energy-Only Offers.

(c) For each MW portion of the Energy Offer Curve of a Three-Part Supply Offer or for each MW portion of the offer portion of an Energy Bid/Offer Curve:

(i) That has an offer price that is less than or equal to the *y*th percentile of the DASPP for the hour over the previous 30 days, credit exposure will be reduced (when the *z*th percentile Settlement Point Price is positive) or increased (when the *z*th percentile Settlement Point Price is negative) by the quantity of the offer multiplied by the *z*th percentile of the DASPP for the hour over the previous 30 days.

(ii) That has an offer price that is greater than the *y*th percentile of the DASPP for the hour over the previous 30 days, the credit exposure will be zero.

(iii) For a Combined Cycle Generation Resource with Three-Part Supply Offers for multiple generator configurations, the reduction in credit exposure will be the maximum credit exposure reduction created by the individual Three-Part Supply Offers’ Offer Curves (when the *z*th percentile Settlement Point Price is positive). If the Three-Part Supply Offer causes a credit increase (when the *z*th percentile Settlement Point Price is negative), the increase in credit exposure will be the maximum credit exposure increase created by the individual Three-Part Supply Offers.

(d) For PTP Obligation Bids:

(i) That have a bid price greater than zero, the sum of the quantity of the bid multiplied by the bid price, plus the *u*th percentile of the hourly positive price difference between the source Real-Time Settlement Point Price minus the sink Real-Time Settlement Point Price over the previous 30 days multiplied by the quantity of the bid.

(ii) That have a bid price less than or equal to zero, the *u*th percentile of the hourly positive price difference between the source Real-Time Settlement Point Price minus the sink Real-Time Settlement Point Price over the previous 30 days multiplied by the quantity of the bid.

(iii) Each tenth of a MW quantity (0.1 MW) of an expiring CRR for a Counter-Party can provide credit reduction for only one-tenth of a MW (0.1 MW) of a PTP Obligation bid for that Counter-Party.

(A) The QSE must submit the PTP Obligation bid at the same source and sink pair for the same hour, for the same operating date where the QSE submitting the PTP Obligation bid is represented by the same Counter-Party as the CRR Account Holder that is the owner of record for an expiring CRR, or group of CRRs.

(B) A portion or all of the PTP Obligation bid quantity must be less than or equal to the total of the quantity of all expiring CRRs at the specified source and sink pair and delivery period, less all valid previously submitted PTP Obligation bids at the specified source and sink pair and delivery period.

(iv) For qualified PTP Obligation bids with a bid price greater than zero, ERCOT shall reduce the credit exposure in paragraph (6)(d)(i) above as follows:

Credit Reduction = Reduction Factor \* min[PTP bid quantity, remaining expiring CRR MWs] \* bid price.

The Reduction Factor is *bd*%. The factor can be adjusted up or down at ERCOT’s sole discretion with at least two Bank Business Days notice. ERCOT may adjust this factor up with less notice, if needed. The expiring CRR may be PTP Options and/or PTP Obligations. If a QSE later cancels the PTP Obligation bid then the amount of exposure credited back to the Counter-Party will be treated as though this PTP Obligation bid was previously offset by expiring CRRs if a matching CRR source and sink pair exists up to the maximum expiring CRR quantity. If a QSE updates the PTP Obligation bid then it will be treated as a cancel followed by a new submission for purposes of credit exposure calculation. Outcome of this calculation is dependent of the sequence of submittals for updates and cancels.

(e) For PTP Obligation bids with Links to an Option with a bid price greater than zero:

Credit Reduction = (1- Reduction Factor *bd*) \* (bid quantity \* bid price)

(f) For Ancillary Service Obligations not self-arranged, the product of the quantity of Ancillary Service Obligation not self-arranged multiplied by the *t*th percentile of the hourly MCPC for that Ancillary Service over the previous 30 days for that hour. For negative Self-Arranged Ancillary Service Quantities, the absolute value of the product of the quantity of the negative Self-Arranged Ancillary Service Quantity times the *t*th percentile of the hourly MCPC for that Ancillary Service over the previous 30 days for that hour.

(g) Values *e1*, *e2*, or *e3*, which are applicable to items (a) and (b) above, under conditions described below, will be determined and applied at ERCOT’s sole discretion. Within the application parameters identified below, ERCOT shall establish values for *e1*, *e2*, and *e3* and provide notice to an affected Counter-Party of any changes to *e1*, *e2*, or *e3* before 0900 generally two Bank Business Days prior to the normally scheduled DAM 1000 by a minimum of two of these methods: written, electronic, posting to the MIS Certified Area or telephonic. However, ERCOT may adjust any DAM credit parameter immediately if, in its sole discretion, ERCOT determines that the parameter(s) set for a Counter-Party do not adequately match the financial risk created by that Counter-Party’s activities in the market. ERCOT shall review the values for *e1*, *e2*, or *e3* for each Counter-Party no less than once every two weeks. ERCOT shall provide written or electronic notice to the Counter-Party of the basis for ERCOT’s assessment, or change of assessment, of the exposure adjustment variable established for the Counter-Party and the impact of the adjustment.

(i) The value of each exposure adjustment *e1*, *e2*, and *e3* is a value between zero and one, rounded to the nearest hundredth decimal place, set by ERCOT by Counter-Party. The values ERCOT establishes for *e1*, *e2*, and *e3* for a Counter-Party shall be applied equally to the portfolio of all QSEs represented by such Counter-Party.

(h) ERCOT must re-examine DAM credit parameters immediately if Counter-Party exceeds 90% of its Available Credit Limit (ACL) available to DAM.

(7) A Counter-Party may request more favorable parameters from ERCOT by agreeing to all of the conditions below:

1. The Counter-Party shall notify ERCOT of any expected changes to Ratio1 or Ratio2, due to change in activity, as described below, and the likely duration of such change as soon as practicable, but no later than two Business Days in advance of the change:
2. If Ratio1 as defined in paragraph (6)(a)(ii)(B) above is likely to be greater than the Counter-Party's currently assigned value of *e1* for particular day(s), then the estimated daily values of Ratio1 specifying the day(s) along with the daily DAM Energy Bid, Energy-Only Offer, Energy Bid/Offer Curves, and Three-Part Supply Offer quantity assumptions used to arrive at those values; and
3. If Ratio2 as defined in paragraph (6)(b)(i)(A)(1) above is likely to be lower than the Counter-Party's currently assigned value of *e2* for particular day(s), then the estimated daily values of Ratio2 specifying the day(s) along with the daily DAM Energy Bid, Energy-Only Offer, Energy Bid/Offer Curves, and Three-Part Supply Offer quantity assumption used to arrive at those values.
4. ERCOT, in its sole discretion, will determine the adequacy of the disclosures made in item (a) above and may require additional information as needed to evaluate whether a Counter- Party is eligible for favorable treatment.
5. ERCOT may change the requirements for providing information, as described in item (a) above, to ensure that reasonable information is obtained from Counter-Parties.
6. ERCOT may, but is not required, to use information provided by a Counter-Party to re-evaluate DAM credit parameters and may take other information into consideration as needed.

1. If ERCOT determines that information provided to ERCOT is erroneous or that ERCOT has not been notified of required changes, ERCOT may set all parameters for the Counter-Party to the default values with a possible adder on the *e1* variable, at ERCOT's sole discretion, for a period of not less than seven days and until ERCOT is satisfied that the Counter-Party has and will comply with the conditions set forth in this Section. In no case shall the adder result in an *e1* value greater than one.

(8) Beginning no later than 0800 and ending at 0945 each Business Day, ERCOT shall post to the MIS Certified Area, approximately every 15 minutes, each active Counter-Party’s remaining Available Credit Limit (ACL) for that day’s DAM and the time at which the report was run.

(9) After the DAM results are posted, ERCOT shall post once each Business Day on the MIS Certified Area each active Counter-Party’s calculated aggregate DAM credit exposure and its aggregate DAM credit exposure per transaction type, to the extent available, as it pertains to the most recent DAM Operating Day. The transaction types are:

(a) DAM Energy Bids;

(b) DAM Energy Only Offers;

(c) PTP Obligation Bids;

(d) Three-Part Supply Offers; and

(e) Ancillary Services; and

(f) Energy Bid/Offer Curves.

(10) The parameters in this Section are defined as follows:

1. The default values of the parameters are:

| Parameter | Unit | Current Value\* |
| --- | --- | --- |
| *d* | percentile | 85 |
| *ep1* | percentile | 95 |
| *a* | percentile | 50 |
| *b* | percentile | 45 |
| *dp* | percentile | 90 |
| *ep2* | percentile | 0 |
| *e3* | value | 1 |
| *y* | percentile | 45 |
| *z* | percentile | 50 |
| *u* | percentile | 90 |
| *bd* | % | 90 |
| *t* | percentile | 50 |
| \* The current value for the parameters referenced in this table above will be recommended by TAC and approved by the ERCOT Board. ERCOT shall update parameter values on the first day of the month following ERCOT Board approval unless otherwise directed by the ERCOT Board. ERCOT shall provide a Market Notice prior to implementation of a revised parameter value. | | |

1. The values of the parameters for Entities that meet the requirements in paragraph (7) above for more favorable treatment are:

| Parameter | Unit | Current Value |
| --- | --- | --- |
| *d* | percentile | 85 |
| *ep1* | percentile | 75 |
| *a* | percentile | 50 |
| *b* | percentile | 45 |
| *dp* | percentile | 90 |
| *ep2* | percentile | 25 |
| *e3* | value | 1 |
| *y* | percentile | 45 |
| *z* | percentile | 50 |
| *u* | percentile | 90 |
| *t* | percentile | 50 |
| \* The current value for the parameters referenced in this table above will be recommended by TAC and approved by the ERCOT Board. ERCOT shall update parameter values on the first day of the month following ERCOT Board approval unless otherwise directed by the ERCOT Board. ERCOT shall provide a Market Notice prior to implementation of a revised parameter value. | | |

4.5.1 DAM Clearing Process

(1) At 1000 in the Day-Ahead, ERCOT shall start the Day-Ahead Market (DAM) clearing process. If the processing of DAM bids and offers after 0900 is significantly delayed or impacted by a failure of ERCOT software or systems that directly impacts the DAM, ERCOT shall post a Notice as soon as practicable on the Market Information System (MIS) Public Area, in accordance with paragraph (1) of Section 4.1.2, Day-Ahead Process and Timing Deviations, extending the start time of the execution of the DAM clearing process by an amount of time at least as long as the duration of the processing delay plus ten minutes. In no event shall the extension exceed more than one hour from when the processing delay is resolved.

(2) ERCOT shall complete a Day-Ahead Simultaneous Feasibility Test (SFT). This test uses the Day-Ahead Updated Network Model topology and evaluates all Congestion Revenue Rights (CRRs) for feasibility to determine hourly oversold quantities.

(3) The purpose of the DAM is to economically and simultaneously clear offers and bids described in Section 4.4, Inputs into DAM and Other Trades.

(4) The DAM uses a multi-hour mixed integer programming algorithm to maximize bid-based revenues minus the offer-based costs over the Operating Day, subject to security and other constraints, and ERCOT Ancillary Service procurement requirements.

(a) The bid-based revenues include revenues from ASDCs, DAM Energy Bids, bid portions of Energy Bid/Offer Curves, and Point-to-Point (PTP) Obligation bids.

(b) The offer-based costs include costs from the Startup Offer, Minimum Energy Offer, and Energy Offer Curve of any Resource that submitted a Three-Part Supply Offer, DAM Energy-Only Offers, offer portions of Energy Bid/Offer Curves, Ancillary Service Only Offers, and Ancillary Service Offers.

(c) Security constraints specified to prevent DAM solutions that would overload the elements of the ERCOT Transmission Grid include the following:

(i) Transmission constraints – transfer limits on energy flows through the ERCOT Transmission Grid, e.g., thermal or stability limits. These limits must be satisfied by the intact network and for certain specified contingencies. These constraints may represent:

(A) Thermal constraints – protect Transmission Facilities against thermal overload.

(B) Generic constraints – protect the ERCOT Transmission Grid against transient instability, dynamic stability or voltage collapse.

(C) Power flow constraints – the energy balance at required Electrical Buses in the ERCOT Transmission Grid must be maintained.

(ii) Resource constraints – the physical and security limits on Resources that submit Three-Part Supply Offers or Energy Bid/Offer Curves:

(A) Resource output constraints – the Low Sustained Limit (LSL) and High Sustained Limit (HSL) of each Resource; and

(B) Resource operational constraints – includes minimum run time, minimum down time, and configuration constraints.

(iii) Other constraints –

(A) Linked offers – the DAM may not select any one part of that Resource capacity to provide more than one Ancillary Service or to provide both energy and an Ancillary Service in the same Operating Hour. The DAM may, however, select part of that Resource capacity to provide one Ancillary Service and another part of that capacity to provide a different Ancillary Service or energy in the same Operating Hour, provided that linked Energy and Off-Line Non-Spinning Reserve (Non-Spin) Ancillary Service Offers are not awarded in the same Operating Hour.

(B) The sum of the awarded Ancillary Service capacities for each Resource must be within the Resource limits specified in the Current Operating Plan (COP) and Section 3.18, Resource Limits in Providing Ancillary Service, and the Resource Parameters as described in Section 3.7, Resource Parameters.

(C) Block Ancillary Service Offers for a Load Resource – blocks will not be cleared unless the entire quantity block can be awarded. Because block Ancillary Service Offers cannot set the Market Clearing Price for Capacity (MCPC), a block Ancillary Service Offer may clear below the Ancillary Service Offer price for that block.

(D) Block DAM Energy Bids, DAM Energy-Only Offers, and PTP Obligation bids – blocks will not be cleared unless the entire time and/or quantity block can be awarded. Because quantity block bids and offers cannot set the Settlement Point Price, a quantity block bid or offer may clear in a manner inconsistent with the bid or offer price for that block.

(E) Combined Cycle Generation Resources – The DAM may commit a Combined Cycle Generation Resource in a time period that includes the last hour of the Operating Day only if that Combined Cycle Generation Resource can transition to a shutdown condition in the DAM Operating Day.

(F) Energy Storage Resources (ESRs) – The energy cleared for an ESR may be negative, indicating purchase of energy, or positive, indicating sale of energy.

(d) Ancillary Service needs for each Ancillary Service include the needs specified in the Ancillary Service Plan that are not part of the Self-Arranged Ancillary Service Quantity and that must be met from available DAM Ancillary Service Offers while co-optimizing with DAM Energy Offers. ERCOT may not buy more of one Ancillary Service in place of the quantity of a different service. See Section 4.5.2, Ancillary Service Insufficiency, for what happens if insufficient Ancillary Service Offers are received in the DAM.

(5) ERCOT shall determine the appropriate Load distribution factors to allocate offers, bids, and source and sink of CRRs at a Load Zone across the energized power flow buses that are modeled with Load in that Load Zone. The non-Private Use Network Load distribution factors are based on historical State Estimator (SE) hourly distribution using a proxy day methodology representing anticipated weather conditions. The Private Use Network Load distribution factors are based on an estimated Load value considering historical net consumption at all Private Use Networks. If ERCOT decides, in its sole discretion, to change the Load distribution factors for reasons such as anticipated weather events or holidays, ERCOT shall select an SE hourly distribution from a proxy day reasonably reflecting the anticipated Load in the Operating Day. ERCOT may also modify the Load distribution factors to account for predicted differences in network topology between the proxy day and Operating Day. ERCOT shall develop a methodology, subject to Technical Advisory Committee (TAC) approval, to describe the modification of the proxy day bus-load distribution for this purpose.

(6) ERCOT shall allocate offers, bids, and source and sink of CRRs at a Hub using the distribution factors specified in the definition of that Hub in Section 3.5.2, Hub Definitions.

(7) A Resource that has a Three-Part Supply Offer cleared in the DAM may be eligible for Make-Whole Payment of the Startup Offer and Minimum Energy Offer submitted by the Qualified Scheduling Entity (QSE) representing the Resource under Section 4.6, DAM Settlement.

(8) The DAM Settlement is based on hourly MW awards and on Day-Ahead hourly Settlement Point Prices. All PTP Options settled in the DAM are settled based on the Day-Ahead Settlement Point Prices (DASPPs). ERCOT shall assign a Locational Marginal Price (LMP) to de-energized Electrical Buses for use in the calculation of the DASPPs by using heuristic rules applied in the following order:

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

(b) Use the following rules in order:

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

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

(iii) Use System Lambda.

(9) The Day-Ahead MCPC for each hour for each Ancillary Service is the Shadow Price for that Ancillary Service for the hour as determined by the DAM algorithm.

(10) If the Day-Ahead MCPC cannot be calculated by ERCOT, the Day-Ahead MCPC for the particular Ancillary Service is equal to the Day-Ahead MCPC for that Ancillary Service in the same Settlement Interval of the preceding Operating Day.

(11) If the DASPPs cannot be calculated by ERCOT, all CRRs shall be settled based on Real-Time prices. Settlements for all CRRs shall be reflected on the Real-Time Settlement Statement.

(12) Constraints can exist between a Resource’s Resource Connectivity Node and its Resource Node, in which case the awarded quantity of energy may be inconsistent with the clearing price when the constraint between the Resource Connectivity Node and the Resource Node is binding.

(13) PTP Obligation bids shall not be awarded where the DAM clearing price for the PTP Obligation is greater than the PTP Obligation bid price plus $0.01/MW per hour.

4.5.3 Communicating DAM Results

(1) As soon as practicable, but no later than 1330 in the Day-Ahead, ERCOT shall notify the parties to each cleared DAM transaction (e.g., the buyer and the seller) of the results of the DAM as follows:

(a) Awarded Ancillary Service Offers, specifying Resource, MW, Ancillary Service type, and price, for each hour of the awarded offer;

(b) Awarded energy offers from Three-Part Supply Offers and from DAM Energy-Only Offers, specifying Resource (except for DAM Energy-Only Offers), MWh, Settlement Point, and Settlement Point Price, for each hour of the awarded offer;

(c) Awarded DAM Energy Bids, specifying MWh, Settlement Point, and Settlement Point Price for each hour of the awarded bid;

(d) Awarded Energy Bid/Offer Curves, specifying Resource, MWh, Settlement Point, and Settlement Point Price, for each hour of the awarded bid/offer; and

(e) Awarded PTP Obligation Bids, number of PTP Obligations in MW, source and sink Settlement Points, and price for each Settlement Interval of the awarded bid.

(2) As soon as practicable, but no later than 1330, ERCOT shall post on the MIS Public Area the hourly:

(a) Day-Ahead MCPC for each type of Ancillary Service for each hour of the Operating Day;

(b) DASPPs for each Settlement Point for each hour of the Operating Day;

(c) Day-Ahead hourly LMPs for each Electrical Bus for each hour of the Operating Day;

(d) Shadow Prices for every binding constraint for each hour of the Operating Day;

(e) Quantity of total Ancillary Service Offers received in the DAM, in MW by Ancillary Service type for each hour of the Operating Day;

(f) Energy bought in the DAM consisting of the following:

(i) The total quantity of awarded DAM Energy Bids (in MWh) bought in the DAM at each Settlement Point for each hour of the Operating Day;

(ii) The total quantity of awarded PTP Obligation Bids (in MWh) cleared in the DAM that sink at each Settlement Point for each hour of the Operating Day; and

(iii) The total absolute value quantity of awards to bid portions of Energy Bid/Offer Curves (in MWh) cleared in the DAM at each Settlement Point for each hour of the Operating Day.

(g) Energy sold in the DAM consisting of the following:

(i) The total quantity of awarded DAM Energy Offers (in MWh), from Three-Part Supply Offers and DAM Energy Only Offers, bought in the DAM at each Settlement Point for each hour of the Operating Day;

(ii) The total quantity of awarded PTP Obligation Bids (in MWh) cleared in the DAM that source at each Settlement Point for each hour of the Operating Day; and

(iii) The total quantity of awards to offer portions of Energy Bid/Offer Curves (in MWh) cleared in the DAM at each Settlement Point for each hour of the Operating Day.

(h) Aggregated Ancillary Service Offer Curve of all Ancillary Service Offers for each type of Ancillary Service for each hour of the Operating Day;

(i) Electrically Similar Settlement Points used during the DAM clearing process; and

(j) Settlement Points that were de-energized in the base case; and

(k) System Lambda.

(3) ERCOT shall monitor Day-Ahead MCPCs and Day-Ahead hourly LMPs for errors and if there are conditions that cause the price to be questionable, ERCOT shall notify all Market Participants that the DAM prices are under investigation as soon as practicable.

(4) ERCOT shall correct prices when: (i) a market solution is determined to be invalid or (ii) invalid prices are identified in an otherwise valid market solution, unless accurate prices cannot be determined. The following are some reasons that may cause these conditions.

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

(b) Software error: Pricing errors may occur due to software implementation errors in DAM pre-processing, DAM clearing process, and/or DAM post processing.

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

(5) All DAM LMPs, MCPCs, and Settlement Point Prices are final at 1000 of the second Business Day after the Operating Day.

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

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

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

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

(b) The ERCOT Board may review and change DAM LMPs, MCPCs, or Settlement Point Prices if ERCOT gave timely notice to Market Participants and the ERCOT Board finds that such prices are significantly affected by an error.

(c) In review of DAM LMPs, MCPCs, or Settlement Point Prices, the ERCOT Board may rely on the same reasons identified in paragraph (4) above to find that the prices are significantly affected by an error.

(6) As soon as practicable, but no later than 1330, ERCOT shall make available the Day-Ahead Shift Factors for binding constraints in the DAM and post to the MIS Secure Area.

**4.6.2.1 Day-Ahead Energy Payment**

(1) The Day-Ahead Energy Payment is made for all cleared offers to sell energy in the DAM, whether through Three-Part Supply Offers, DAM Energy-Only Offer Curves, or cleared sales from the offer portion of Energy Bid/Offer Curves. The payment to each Qualified Scheduling Entity (QSE) for each Settlement Point for a given hour of the Operating Day is calculated as follows:

DAESAMT *q,**p* = (-1) \* DASPP *p* \* DAES *q,**p*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Definition** |
| DAESAMT *q, p* | $ | *Day-Ahead Energy Sale Amount per QSE per Settlement Point*⎯The payment to QSE *q* for the cleared energy offers at Settlement Point *p* for the hour. |
| DASPP *p* | $/MWh | *Day-Ahead Settlement Point Price per Settlement Point*⎯The DAM SPP at Settlement Point *p* for the hour. |
| DAES *q, p* | MW | *Day-Ahead Energy Sale per QSE per Settlement Point*⎯The total amount of energy represented by QSE *q*’s cleared Three-Part Supply Offers in the DAM, cleared DAM Energy-Only Offer Curves, and cleared sales from the offer portion of Energy Bid/Offer Curves at Settlement Point *p*, for the hour. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |

(2) The total of the Day-Ahead Energy Payments to each QSE for the hour is calculated as follows:

DAESAMTQSETOT *q* = DAESAMT *q, p*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Definition** |
| DAESAMTQSETOT *q* | $ | *Day-Ahead Energy Sale Amount QSE Total per QSE*⎯The total of the payments to QSE *q* for its cleared energy offers at all Settlement Points for the hour. |
| DAESAMT *q, p* | $ | *Day-Ahead Energy Sale Amount per QSE per Settlement Point*⎯The payment to QSE *q* for the cleared energy offers at Settlement Point *p* for the hour. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |

**4.6.2.2 Day-Ahead Energy Charge**

(1) The Day-Ahead Energy Charge is made for all cleared DAM Energy Bids or cleared purchases from the bid portion of Energy Bid/Offer Curves. This charge to each QSE for each Settlement Point for a given hour of the Operating Day is calculated as follows:

DAEPAMT *q, p* = DASPP *p* \* DAEP *q, p*

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| DAEPAMT *q, p* | $ | *Day-Ahead Energy Charge per QSE per Settlement Point*⎯The charge to QSE *q* for all its cleared energy bids at Settlement Point *p* for the hour. |
| DASPP *p* | $/MWh | *Day-Ahead Settlement Point Price per Settlement Point*⎯The DAM SPP at Settlement Point *p* for the hour. |
| DAEP *q, p* | MW | *Day-Ahead Energy Purchase per QSE per Settlement Point*⎯The total amount of energy represented by QSE *q*’s cleared DAM Energy Bids and cleared purchases from the bid portion of Energy Bid/Offer Curves at Settlement Point *p* for the hour. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |

(2) The total of the Day-Ahead Energy Charges to each QSE for the hour is calculated as follows:

DAEPAMTQSETOT *q* = DAEPAMT *q, p*

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Definition** |
| DAEPAMTQSETOT *q* | $ | *Day-Ahead Energy Purchase Amount QSE Total per QSE*⎯The total of the charges to QSE *q* for its cleared energy bids at all Settlement Points for the hour. |
| DAEPAMT *q, p* | $ | *Day-Ahead Energy Purchase Amount per QSE per Settlement Point*⎯The charge to QSE *q* for its cleared DAM Energy Bids and cleared purchases from the bid portion of Energy Bid/Offer Curves at Settlement Point *p* for the hour. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |

4.6.2.3 Day-Ahead Make-Whole Settlements

(1) A QSE that has a Three-Part Supply Offer cleared in the DAM is eligible for a Day-Ahead Make-Whole Payment startup cost compensation, if, for the Resource associated with the offer:

(a) The generator’s breakers were open, as indicated by a telemetered Resource status of Off-Line, for at least five minutes during the Adjustment Period for the beginning of the DAM commitment;

(b) The generator’s breakers were closed, as indicated by a telemetered Resource status of On-Line, for at least one minute during the DAM commitment period; and

(c) The breaker open-close sequence, as indicated by the On-Line/Off-Line sequence from the telemetered Resource status, for which the QSE is eligible for startup cost compensation in the DAM or Reliability Unit Commitment (RUC) for the previous Operating Day does not qualify in meeting the criteria in items (a) and (b) above.

(d) The breaker open-close sequence for which the QSE is eligible for startup cost compensation in an earlier DAM commitment period within the same Operating Day does not qualify in meeting the criteria in items (a) and (b) above.

(2) Notwithstanding the eligibility criteria described in paragraph (1) above, a Resource will not be eligible for Day-Ahead Make-Whole Payment Startup Cost compensation if the Resource was considered by the DAM as not having a cost to start due to the DAM commitment period being contiguous with a self-committed hour, as described in Section 4.4.9.1, Three-Part Supply Offers.

(3) A QSE that has a Three-Part Supply Offer cleared in the DAM is eligible for Day-Ahead Make-Whole Payment energy cost compensation in a DAM-committed Operating Hour, if, for the Resource associated with the offer the generator’s breakers were closed, as indicated by a telemetered Resource Status of On-Line, for at least one minute during the DAM-committed Operating Hour.

(4) The Day-Ahead Make-Whole Payment guarantees the QSE that the total payment received from the DAM for a DAM-committed Resource is not less than the total cost calculated based on the Startup Cap, the Minimum Energy Cap, and the Energy Offer Curve capped by the Energy Offer Curve Cap defined under Section 4.4.9.3.3, Energy Offer Curve Caps for Make-Whole Calculation Purposes.

(5) If a Generation Resource is eligible for startup or energy cost compensation in the Day-Ahead Make-Whole payment, then Ancillary Service revenue from the hours committed in the DAM will be included in its make-whole calculation for that Resource.

(6) For purposes of this Section 4.6.2.3, the telemetered Resource Status of OFFQS shall be considered as Off-Line.

(7) An Energy Storage Resource (ESR) is not eligible for Day-Ahead Make-Whole Payment.

***4.6.2.3.2 Day-Ahead Make-Whole Charge***

(1) ERCOT shall charge a Day-Ahead Make-Whole Charge to each QSE that has one or more cleared DAM Energy Bids, cleared purchases from the bid portion of Energy Bid/Offer Curves, and/or Point-to-Point (PTP) Obligation Bids. The Day-Ahead Make-Whole Charge for an hour is that QSE’s prorata share of the total amount of Day-Ahead Make-Whole Payments for that hour. The proration must be based on the ratio of the energy amount of the QSE’s cleared DAM Energy Bids, cleared purchases from the bid portion of Energy Bid/Offer Curves, and PTP Obligation Bids to the total energy amount of all QSEs’ cleared DAM Energy Bids, cleared purchases from the bid portion of Energy Bid/Offer Curves, and PTP Obligation Bids. The Day-Ahead Make-Whole Charge to each QSE for a given hour is calculated as follows:

LADAMWAMT *q* = (-1) \* DAMWAMTTOT \* DAERS *q*

Where:

Day-Ahead Make-Whole Payment Total

DAMWAMTTOT = DAMWAMTQSETOT *q*

Day-Ahead Energy Purchase Ratio Share per QSE

DAERS *q* = DAE *q* / DAETOT

DAETOT = DAE *q*

DAE *q* = DAEP *q, p* + RTOBL *q, (j, k)*

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| LADAMWAMT *q* | $ | *Day-Ahead Make-Whole Charge*⎯The allocated charge to QSE *q* to make whole all the eligible DAM-committed Resources for the hour. |
| DAMWAMTTOT | $ | *Day-Ahead Make-Whole Payment Total*⎯The total of the Day-Ahead Make-Whole Payments to all QSEs for all DAM-committed Resources for the hour. |
| 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. |
| DAERS *q* | none | *Day-Ahead Energy Purchase Ratio Share per QSE*⎯ The ratio of QSE *q*’s total amount of energy represented by its cleared DAM Energy Bids, cleared purchases from the bid portion of Energy Bid/Offer Curves, and PTP Obligation Bids, to the total amount of energy represented by all QSEs’ cleared DAM Energy Bids, cleared purchases from the bid portion of Energy Bid/Offer Curves, and PTP Obligation Bids, for the hour. |
| DAETOT | MW | *Day-Ahead Energy Total*—The total amount of energy represented by all cleared DAM Energy Bids, all cleared purchases from the bid portion of Energy Bid/Offer Curves, and all cleared PTP Obligation Bids for the hour. |
| DAE *q* | MW | *Day-Ahead Energy per QSE*—QSE *q*’s total amount of energy, represented by its cleared DAM Energy Bids, cleared purchases from the bid portion of Energy Bid/Offer Curves, and PTP Obligation Bids, for the hour. |
| DAEP *q, p* | MW | *Day-Ahead Energy Purchase per QSE per Settlement Point*—The total amount of energy represented by QSE *q*’s cleared DAM Energy Bids and cleared purchases from the bid portion of Energy Bid/Offer Curves at the Settlement Point *p* for the hour. |
| RTOBL *q, (j, k)* | MW | *Real-Time Obligation per QSE per pair of source and sink*—The total amount of energy represented by QSE *q*’s cleared PTP Obligation Bids with the source *j* and the sink *k*, for the hour. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |
| *j* | none | A source Settlement Point. |
| *k* | none | A sink Settlement Point. |

**5.3 ERCOT Security Sequence Responsibilities**

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

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

(3) For each RUC process, ERCOT shall:

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

(i) Validating Three-Part Supply Offers, defined in Section 4.4.9.1, Three-Part Supply Offers, Energy Bid/Offer Curves, defined in Section 4.4.9.7, Energy Bid/Offer Curve, and Ancillary Service Offers, defined in Section 4.4.7.2, Ancillary Service Offers;

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

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

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

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

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

|  |
| --- |
| ***[NPRR977: Insert paragraph (e) below upon system implementation:]***  (e) Post to the MIS Secure Area all Resources that were committed by the RUC process, including verbal RUC commitments, but were subsequently cancelled by the ERCOT Operator. |

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

**5.4 QSE Security Sequence Responsibilities**

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

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

(b) Submit any Three-Part Supply Offers, Energy Bid/Offer Curves, and Ancillary Service Offers before:

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

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

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

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

(e) Submit an updated COP before 1430 in the Day-Ahead that shows the specific Resources that will be used to supply the QSE’s Ancillary Service Supply Responsibility; and

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

***5.7.1 RUC Make-Whole Payment***

(1) To make up the difference when the revenues that a Reliability Unit Commitment (RUC)-committed Resource receives are less than its costs as described in paragraph (2) below, ERCOT shall calculate a RUC Make-Whole Payment for that Operating Day for that Resource (whether committed by Day-Ahead RUC (DRUC) or Hourly RUC (HRUC)). ERCOT shall not calculate or pay a RUC Make-Whole Payment for an Energy Storage Resource (ESR).

(2) ERCOT shall pay to the Qualified Scheduling Entity (QSE) for the Resource a Make-Whole Payment if the RUC Guarantee calculated in Section 5.7.1.1, RUC Guarantee, is greater than the sum of:

(a) RUC Minimum-Energy Revenue calculated in Section 5.7.1.2, RUC Minimum-Energy Revenue;

(b) Revenue less cost above Low Sustained Limited (LSL) during RUC-Committed Hours calculated in Section 5.7.1.3, Revenue Less Cost Above LSL During RUC-Committed Hours; and

(c) Revenue less cost during QSE Clawback Intervals calculated in Section 5.7.1.4, Revenue Less Cost During QSE Clawback Intervals.

(3) The RUC Make-Whole Payment to the QSE for each RUC-committed Resource, including Reliability Must-Run (RMR) Units, for each RUC-Committed Hour in an Operating Day is calculated as follows:

RUCMWAMT*q,r,h* = (-1) \* Max (0, RUCG*q,r,d* – RUCMEREV*q,r,d* – RUCEXRR*q,r,d* – RUCEXRQC*q,r,d*) / RUCHR*q,r,d*

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| RUCMWAMT*q,r,h* | $ | *RUC Make-Whole Payment*—The RUC Make-Whole Payment to the QSE for Resource *r*, for each RUC-Committed Hour of the Operating Day. When one or more Combined Cycle Generation Resources are committed by RUC, payment is made to the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCG*q,r,d* | $ | *RUC Guarantee*—The sum of eligible Startup Costs and minimum-energy costs for Resource *r* during all RUC-Committed Hours, for the Operating Day. See Section 5.7.1.1. When one or more Combined Cycle Generation Resources are committed by RUC, guaranteed costs are calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCMEREV*q,r,d* | $ | *RUC Minimum-Energy Revenue*—The sum of the energy revenues for Resource *r*’s generation up to LSL during all RUC-Committed Hours, for the Operating Day. See Section 5.7.1.2. When one or more Combined Cycle Generation Resources are committed by RUC, minimum-energy revenue is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCEXRR*q,r,d* | $ | *Revenue Less Cost Above LSL During RUC-Committed Hours*—The sum of the total revenue for Resource *r* operating above its LSL less the cost during all RUC-Committed Hours, for the Operating Day. See Section 5.7.1.3. When one or more Combined Cycle Generation Resources are committed by RUC, revenue less cost above LSL is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCEXRQC*q,r,d* | $ | *Revenue Less Cost During QSE Clawback Intervals*—The sum of the total revenue for Resource *r* less the cost during all QSE Clawback Intervals, for the Operating Day. See Section 5.7.1.4. When one or more Combined Cycle Generation Resources are committed by RUC, revenue less cost during QSE Clawback Intervals is calculated for the Combined Cycle Train for all Combined Cycle Generation Resources earning revenue in QSE Clawback Intervals. |
| RUCHR*q,r,d* | None | RUC Hour—The total number of RUC-Committed Hours, for Resource *r* for the Operating Day. When one or more Combined Cycle Generation Resources are committed by RUC, the total number of RUC-Committed Hours is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| *q* | None | A QSE. |
| *r* | None | A RUC-committed Generation Resource. |
| *d* | None | An Operating Day containing the RUC-commitment. |
| *h* | None | An hour in the RUC-commitment period. |

***5.7.2 RUC Clawback Charge***

(1) A QSE for a Resource shall pay a RUC Clawback Charge for the Operating Day if the RUC Guarantee is less than the sum of:

(a) RUC Minimum-Energy Revenue calculated in Section 5.7.1.2, RUC Minimum-Energy Revenue;

(b) Revenue Less Cost Above LSL During RUC-Committed Hours calculated in Section 5.7.1.3, Revenue Less Cost Above LSL During RUC-Committed Hours; and

(c) Revenue Less Cost During QSE-Clawback Intervals calculated in Section 5.7.1.4, Revenue Less Cost During QSE Clawback Intervals.

(2) The amount of the RUC Clawback Charge is a percentage of the difference calculated in paragraph (1) above. Whether or not the QSE submits a Three-Part Supply Offer for a Resource in the Day Ahead Market (DAM) determines if that Resource will have a clawback applied in its Settlement. If the QSE submitted a validated Three-Part Supply Offer for the Resource into the DAM, then the clawback percentage in RUC Committed Hours is 50% and the clawback percentage in QSE Clawback Intervals is 0%. If not, then the clawback percentage in RUC Committed Hours is 100% and the clawback percentage in QSE Clawback Intervals is 50%.

(3) If an Energy Emergency Alert (EEA) is in effect for any period of the Operating Day, then in all RUC Committed Hours and all QSE Clawback Intervals of the Operating Day the clawback percentage is 0% if the QSE submitted a validated Three Part Supply Offer for the Resource into the DAM and 50% otherwise.

(4) For Combined Cycle Trains, if at least one Combined Cycle Generation Resource is offered into the DAM, then the Combined Cycle Train is considered to be offered into the DAM.

(5) The RUC Clawback Charge for a Resource, including RMR Units, for each Operating Day is allocated evenly over the RUC-Committed Hours for that Resource.

(6) Energy Storage Resources are not subject to RUC Clawback Charges.

(7) For each RUC-committed Resource, the RUC Clawback Charge for each RUC-Committed Hour of the Operating Day is calculated as follows:

If (RUCMEREV *q, r, d* + RUCEXRR *q, r, d* – RUCACREV *q, r, d* – RUCG *q, r, d*) > 0,

Then,

RUCCBAMT *q, r, h* = [(RUCMEREV *q, r, d* + RUCEXRR *q, r, d* – RUCACREV *q, r, d* – RUCG *q, r, d*) \* RUCCBFR *q, r, d* + RUCEXRQC *q, r, d* \* RUCCBFC *q, r, d*] / RUCHR *q, r, d*

Otherwise,

RUCCBAMT *q, r, h* = [Max (0, RUCMEREV *q, r, d* + RUCEXRR *q, r, d* + RUCEXRQC *q, r, d* – RUCACREV *q, r, d* – RUCG *q, r, d*) \* RUCCBFC *q, r, d*] / RUCHR *q, r, d*

Where,

The RUCAC revenue is calculated for a Combined Cycle Train as follows:

RUCACREV *q, r, d* = Max{0, RUCMEREV96 *q, r, i* + Max(0, RUCEXRR96 *q, r, i*)}

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| RUCCBAMT *q, r, h* | $ | *RUC Clawback Charge*––The RUC Clawback Charge to a QSE for Resource *r* represented by QSE *q* as described in this Section, for each RUC-Committed Hour *h* of the Operating Day for that Resource. When one or more Combined Cycle Generation Resources are committed by RUC, a charge is made to the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCG *q, r, d* | $ | *RUC Guarantee*—The sum of eligible Startup Costs and Minimum-Energy Costs for Resource *r* represented by QSE *q* during all RUC-Committed Hours, for the Operating Day *d*. See Section 5.7.1.1, RUC Guarantee. When one or more Combined Cycle Generation Resources are committed by RUC, guaranteed costs are calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCMEREV *q, r, d* | $ | *RUC Minimum-Energy Revenue*—The sum of the energy revenues for generation of Resource *r* represented by QSE *q* up to LSL during all RUC-Committed Hours, for the Operating Day *d*. See Section 5.7.1.2. When one or more Combined Cycle Generation Resources are committed by RUC, RUC Minimum-Energy Revenue is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCEXRR *q, r, d* | $ | *Revenue Less Cost Above LSL During RUC-Committed Hours*—The sum of the total revenue for Resource *r* represented by QSE *q* above the LSL less the cost during all RUC-Committed Hours, for the Operating Day *d*. See Section 5.7.1.3. When one or more Combined Cycle Generation Resources are committed by RUC, Revenue Less Cost Above LSL During RUC-Committed Hours is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCEXRQC *q, r, d* | $ | *Revenue Less Cost from QSE-Clawback Intervals*—The sum of the total revenue for Resource *r* represented by QSE *q* less the cost during all QSE-Clawback Intervals for the Operating Day *d*. See Section 5.7.1.4. When one or more Combined Cycle Generation Resources are committed by RUC, Revenue Less Cost from QSE-Clawback Intervals is calculated for the Combined Cycle Train for all Combined Cycle Generation Resources earning revenue in QSE Clawback Intervals. |
| RUCACREV *q, r, d* | $ | *Revenue from RUCAC Hours*—The net positive sum for the energy revenues for generation of Resource *r* represented by QSE *q* up to LSL and the total revenue for Resource *r* operating above its LSL less the cost during all RUCAC-Hours, for the Operating Day *d*. When one or more Combined Cycle Generation Resources are RUCAC, revenue from RUCAC Hours is calculated for the Combined Cycle Train for all Combined Cycle Generation Resources that were RUC-committed during the RUCAC-Hours. |
| RUCMEREV96 *q, r, i* | $ | *RUC Minimum-Energy Revenue by Interval*—The energy revenues for generation of Resource *r* represented by QSE *q* up to LSL during all RUC-Committed Hours, for the Settlement Interval *i*. When one or more Combined Cycle Generation Resources are committed by RUC, RUC Minimum-Energy Revenue is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. During RUCAC-Intervals for a Combined Cycle Train, the minimum energy revenue is calculated as the difference between the minimum energy revenue of the RUC-committed configuration and the QSE-committed configuration. |
| RUCEXRR96 *q, r, i* | $ | *Revenue Less Cost Above LSL During RUC-Committed Hours by Interval*—The total revenue for Resource *r* represented by QSE *q* operating above its LSL less the cost during all RUC-Committed hours, for the Settlement Interval *i*. When one or more Combined Cycle Generation Resources are committed by RUC, revenue less cost above LSL is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCCBFR *q, r, d* | none | *RUC Clawback Factor for RUC-Committed Hours*—The Clawback Factor for Resource *r* represented by QSE *q* for RUC-Committed Hours, as specified in paragraphs (2) and (3) above, for the Operating Day *d*. When one or more Combined Cycle Generation Resources are committed by RUC, the RUC Clawback Factor for RUC-Committed Hours is determined for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCCBFC *q, r, d* | none | *RUC Clawback Factor for QSE Clawback Intervals*—The Clawback Factor for Resource *r* represented by QSE *q* for QSE Clawback Intervals, as specified in paragraphs (2) and (3) above, for the Operating Day *d*. When one or more Combined Cycle Generation Resources are committed by RUC, the RUC Clawback Factor for QSE Clawback Intervals is determined for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| RUCHR *q, r, d* | none | *RUC Hour*—The total number of RUC-Committed Hours, for Resource *r* represented by QSE *q* for the Operating Day *d*. When one or more Combined Cycle Generation Resources are committed by RUC, the total number of RUC-Committed Hours is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources. |
| *q* | none | A QSE. |
| *r* | none | A RUC-committed Generation Resource. |
| *d* | none | An Operating Day containing the RUC-commitment. |
| *h* | none | An hour in the RUC-commitment period. |
| *i* | none | A 15-minute Settlement Interval within the hour that includes a RUCAC instruction. |

***5.7.3 Payment When ERCOT Decommits a QSE-Committed Resource***

(1) If ERCOT decommits a QSE-committed Resource during the RUC process earlier than its scheduled shutdown within the Operating Day, then no compensation is due to the affected QSE from ERCOT.

(2) If ERCOT decommits a QSE committed Resource that is not scheduled to shutdown within the Operating Day, then ERCOT shall pay the affected QSE an amount as calculated below for the hours of decommitment. The number of continuous decommitted hours used in the calculation are the hours beginning with the first decommitted hour until the earlier of:

(a) The hour ERCOT determines that the Resource may again be at LSL; and

(b) The end of the last hour of the Operating Day.

(3) If ERCOT decommits a QSE-committed Resource not scheduled to shutdown within the Operating Day, and the decommitment period spans more than one Operating Day, the RUC Decommitment Payment Amount shall be calculated and paid in the Operating Day in which the RUC decommitment originated. The number of continuous decommitted hours used in the calculation are the hours beginning with the first decommitted hour until the end of the last hour of the Operating Day in which the RUC decommitment originated.

(4) The payment for a RUC Cancellation instruction for a Resource is settled for each hour through an adjustment in the RUC Decommitment Payment Amount as shown in paragraph (8) below.

(5) ERCOT shall produce a report each April that provides the percentage of the RUC Decommitment Payment Amounts that are a result of RUC cancellations during the 12 months of the previous calendar year. The report shall be based on the Final Settlements. ERCOT shall present the results of this study to the appropriate Technical Advisory Committee (TAC) subcommittee. If there are no RUC Decommitment Payment Amounts for a given calendar year, then ERCOT will not be required to produce the annual report.

(6) The SUPR, MEPR and LSL used to calculate payment when ERCOT decommits a QSE-committed Combined Cycle Train is the SUPR, MEPR and LSL that corresponds to the Combined Cycle Generation Resource, within the Combined Cycle Train, that is RUC-decommitted in the first hour of a contiguous decommitted period.

(7) If the SUPR used to calculate payment when ERCOT decommits a QSE-committed AGR is based upon approved verifiable cost for all of the generators associated with the AGR, ERCOT shall scale the startup payment according to the number of generators of the AGR that started following the decommitment. ERCOT shall make the adjustment no later than on Final Settlement.

(8) The payment for a RUC decommitment instruction for a Resource, including RMR Units and excluding Energy Storage Resources (ESRs), is calculated for each hour as follows:

RUCDCAMT*q,r,h* = (-1) \* Max (0, (SUPR*q,r,s* - (Max (0, MEPR*q,r,i* - RTSPP*p,i*) \* (LSL*q,r,i* \* (¼))))) / NCDCHR*q,r,h*

Where:

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

Then, SUPR*q,r,s* = Min (SUO*q,r,s*, SUCAP *q,r,s*)

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

Otherwise, SUPR*q,r,s* = SUCAP*q,r,s*

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

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

Then, SUCAP*q,r,s* = verifiable Startup Costs*q,r,s*

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

Otherwise, SUCAP*q,r,s* = RCGSC*s*

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

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| RUCDCAMT*q,r,h* | $ | *RUC Decommitment Payment Amount*—The payment to the QSE for the Resource that was decommitted by ERCOT but that was not scheduled to shut down in the Operating Day, for each decommitted hour of the Operating Day. When one or more Combined Cycle Generation Resources are decommitted by RUC, payment is made to the Combined Cycle Train for all RUC-decommitted Combined Cycle Generation Resources. |
| SUPR*q,r,s* | $/Start | *Startup Price per start*—The Settlement price for Resource *r* for the start *s*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| SUO*q,r,s* | $/Start | *Startup Offer per start*—Represents an offer for all costs incurred by Generation Resource *r* in starting up and reaching the Resource’s LSL. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| SUCAP*q,r,s* | $/Start | *Startup Cap*—The amount used for 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 verifiable unit-specific Startup Cost. The verifiable unit-specific Startup Cost will be determined as described in Section 5.6.1, Verifiable Costs, minus the average energy produced during the time period between breaker close and LSL multiplied by the heat rate proxy “H” multiplied by the appropriate FIP, FOP, or solid fuel price. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RCGSC*s* | $/Start | *Resource Category Generic Startup Cost*—The Resource Category Startup Offer Generic Cap cost 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. |
| MEPR*q,r,i* | $/MWh | *Minimum-Energy Price*—The Settlement price for Resource *r* for minimum energy for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MEO*q,r,i* | $/MWh | *Minimum-Energy Offer*—Represents an offer for the costs incurred by Resource *r* in producing energy at the Resource’s LSL for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| MECAP*q,r,i* | $/MWh | *Minimum-Energy Cap*—The amount used for Resource *r* for minimum-energy costs. The minimum cost is the Resource Category Minimum-Energy Generic Cap (RCGMEC) unless ERCOT has approved verifiable unit-specific minimum energy costs for that Resource, in which case the Minimum-Energy Cap is the verifiable unit-specific minimum energy cost. See Section 5.6.1 for more information on verifiable costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RCGMEC*i* | $/MWh | *Resource Category Generic Minimum-Energy Cost*—The Resource Category Minimum-Energy Generic Cap cost for the category of the Resource, according to Section 4.4.9.2.3. |
| LSL*q,r,i* | MW | *Low Sustained Limit*—The LSL of Generation Resource *r* represented by QSE *q* for the hour that includes the Settlement Interval *i*, as submitted in the COP. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTSPP*p,i* | $/MWh | *Real-Time Settlement Point Price*—The Real-Time Settlement Point Price at the Resource’s Settlement Point for the Settlement Interval *i*. |
| NCDCHR*q,r,h* | none | *Number of Continuous Decommitted Hours*—The number of continuous decommitment hours for Resource *r* within an Operating Day. When one or more Combined Cycle Generation Resources are decommitted by RUC, the Number of Continuous Decommitted Hours is calculated for the Combined Cycle Train for all RUC-decommitted Combined Cycle Generation Resources. |
| *q* | none | A QSE. |
| *r* | none | A RUC-decommitted Generation Resource. |
| *h* | none | An hour in the RUC decommitment period. |
| *p* | none | A Resource Node Settlement Point. |
| *s* | none | A start. |
| *i* | none | A 15-minute Settlement Interval within the contiguous decommitted period. |

***5.7.4.1.1 Capacity Shortfall Ratio Share***

(1) In calculating the shortfall amount for each QSE, the Resource capacity (RCAP) shall be calculated for a Generation Resource or ESR, that is not a DC-Coupled Resource, and that meets any of the following conditions:

(a) QSE-committed;

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

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

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

(2) In calculating the amount short for each QSE, the available capacity of a DC-Coupled Resource shall be calculated for each RUC snapshot, and at the end of the Adjustment Period, by adding the capacity value of the Energy Storage System (ESS) that is included in the HSL of the DC-Coupled Resource, as submitted in the COP, to the Wind-powered Generation Resource Production Potential (WGRPP), and/or the PhotoVoltaic Generation Resource Production Potential (PVGRPP), as follows:

The DCRCAPSNAP variable at the RUC snapshot is calculated as:

DCRCAPSNAP *ruc, q, r, h =* RUCHSLESS*ruc, q, r, h* + (WGRPP*ruc, q, r, h* + PVGRPP*ruc, q, r, h*)

The DCRCAPADJ variable at the end of the Adjustment Period is calculated as:

DCRCAPADJ *ruc, q, r, h =* HSLESS *q, r, h* + (WGRPP*ruc, q, r, h* + PVGRPP*ruc, q, r, h*)

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| *DCRCAPSNAP ruc, q, r, h* | MW | *DC-Coupled Resource Capacity at Snapshot*—The Resource Capacity of DC-Coupled Resource *r* represented by the QSE *q* for the hour *h*, according to the snapshot for the RUC process. |
| *RUCHSLESS ruc, q, r, h* | MW | *High Sustained Limit of ESS at Snapshot* —The portion of the HSL of the DC-Coupled Resource due to the ESS that is part of the DC-Coupled Resource *r* represented by QSE *q* for the hour *h*, according to the RUC Snapshot for the RUC process. |
| *WGRPP ruc, q, r, h* | MW | *Wind-powered Generation Resource Production Potential at Snapshot* —The Wind-powered Generation Resource Production Potential (WGRPP) as described in Section 4.2.2, Wind-Powered Generation Resource Production Potential, for the DC-Coupled Resource *r* represented by QSE *q* for the hour *h*, as seen in the snapshot for the RUC process *ruc*. |
| *PVGRPP ruc, q, r, h* | MW | *PhotoVoltaic Generation Resource Production Potential at Snapshot* — The PhotoVoltaic Generation Resource Production Potential (PVGRPP) as described in Section 4.2.3, PhotoVoltaic Generation Resource Production Potential, for the DC-Coupled Resource *r* represented by QSE *q* for the hour *h*, as seen in the snapshot for the RUC process *ruc*. |
| *DCRCAPADJ ruc, q, r, h* | MW | *DC-Coupled Resource Capacity at Adjustment Period*—The Resource Capacity of DC-Coupled Resource *r* represented by the QSE *q* for the hour *h*, at the end of the Adjustment Period. |
| *HSLESS q, r, h* | MW | *High Sustained Limit for ESS at Adjustment Period* —The portion of the HSL of the DC-Coupled Resource due to the ESS that is part of the DC-Coupled Resource *r* represented by QSE *q* for the hour *h*, at the end of the Adjustment Period. |
| *q* | none | A QSE. |
| *r* | none | A DC-Coupled Resource that is QSE-committed or RUC-decommitted for the Settlement Interval (subject to paragraph (4) below) or a Switchable Generation Resource (SWGR) released by a non-ERCOT Control Area Operator (CAO) to operate in the ERCOT Control Area due to an ERCOT RUC instruction for an actual or anticipated EEA condition. |
| *h* | none | An hourly Settlement Interval. |
| *ruc* | none | A RUC process for which this DC-Coupled Resource Capacity is calculated. |

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

(4) In calculating the amount short for each QSE, the QSE must be given a capacity credit if a Resource was given notice of decommitment within the two hours before the Operating Hour as a result of the RUC process as follows:

(a) Non-Intermittent Renewable Resources (IRRs) will have the RCAPSNAP and RCAPADJ variables used below equal to the RCAPSNAP value for the Resource immediately before the decommitment instruction was given;

(b) DC-Coupled Resources will have the DCRCAPSNAP and DCRCAPADJ variables used below set equal to the DCRCAPSNAP value for the Resource immediately before the decommitment instruction was given.

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

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

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

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

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

Where:

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

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

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

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

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

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

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

The QSE’s On-Line Ancillary Service Position according to the RUC snapshot for a 15 minute Settlement Interval is:ASONPOSSNAP ***ruc, q, i***= RUPOSSNAP *ruc, q, h* + RRPOSSNAP *ruc, q, h* + Max (0, (ECRPOSSNAP *ruc, q, h* + NSPOSSNAP *ruc, q, h* – ASOFFOFRSNAP *ruc, q, r, h*))

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

RUCCAPSNAP *ruc, q, i* =RCAPSNAP *ruc, q, r, h* +  DCRCAPSNAP *ruc, q, r, h* + (RUCCPSNAP *ruc, q, h* – RUCCSSNAP *ruc, q, h*) + (DAEP *q, p, h* –DAES *q, p, h*) + (RTQQEPSNAP *ruc, q, p, i* – RTQQESSNAP *ruc, q, p, i*) +  DCIMPSNAP *ruc, q, p, i* + ASOFRLRSNAP *ruc, q, r, h* (12) The Ancillary Service shortfall calculation compares the Ancillary Service capability of the QSE, measured by the submitted Ancillary Service Offers, to the Ancillary Service Position, described in Section 5.4.1, RUC Ancillary Service Positions. Because the same Resource capacity can be represented in Ancillary Offers for multiple products, the aggregated capability is accounted for by grouping Ancillary Service types in the calculation below. The Ancillary Service shortfall in MW that a QSE had according to the RUC snapshot for a 15-minute Settlement Interval is:

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

Where,

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

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

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

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

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

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

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

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

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

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

Where,

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

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

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

RUCCAPADJ *q, i* = RCAPADJ *q, r, h* + (RUCCPADJ *q, h* – RUCCSADJ *q, h*) + (DAEP *q, p, h* – DAES *q, p, h*) + (RTQQEPADJ *q, p, i* – RTQQESADJ *q, p, i*) +  DCIMPADJ *q, p, i* + ASOFRLRADJ *q, r, h*

(15) The Ancillary Service shortfall calculation compares the Ancillary Service capability of the QSE, measured by the submitted Ancillary Service Offers, to the Ancillary Service Position, described in Section 5.4.1, RUC Ancillary Service Positions. Because the same Resource capacity can be represented in Ancillary Offers for multiple products, the aggregated capability is accounted for by grouping Ancillary Service types in the calculation below. The Ancillary Service shortfall in MW that a QSE had at the end of the Adjustment Period for a 15-minute Settlement Interval is:

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

Where,

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

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

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

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

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

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

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| RUCSFRS *ruc, i, q* | none | *RUC Shortfall Ratio Share*—The ratio of the QSE *q*’s capacity shortfall to the sum of all QSEs’ capacity shortfalls, for the RUC process *ruc*, for the 15-minute Settlement Interval *i*. |
| RUCSF *ruc, i, q* | MW | *RUC Shortfall*—The QSE *q*’s capacity shortfall for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| RUCSFTOT *ruc, i* | MW | *RUC Shortfall Total*—The sum of all QSEs’ capacity shortfalls, for a RUC process *ruc*, for a 15-minute Settlement Interval *i*. |
| RUCSFSNAP *ruc, q, i* | MW | *RUC Shortfall at Snapshot*—The QSE *q*’s capacity shortfall will be the maximum of the QSE’s overall shortfall or Ancillary Service shortfall, as calculated for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| RUCSFADJ *ruc, q, i* | MW | *RUC Shortfall at End of Adjustment Period*—The QSE *q*’s end of Adjustment Period capacity shortfall will be the maximum of the QSE’s overall shortfall or Ancillary Service shortfall, as calculated for the RUC process *ruc*, for the 15-minute Settlement Interval *i*. |
| RUCCAPCREDIT *q, i, z* | MW | *RUC Capacity Credit*—The QSE *q*’s capacity credit resulting from capacity paid through the RUC Capacity-Short Amount for RUC process *z* for the 15-minute Settlement Interval *i*. |
| RUCOSFSNAP *ruc, q, i* | MW | *RUC Overall Shortfall at Snapshot* —The QSE *q*’s overall capacity shortfall according to the snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| RUCASFSNAP *ruc, q, i* | MW | *RUC Ancillary Service Shortfall at Snapshot* —The QSE *q*’s ancillary service capacity shortfall according to the snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASONPOSSNAP *ruc ,q ,i* | MW | *Ancillary Service On-Line Position at Snapshot –* The QSE *q’s* total On-Line ancillary service position according to the snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i.* |
| RUPOSSNAP *ruc, q, h* | MW | *Regulation Up Position at Snapshot* ⎯The QSE *q’s* Real-Time Reg-Up position pursuant to Section 5.4.1, RUC Ancillary Service Positions, according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| RRPOSSNAP *ruc, q, h* | MW | *Responsive Reserve Service Position at Snapshot* ⎯The QSE *q’s* Real-Time RRS position pursuant to Section 5.4.1 according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| ECRPOSSNAP *ruc, q, h* | MW | *ERCOT Contigency Reserve Service Position at Snapshot* ⎯The QSE *q’s* Real-Time ECRS position pursuant to Section 5.4.1 according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| NSPOSSNAP *ruc, q, h* | MW | *Non-Spin Reserve Service Position at Snapshot* ⎯The QSE *q’s* Real-Time Non-Spin position pursuant to Section 5.4.1 according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| RDPOSSNAP *ruc, q, h* | MW | *Regulation Down Position at Snapshot* ⎯The QSE *q’s* Real-Time Reg-Down position pursuant to Section 5.4.1 according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| ASOFFOFRSNAP *ruc, q, r, h* | MW | *Ancillary Service Offline Offers at Snapshot –*The capacity represented by validated Ancillary Service Offers for ECRS and Non-Spin for Resource *r* represented by QSE *q* according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFRLRSNAP *ruc, q, r, h* | MW | *Ancillary Service Offer per Load Resource at Snapshot –* The capacity represented by validated ancillary service offers for Reg-Up, Non-Spin, RRS, and ECRS for the Load Resource *r*  represented by QSE *q* according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASCAP1SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 1 at Snapshot* ⎯The net capacity for Reg-Up for QSE *q*, according to the snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASCAP2SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 2 at Snapshot* ⎯The net capacity for RRS for QSE *q*, according to the snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASCAP3SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 3 at Snapshot* ⎯The net capacity for Reg-Up and RRS for QSE *q*, according to the snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASCAP4SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 4 at Snapshot* ⎯The net capacity for Reg-Up, RRS, and ECRS for QSE *q*, according to the snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASCAP5SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 5 at Snapshot* ⎯The net capacity for Reg-Up, RRS, ECRS, and Non-Spinning Reserve (Non-Spin) for QSE *q*, according to the snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASCAP6SNAP *ruc, q, i* | MW | *Ancillary Service Net Capacity Level 6 at Snapshot* ⎯The net capacity for Regulation Down Service (Reg-Down) for QSE *q*, according to the snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| ASOFR1SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 1 at Snapshot –* The capacity represented by validated Reg-Up Ancillary Service Offers for Resource *r* represented by QSE *q* according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR2SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 2 at Snapshot –* The capacity represented by validated RRS Ancillary Service Offers for Resource *r* represented by QSE *q* according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR3SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 3 at Snapshot –* The capacity represented by validated Reg-Up and RRS Ancillary Service Offers for Resource *r* represented by QSE *q* according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR4SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 4 at Snapshot –* The capacity represented by validated Reg-Up, RRS, and ECRS Ancillary Service Offers for Resource *r* represented by QSE *q* according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR5SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 5 at Snapshot –* The capacity represented by validated Reg-Up, RRS, ECRS, and Non-Spin Ancillary Service Offers for Resource *r* represented by QSE *q* according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR6SNAP *ruc, q, r, h* | MW | *Ancillary Service Offer Level 6 at Snapshot –* The capacity represented by validated Reg-Down Ancillary Service Offers for Resource *r* represented by QSE *q* according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| RUCOSFADJ *ruc, q, i* | MW | *RUC Overall Shortfall at End of Adjustment Period* —The QSE *q’s* overall capacity shortfall at the end of the Adjustment Period, including capacity from IRRs as seen in the snapshot for the RUC process *ruc* and capacity from DC-Coupled Resources, for the 15-minute Settlement Interval *i*. |
| RUCASFADJ *q, i* | MW | *RUC Ancillary Service Shortfall at End of Adjustment Period* —The QSE *q’s* Ancillary Service capacity shortfall at the end of the Adjustment Period for the 15-minute Settlement Interval *i*. |
| ASONPOSADJ *q ,i* | MW | *Ancillary Service On-Line Position at End of Adjustment Period –* The QSE *q’s* total On-Line Ancillary Service position at the end of the Adjustment Periodfor the 15-minute Settlement Interval *i.* |
| RUPOSADJ *q, h* | MW | *Regulation Up Position at End of Adjustment Period* ⎯The QSE *q’s* Reg-Up position at the end of the Adjustment Period pursuant Section 5.4.1, RUC Ancillary Service Positions, for the hour *h* that includes the 15-minute Settlement Interval. |
| RRPOSADJ *q, h* | MW | *Responsive Reserve Service Position at End of Adjustment Period* ⎯The QSE *q’s* RRS position at the end of the Adjustment Period pursuant to Section 5.4.1 for the hour *h* that includes the 15-minute Settlement Interval. |
| ECRPOSADJ *q, h* | MW | *ERCOT Contigency Reserve Service Position at End of Adjustment Period* ⎯The QSE *q’s* ECRS position at the end of the Adjustment Period pursuant to Section 5.4.1 for the hour *h* that includes the 15-minute Settlement Interval. |
| NSPOSADJ *q, h* | MW | *Non-Spin Reserve Service Position at End of Adjustment Period* ⎯The QSE *q’s* Non-Spin position at the end of the Adjustment Period pursuant to Section 5.4.1 for the hour *h* that includes the 15-minute Settlement Interval. |
| RDPOSADJ *q, h* | MW | *Regulation Down Position at End of Adjustment Period* ⎯The QSE *q’s*  Reg-Down position at the end of the Adjustment period pursuant to Section 5.4.1 for the hour *h* that includes the 15-minute Settlement Interval. |
| ASOFFOFRADJ *q, r, h* | MW | *Ancillary Service Offline Offers at End of Adjustment Period –*The capacity represented by validated Ancillary Service Offers for ECRS and Non-Spin for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFRLRADJ *q, r, h* | MW | *Ancillary Service Offer per Load Resource at End of Adjustment Period –* The capacity represented by validated ancillary service offers for Reg-Up, Non-Spin, RRS, and ECRS for the Load Resource *r*  represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP Status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h.* |
| ASCAP1ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 1 at End of Adjustment Period* ⎯The net capacity at the end of the Adjustment Period for Reg-Up for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASCAP2ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 2 at End of Adjustment Period* ⎯The net capacity at the end of the Adjustment Period for RRS for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASCAP3ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 3 at End of Adjustment Period* ⎯The net capacity at the end of the Adjustment Period for Reg-Up and RRS for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASCAP4ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 4 at End of Adjustment Period* ⎯The net capacity at the end of the Adjustment Period for Reg-Up, RRS, and ECRS for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASCAP5ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 5 at End of Adjustment Period* ⎯The net capacity at the end of the Adjustment Period for Reg-Up, RRS, ECRS, and Non-Spin for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASCAP6ADJ *q, i* | MW | *Ancillary Service Net Capacity Level 6 at End of Adjustment Period* ⎯ The net capacity at the end of the Adjustment Period for Reg-Down for QSE *q*, for the 15-minute Settlement Interval *i*. |
| ASOFR1ADJ *q, r, h* | MW | *Ancillary Service Offer Level 1 at End of Adjustment Period –* The capacity represented by validated Reg-Up Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR2ADJ *q, r, h* | MW | *Ancillary Service Offer Level 2 at End of Adjustment Period –* The capacity represented by validated RRS Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR3ADJ *q, r, h* | MW | *Ancillary Service Offer Level 3 at End of Adjustment Period –* The capacity represented by validated Reg-Up and RRS Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR4ADJ *q, r, h* | MW | *Ancillary Service Offer Level 4 at End of Adjustment Period –* The capacity represented by validated Reg-Up, RRS, and ECRS Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR5ADJ *q, r, h* | MW | *Ancillary Service Offer Level 5 at End of Adjustment Period–* The capacity represented by validated Reg-Up, RRS, ECRS, and Non-Spin Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| ASOFR6ADJ *q, r, h* | MW | *Ancillary Service Offer Level 6 at End of Adjustment Period –* The capacity represented by validated Reg-Down Ancillary Service Offers for Resource *r* represented by QSE *q* at the end of the Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. A Resource’s offered capacity is only included in the sum to the extent that the Resource’s COP status and Ancillary Service Capability indicate it would be capable of providing the Ancillary Service during the hour *h*. |
| RTAML *q, p, i* | MWh | *Real-Time Adjusted Metered Load*—The QSE *q*’s Adjusted Metered Load (AML) at the Settlement Point *p* for the 15-minute Settlement Interval *i*. |
| RUCCAPSNAP *ruc, q, i* | MW | *RUC Capacity Snapshot at time of RUC*—The amount of the QSE *q*’s calculated capacity in the snapshot for the RUC process *ruc* for a 15-minute Settlement Interval *i*. |
| RCAPSNAP *ruc, q, r, h* | MW | *Resource Capacity at Snapshot*—The available capacity of Generation Resource or ESR *r*, that is not a DC-Coupled Resource, represented by the QSE *q*, according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. For ESRs and Generation Resources that are not IRRs, the available capacity shall be equal to HSL. For WGRs and PVGRs, the available capacity shall be equal to the WGRPP and the PVGRPP, respectively. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RTDCEXP *q, p, i* | MW | *Real-Time DC Export*—The aggregated DC Tie Schedule through DC Tie *p* submitted by QSE *q* that is under the Oklaunion Exemption as an exporter from the ERCOT Region, for the 15-minute Settlement Interval *i*. |
| DCRCAPSNAP *ruc, q, r, h* | MW | *DC-Coupled Resource Capacity at Snapshot*—The Resource Capacity of DC-Coupled Resource *r* represented by the QSE *q* for the hour *h*, according to the snapshot for the RUC process *ruc*. |
| DCRCAPADJ *ruc, q, r, h* | MW | *DC-Coupled Resource Capacity at Adjustment Period*—The Resource Capacity of DC-Coupled Resource *r* represented by the QSE *q* for the hour *h*, at the end of the Adjustment Period. |
| DCIMPADJ *q, p, i* | MW | *DC Import at End of Adjustment Period*—The approved aggregated DC Tie Schedule submitted by QSE *q* as an importer into the ERCOT System through DC Tie *p* at the end of the Adjustment Period, for the 15-minute Settlement Interval *i*. |
| DCIMPSNAP *ruc, q, p, i* | MW | *DC Import at Snapshot*—The approved aggregated DC Tie Schedule submitted by QSE *q* as an importer into the ERCOT System through DC Tie *p*, according to the snapshot for the RUC process *ruc* for the 15-minute Settlement Interval *i*. |
| RUCCPSNAP *ruc, q, h* | MW | *RUC Capacity Purchase at Snapshot*—The QSE *q*’s capacity purchase, according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| RUCCSSNAP *ruc, q, h* | MW | *RUC Capacity Sale at Snapshot*—The QSE *q*’s capacity sale, according to the snapshot for the RUC process *ruc* for the hour *h* that includes the 15-minute Settlement Interval. |
| RUCCAPADJ *q, i* | MW | *RUC Capacity at End of Adjustment Period*—The amount of the QSE *q*’s calculated capacity, excluding capacity for IRRs and DC-Coupled Resources, at the end of the Adjustment Period for a 15-minute Settlement Interval *i.* |
| RCAPADJ *q, r, h* | MW | *Resource Capacity at End of Adjustment Period*—The HSL of a non-IRR Generation Resource or ESR *r*, that is not a DC-Coupled Resource, represented by the QSE *q* at the end of the Adjustment Period, for the hour *h* that includes the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| RUCCPADJ *q, h* | MW | *RUC Capacity Purchase at End of Adjustment Period*—The QSE *q*’s capacity purchase, at the end of Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. |
| RUCCSADJ *q, h* | MW | *RUC Capacity Sale at End of Adjustment Period*—The QSE *q*’s capacity sale, at the end of Adjustment Period for the hour *h* that includes the 15-minute Settlement Interval. |
| DAEP *q, p, h* | MW | *Day-Ahead Energy Purchase*—The QSE *q*’s energy purchased in the DAM at the Settlement Point *p* for the hour *h* that includes the 15-minute Settlement Interval. |
| DAES *q, p, h* | MW | *Day-Ahead Energy Sale*—The QSE *q*’s energy sold in the DAM at the Settlement Point *p* for the hour *h* that includes the 15-minute Settlement Interval. |
| RTQQEPSNAP *ruc, q, p, i* | MW | *Real-Time QSE-to-QSE Energy Purchase at Snapshot*—The QSE *q*’s Energy Trades in which the QSE is the buyer at the delivery Settlement Point *p* for the 15-minute Settlement Interval *i*, in the snapshot for the RUC process *ruc*. |
| RTQQESSNAP *ruc, q, p, i* | MW | *Real-Time QSE-to-QSE Energy Sale at Snapshot*—The QSE *q*’s Energy Trades in which the QSE is the seller at the delivery Settlement Point *p* for the 15-minute Settlement Interval *i*, in the snapshot for the RUC process *ruc*. |
| RTQQEPADJ *q, p, i* | MW | *Real-Time QSE-to-QSE Energy Purchase at End of Adjustment Period*—The QSE *q*’s Energy Trades in which the QSE is the buyer at the delivery Settlement Point *p* for the 15-minute Settlement Interval *i*, at the end of the Adjustment Period for that Settlement Interval. |
| RTQQESADJ *q, p, i* | MW | *Real-Time QSE-to-QSE Energy Sale at End of Adjustment Period*—The QSE *q*’s Energy Trades in which the QSE is the seller at the delivery Settlement Point *p* for the 15-minute Settlement Interval *i*, at the end of the Adjustment Period for that Settlement Interval. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |
| *r* | none | Generation Resource, an ESR, or a Load Resource |
| *z* | none | A previous RUC process for the Operating Day. |
| *i* | none | A 15-minute Settlement Interval. |
| *h* | none | The hour that includes the Settlement Interval *i*. |
| *ruc* | none | The RUC process for which this RUC Shortfall Ratio Share is calculated. |

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

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

**Preparation for**

**Real**

**-**

**Time Ops**

**Adj Period**

**18:00**

**(D**

**–**

**1)**

**60 Minutes**

**Prior to**

**Op Hour**

**QSE Deadline:**

**Update Energy Bids and Offers**

**Update Output Schedules**

**Update Inc/Dec Offers for**

**DSRs**

**ERCOT Activity:**

**LFC Process every 4 secs**

**Execute SCED every 5**

**mins**

**Communicate Instructions,**

**Awards & Prices**

**ERCOT Activity:**

**Snapshot Inputs &**

**Execute HRUC**

**Operating Period**

**Operating Hour**

**Clock**

**Hour**

**T**

**Adjustment Period & Real**

**-**

**Time Operations**

**Real**

**-**

**Time**

**Operations**

**QSE Deadline:**

**Update Output Schedules for DSRs**

**Update AS Offers**

**Update Energy Bid/Offer Curves**

**Provide SCADA Telemetry**

**ERCOT Activity:**

**Communicate**

**HRUC Commitments**

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

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

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

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

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

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

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

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

(a) If it is determined that correcting the Real-Time Settlement Point Prices will not affect the Base Points that were received by Qualified Scheduling Entities (QSEs), then ERCOT shall correct the prices before the prices are considered final in paragraph (6) below.

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

(c) If the Base Points received by QSEs are inconsistent with the Real-Time Settlement Point Prices reduced by the sum of the Real-Time On-Line Reliability Deployment Prices and the Real-Time Reserve Prices for On-Line Reserves averaged over the 15-minute Settlement Interval, then ERCOT shall consider those Base Points as due to manual override from the ERCOT Operator and settle the relevant Settlement Interval(s) in accordance with Section 6.6.9, Emergency Operations Settlement.

(6) All Real-Time LMPs, Real-Time Settlement Point Prices, Real-Time prices for energy metered, Real-Time On-Line Reliability Deployment Price Adders, Real-Time On-Line Reliability Deployment Prices, Real-Time Reserve Prices for On-Line Reserves, Real-Time Reserve Prices for Off-Line Reserves, Real-Time On-Line Reserve Price Adders, Real-Time Off-Line Reserve Price Adders and SASM MCPCs are final at 1600 of the second Business Day after the Operating Day.

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

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

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

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

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

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

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

(1) The following table summarizes the timeline for the Adjustment Period and the activities of QSEs and ERCOT. The table is intended to be only a general guide and not controlling language, and any conflict between this table and another section of the Protocols is controlled by the other section:

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

***6.4.2 Output Schedules***

(1) A QSE that represents a Resource, other than an RMR Unit, must submit and maintain an Energy Offer Curve, an Energy Bid/Offer Curve, or an Output Schedule for the Resource for all times when the Resource is On-Line.

(2) The entry of an Energy Offer Curve or Energy Bid/Offer Curve for a Resource automatically nullifies the Output Schedule for that Resource and prohibits entry of future Output Schedules for that Resource for the time during which the Energy Offer Curve or Energy Bid/Offer Curve is in effect.

(3) For a Resource for which an Energy Offer Curve or Energy Bid/Offer Curve has not been submitted, the SCED process uses the Output Schedule submitted for that Resource as desired Dispatch levels for the Resource.

**6.4.2.1 Output Schedules for Resources Other than Dynamically Scheduled Resources**

(1) An Output Schedule for a non-DSR Resource may be submitted and updated only during the Adjustment Period. An Output Schedule for a non-DSR Resource may be submitted and updated for each five-minute interval for each Operating Hour.

(2) For a Resource that is not a DSR and that is On-Line, the following provisions apply:

(a) The Output Schedule for a Qualifying Facility (QF) not submitting an Energy Offer Curve is considered to be equal to the telemetered output of the QF at the time that the SCED runs;

(b) The Output Schedule for Intermittent Renewable Resources (IRR) not submitting Energy Offer Curves is considered to be equal to the telemetered output of the Resource at the time that the SCED runs; and

(c) ERCOT shall create proxy Energy Offer Curves or proxy Energy Bid/Offer Curves for the Resource under paragraph (4)(a) of Section 6.5.7.3, Security Constrained Economic Dispatch.

**6.4.2.3 Output Schedule Criteria**

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

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

(b) The name of the Resource;

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

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

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

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

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

***6.4.4 Energy Offer Curve and Energy Bid/Offer Curve***

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

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

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

(4) For ESRs with a Resource Status other than ONTEST or ONHOLD, if a valid Energy Bid/Offer Curve or an Output Schedule does not exist, then ERCOT shall notify the QSE and create a proxy Energy Bid/Offer Curve priced at -$250/MWh for the MW portion of the curve less than zero MW, and priced at the RTSWCAP for the MW portion of the curve greater than zero MW.

**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.

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

(2) ERCOT shall verify that either an Energy Offer Curve or Energy Bid/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 or Energy Bid/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.

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| ***[NPRR857: Replace paragraph (3) above with the following upon system implementation:]***  (3) In Real-Time operations, ERCOT may only issue Dispatch Instructions for Direct Current Ties (DC Ties) to the appropriate Direct Current Tie Operator (DCTO), for Transmission Facilities to a Transmission Service Provider (TSP), for distribution facilities to a Distribution Service Provider (DSP), or for a Resource to the QSE that represents it. |

(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;

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

(j) 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;

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| ***[NPRR863: Replace item (o) above with the following upon system implementation:]***  (o) Ancillary Service Schedule for each quantity of ECRS 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), 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;

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| ***[NPRR863: Replace paragraph (p) above with the following upon system implementation:]***  (p) Ancillary Service Resource Responsibility for each quantity of Regulation Up Service (Reg-Up), Regulation Down Service (Reg-Down), RRS, ECRS, 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;

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| ***[NPRR863: Replace item (f) above with the following upon system implementation:]***  (f) Ancillary Service Schedule (in MW) for each quantity of RRS, ECRS, 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;

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| ***[NPRR863: Replace item (g) above with the following upon system implementation:]***  (g) Ancillary Service Resource Responsibility (in MW) for each quantity of Reg-Up and Reg-Down for Controllable Load Resources, and RRS, ECRS, 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 representing an ESR connected to Transmission Facilities or distribution facilities shall provide the following Real-Time telemetry data to ERCOT for each ESR. 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 consumption or output (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 or consumption of an ESR for all real power dispatch purposes, including use in Security-Constrained Economic Dispatch (SCED), in determination of High Dispatch Limit (HDL), and Low Dispatch Limit (LDL) and is consistent with telemetered HSL, LSL and Frequency Responsive Capacity (FRC);

(b) Gross real power consumption or output (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 conversion 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) ESR breaker and switch status;

(i) HSL;

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

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

(l) LSL;

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

(n) For Ancillary Services other than RRS, a blended ramp rate (in MW/min) that reflects the current physical capability of the Resource to provide that specific type of Ancillary Service; and

(o) Five-minute blended normal up and down ramp rates;

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

(8) 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.

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

(10) 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.

(11) 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.

(12) 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.

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

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

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

(c) State of Charge, in MWh;

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

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

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

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| --- |
| ***[NPRR829: Insert paragraph (15) below upon system implementation:]***  (15) A QSE representing a Settlement Only Generator (SOG) that elects to include the net generation of the SOG in the estimate of Real-Time Liability (RTL) shall provide ERCOT Real-Time telemetry of the net generation of the SOG. |

|  |
| --- |
| ***[NPRR885: Insert paragraph (16) below upon system implementation:]***  (16) A QSE representing a Must-Run Alternative (MRA) shall telemeter the MRA MW currently available (unloaded) and not included in the HSL. |

***6.5.7.1.10 Network Security Analysis Processor and Security Violation Alarm***

(1) Using the input provided by the State Estimator, ERCOT shall use the NSA processor to perform analysis of all contingencies in the active list. For each contingency, ERCOT shall use the NSA processor to monitor the elements for limit violations. ERCOT shall use the NSA processor to verify Electrical Bus voltage limits to be within a percentage tolerance as outlined in the Operating Guides. Contingency security violations for transmission lines and transformers occur if:

(a) The predicted post-contingency MVA exceeds 100% of the Emergency Rating after consideration of Dynamic Ratings; and

(b) A RAP, AMP or RAS is not defined allowing relief within the time allowed by the security criteria as defined in Operating Guide Section 2.2.2, Security Criteria.

(2) When the NSA processor notifies ERCOT of a security violation, ERCOT shall immediately:

(a) Initiate the process described in Section 6.5.7.1.11, Transmission Network and Power Balance Constraint Management;

(b) Seek to determine what unforeseen change in system condition has arisen that has resulted in the security violation, especially those that were 125% or greater of the Emergency Rating for a single SCED interval or greater than 100% of the Emergency Rating for a duration of 30 minutes or more; and

(c) Where possible, seek to reverse the action (e.g. initiating a transmission clearance that the system was not properly pre-dispatched for) that has led to a security violation until further preventative action(s) can be taken.

(3) If SCED does not resolve a transmission security violation, ERCOT shall attempt to relieve the security violation by:

(a) Confirming that pre-determined RAPs are properly modeled in the system;

(b) Instructing Resources to follow Base Points from SCED if those Resources are not already doing so;

(c) Instructing Resources to update the Resources Status in the COP from ONTEST to ON in order to provide more capacity to SCED;

(d) Deploying Resource-Specific Non-Spin;

(e) Committing additional Generation Resources through the Reliability Unit Commitment (RUC) process;

(f) Removing conflicting non-cascading constraints from the SCED process;

(g) Re-Dispatching generation or, in the case of an ESR, its output or consumption, by over-riding HDLs and LDLs;

(h) Instructing TSPs to utilize Reactive Power devices to manage voltage; and

(i) If all other mechanisms have failed, ERCOT may authorize the expedited use of a Temporary Outage Action Plan (TOAP) or Mitigation Plan.

(4) NSA must be capable of analyzing contingencies, including the effects of RASs, AMPs and RAPs modeled in the Network Operations Model. The NSA must fully integrate the evaluation and deployment of RASs, AMPs and RAPs and notify the ERCOT Operator of the application of these RASs, AMPs and RAPs to the solution.

(5) The Real-Time NSA may employ the use of appropriate ranking and other screening techniques to further reduce computation time by executing one or two iterations of the contingency study to gauge its impact and discard further study if the estimated result is inconsequential.

(6) HDL or LDL overrides required to pre-posture for an expected Outage shall only be utilized until SCED is capable of managing the related constraint by economic dispatch.

(7) ERCOT shall report monthly:

(a) All security violations that were 125% or greater of the Emergency Rating for a single SCED interval or greater than 100% of the Emergency Rating for a duration of 30 minutes or more during the prior reporting month and the number of occurrences and congestion cost associated with each of the constraints causing the security violations on a rolling 12 month basis.

(b) Operating conditions on the ERCOT System that contributed to each transmission security violation reported in paragraph (7)(a) above. Analysis should be made to understand the root cause and what steps could be taken to avoid a recurrence in the future.

***6.5.7.1.12 Resource Limits***

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

(a) HASL;

(b) LASL;

(c) Normal Ramp Rate based on the values telemetered by the QSE to ERCOT;

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

(e) SCED Up Ramp Rate (SURAMP), which represents the ability of a Generation Resource to increase generation output in SCED;

(f) SCED Down Ramp Rate (SDRAMP), which represents the ability of a Generation Resource to decrease generation output in SCED;

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

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

(2) The following Load Resource limits are calculated by ERCOT and used in other calculations and as information for ERCOT Operators:

(a) For all Load Resources:

(i) HASL; and

(ii) LASL; and

(b) For Controllable Load Resources qualified to be Dispatched by SCED:

(i) Normal Ramp Rate based on the values telemetered by the QSE to ERCOT;

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

(iii) SURAMP, which represents the ability of a Load Resource to decrease consumption in SCED;

(iv) SDRAMP, which represents the ability of a Load Resource to increase consumption in SCED;

(v) HDL, which represents a dynamically calculated MW upper limit on a Resource that describes the maximum capability of the Resource SCED dispatch for the next five minutes (the Resource’s Real-Time consumption plus the product of the Normal Ramp Rate, as telemetered by the QSE, multiplied by five), restricted by HASL; and

(vi) LDL, which represents a dynamically calculated MW lower limit on a Resource that describes the minimum capability of the Resource SCED dispatch for the next five minutes (the Resource’s Real-Time consumption minus the product of the Normal Ramp Rate, as telemetered by the QSE, multiplied by five), restricted by LASL.

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

**6.5.7.2 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

Services

Provided: Reg

Down

Provided: Reg Up,

Responsive, Non-Spin

Current

Telemetry

HDL

LDL

Ramp

Rate

5 Minutes

**Generation**

Quantity

Offer Curve Generation

LSL

HSL

-

-

-

Generation

Increase

Ramp

Rate

5 Minutes

-

0

-

-

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

|  |
| --- |
| ***[NPRR863: Replace paragraph (2) above with the following upon system implementation:]***  LSL  HSL  Time  LSL  -  LASL  -  HASL  -  Generation  Increase    Services  Provided: Reg  Down  Provided: Reg Up,  ECRS, Non-Spin, RRS    Current  Telemetry  HDL  LDL  Ramp  Rate  5 Minutes  **Generation**  Quantity  Offer Curve Generation  LSL  HSL  -  -  -  Generation  Increase    Ramp  Rate  5 Minutes  -  0  -  -    Increase  Generation  Decrease  Ramp  Rate  5 Minutes  Ancillary  (2) The figures below illustrate how the Resource Limit Calculator determines the Resource limits for Generation and Load Resources:  Generation Resources:  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, ECRS, Non-Spin  HSL = MPC -  Normal Load  Fluctuation |

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

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

|  |
| --- |
| ***[NPRR863: Replace the formula “HASL” above with the following upon system implementation:]***  **HASL = Max (LASL, (HSLTELEM – (ECRSTELEM + RUSTELEM + NSRSTELEM + RRSTELEM + NFRCTELEM)))** |

|  |  |
| --- | --- |
| **Variable** | **Description** |
| HASL | High Ancillary Service Limit. |
| HSLTELEM | High Sustained Limit provided via telemetry – per Section 6.5.5.2.   |  | | --- | | ***[NPRR879: Replace the description above with the following upon system implementation:]***  For IRRs carrying Ancillary Service Resource Responsibilities and all IRRs within an IRR Group where any IRR within the IRR Group is carrying an Ancillary Service Resource Responsibility, HSLTELEM shall be the five-minute intra-hour forecast for the Resource. For all other Resources, HSLTELEM shall be the Resource’s HSL provided to ERCOT via telemetry, in accordance with Section 6.5.5.2. | |
| 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. |
| |  |  |  | | --- | --- | --- | | ***[NPRR863: Insert the variable “ECRSTELEM” below upon system implementation:]***   |  |  | | --- | --- | | ECRSTELEM | ECRS Ancillary Service Schedule provided by telemetry. | | | |
| NFRCTELEM | NFRC currently available (unloaded) and included in the HSL of the Generation Resource with non-zero RRS 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 – (1 – RDSDEPLP) \* (RUSTELEM / 7)**

|  |  |
| --- | --- |
| **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.   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  Normal Ramp Rate up, as telemetered by the QSE, when ECRS is not deployed or when the subject Resource is not providing ECRS.  Emergency Ramp Rate up, as telemetered by the QSE, for Resources deploying ECRS. | |
| RUSTELEM | Reg-Up Ancillary Service Resource Responsibility designation provided by telemetry. |
| RDSDEPLP | Percentage of system-wide Reg-Down Ancillary Resource Responsibility deployed by LFC. This value shall not exceed 100% and controls the amount of ramp rate reserved for Regulation Service in Real-Time. |

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

**SDRAMP = NORMRAMP – (1 – RUSDEPLP) \* (RDSTELEM / 7)**

| **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. |
| RUSDEPLP | Percentage of system-wide Reg-Up Ancillary Resource Responsibility deployed by LFC. This value shall not exceed 100% and controls the amount of ramp rate reserved for Regulation Service in Real-Time. |

(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)))**

|  |
| --- |
| ***[NPRR863: Replace the formula “LASL” above with the following upon system implementation:]***  **LASL = Min (HASL, (LPCTELEM + (ECRSTELEM + RRSTELEM + RUSTELEM + NSRSTELEM)))** |

|  |  |
| --- | --- |
| **Variable** | **Description** |
| LASL | Low Ancillary Service Limit. |
| HASL | High Ancillary Service Limit. |
| LPCTELEM | Low Power Consumption provided via telemetry. |
| |  |  |  | | --- | --- | --- | | ***[NPRR863: Insert the variable “ECRSTELEM” below upon system implementation:]***   |  |  | | --- | --- | | ECRSTELEM | ECRS Ancillary Service Schedule provided by telemetry. | | | |
| 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. |

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

**SURAMP = RAMPRATE – (1 – RDSDEPLP) \* (RUSTELEM / 7)**

|  |  |
| --- | --- |
| **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. |
| RDSDEPLP | Percentage of system-wide Reg-Down Ancillary Resource Responsibility deployed by LFC. This value shall not exceed 100% and controls the amount of ramp rate reserved for Regulation Service in Real-Time. |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR863: Replace paragraph (11) above with the following upon system implementation:]***  (11) For each Controllable Load Resource, the SURAMP is calculated as follows:  **SURAMP = RAMPRATE – (1 – RDSDEPLP) \* (RUSTELEM / 7)**   |  |  | | --- | --- | | **Variable** | **Description** | | SURAMP | SCED Up Ramp Rate. | | RAMPRATE | Normal Ramp Rate up, as telemetered by the QSE, when ECRS is not deployed or when the subject Load Resource is not providing ECRS.  Emergency Ramp Rate up, as telemetered by the QSE, for Load Resources deploying ECRS. | | RUSTELEM | Reg-Up Ancillary Service Resource Responsibility designation provided by telemetry. | | RDSDEPLP | Percentage of system-wide Reg-Down Ancillary Resource Responsibility deployed by LFC. This value shall not exceed 100% and controls the amount of ramp rate reserved for Regulation Service in Real-Time. | |

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

**SDRAMP = NORMRAMP – (1 – RUSDEPLP) \* (RDSTELEM / 7)**

| **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. |
| RUSDEPLP | Percentage of system-wide Reg-Up Ancillary Resource Responsibility deployed by LFC. This value shall not exceed 100% and controls the amount of ramp rate reserved for Regulation Service in Real-Time. |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR863: Replace paragraph (12) above with the following upon system implementation:]***  (12) For each Controllable Load Resource, the SDRAMP is calculated as follows:  **SDRAMP = NORMRAMP – (1 – RUSDEPLP) \* (RDSTELEM / 7)**   | **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. | | RUSDEPLP | Percentage of system-wide Reg-Up Ancillary Resource Responsibility deployed by LFC. This value shall not exceed 100% and controls the amount of ramp rate reserved for Regulation Service in Real-Time. | |

(15) For ESRs, HDL is calculated as follows:

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

**HDL = 0**

(b) If the telemetered Resource Status is ONTEST, then

**HDL** = Max(**Min (POWERTELEM, HSLTELEM), LSLTELEM)**

(c) If the telemetered Resource Status is any status code specified in item (5)(b)(iv) of Section 3.9.1, Current Operating Plan (COP) Criteria, other than OUT, EMR, EMRSWGR, ONHOLD, or ONTEST, then

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

|  |  |
| --- | --- |
| **Variable** | **Description** |
| HDL | High Dispatch Limit. |
| POWERTELEM | Net real power provided via telemetry. |
| NORMRAMPUP | 5-minute blended Normal Ramp Rate up, as telemetered by the QSE. |
| HSLTELEM | High Sustained Limit (HSL) provided via telemetry – per Section 6.5.5.2. |

(16) For ESRs, LDL is calculated as follows:

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

**LDL = 0**

(b) If the telemetered Resource Status is ONTEST, then

**LDL** = **Max (Min(POWERTELEM, HSLTELEM), LSLTELEM)**

(c) If the telemetered Resource Status is any status code specified in item (5)(b)(iv) of Section 3.9.1, Current Operating Plan (COP) Criteria, other than OUT, or EMR, or EMRSWGR, or ONHOLD, or ONTEST, then

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

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

(17) 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. |

(18) 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. |

**6.5.7.3 Security Constrained Economic Dispatch**

(1) The SCED process is designed to simultaneously manage energy, Ancillary Services, the system power balance and network congestion through Resource Base Points, Ancillary Service awards, and the calculation of LMPs and MCPCs approximately every five minutes. The SCED process uses a two-step methodology that applies mitigation to offers for energy prospectively to resolve Non-Competitive Constraints for the current Operating Hour. The SCED process evaluates Energy Offer Curves, Energy Bid/Offer Curves, Ancillary Service Offers, Output Schedules and Real-Time Market (RTM) Energy Bids to determine Resource Dispatch Instructions and Ancillary Service awards by maximizing bid-based revenues minus offer-based costs, subject to power balance, Ancillary Service Demand Curves (ASDCs), and network constraints. The SCED process uses the Resource Status provided by SCADA telemetry under Section 6.5.5.2, Operational Data Requirements, and validated by the Real-Time Sequence, instead of the Resource Status provided by the COP. An RTM Energy Bid represents the bid for energy distributed across all nodes in the Load Zone in which the Controllable Load Resource is located.

|  |
| --- |
| ***[NPRR986: Replace paragraph (1) above with the following upon system implementation:]***  (1) The SCED process is designed to simultaneously manage energy, Ancillary Services, the system power balance and network congestion through Resource Base Points, Ancillary Service awards, and the calculation of LMPs and MCPCs approximately every five minutes. The SCED process uses a two-step methodology that applies mitigation to offers for energy prospectively to resolve Non-Competitive Constraints for the current Operating Hour. The SCED process evaluates Energy Offer Curves, Energy Bid/Offer Curves, Ancillary Service Offers, Output Schedules and Real-Time Market (RTM) Energy Bids to determine Resource Dispatch Instructions and Ancillary Service awards by maximizing bid-based revenues minus offer-based costs, subject to power balance, Ancillary Service Demand Curves (ASDCs), and network constraints. The SCED process uses the Resource Status provided by SCADA telemetry under Section 6.5.5.2, Operational Data Requirements, and validated by the Real-Time Sequence, instead of the Resource Status provided by the COP. |

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

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

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

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

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

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

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

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

(b) DSRs with Energy Offer Curves

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

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

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

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

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

(d) IRRs

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

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

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

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

(e) RUC-committed Resources

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

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL | $1,500 |
| Zero | $1,500 |

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

|  |  |
| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL (if more than highest MW in Energy Offer Curve) | Greater of $1,500 or price associated with the highest MW in QSE submitted Energy Offer Curve |
| Energy Offer Curve | Greater of $1,500 or the QSE submitted Energy Offer Curve |
| Zero | Greater of $1,500 or the first price point of the QSE submitted Energy Offer Curve |

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| ***[NPRR930: Insert paragraph (iii) below upon system implementation and renumber accordingly:]***  (iii) For each RUC-committed Resource during the time period stated in the Advance Action Notice (AAN) if any Resource received an Outage Schedule Adjustment, ERCOT shall create a proxy Energy Offer Curve as described below:   |  |  | | --- | --- | | **MW** | **Price (per MWh)** | | HSL | $4,500 | | Zero | $4,500 | |

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

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| --- | --- |
| **MW** | **Price (per MWh)** |
| HSL of RUC-committed configuration | $1,500 |
| Zero | $1,500 |

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

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

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| ***[NPRR1019: Insert paragraphs (v)-(viii) below upon system implementation:]***  (v) For each RUC-committed Switchable Generation Resource (SWGR) that is not part of a Combined Cycle Train already operating in ERCOT, that has not submitted an Energy Offer Curve, and that has a COP Resource Status of EMRSWGR for the instructed Operating Hour at the time of the RUC instruction, ERCOT shall create a proxy Energy Offer Curve as described below:   |  |  | | --- | --- | | **MW** | **Price (per MWh)** | | HSL | $4,500 | | Zero | $4,500 |   (vi) For each RUC-committed SWGR that is not part of a Combined Cycle Train already operating in ERCOT, that has submitted an Energy Offer Curve, and that has a COP Resource Status of EMRSWGR for the instructed Operating Hour at the time of the RUC instruction, ERCOT shall create a proxy Energy Offer Curve as described below:   |  |  | | --- | --- | | **MW** | **Price (per MWh)** | | HSL (if more than highest MW in Energy Offer Curve) | Greater of $4,500 or price associated with the highest MW in QSE-submitted Energy Offer Curve | | Energy Offer Curve | Greater of $4,500 or the QSE-submitted Energy Offer Curve | | Zero | Greater of $4,500 or the first price point of the QSE-submitted Energy Offer Curve |   (vii) For each Combined Cycle Train configuration that includes at least one SWGR that is operating in a non-ERCOT Control Area as part of a configuration with a COP Resource Status of EMRSWGR for the instructed Operating Hour at the time of a RUC instruction requiring the switching of the SWGR into the ERCOT Control Area, if the QSE for the Combined Cycle Train has not submitted an Energy Offer Curve for the RUC-committed configuration, ERCOT shall create a proxy Energy Offer Curve as described below:   |  |  | | --- | --- | | **MW** | **Price (per MWh)** | | HSL of RUC-committed configuration | $4,500 | | Zero | $4,500 |   (viii) For each Combined Cycle Train configuration that includes at least one SWGR that is operating in a non-ERCOT Control Area as part of a configuration with a COP Resource Status of EMRSWGR for the instructed Operating Hour at the time of a RUC instruction requiring the switching of the SWGR into the ERCOT Control Area, if the QSE for the Combined Cycle Train has submitted an Energy Offer Curve for the RUC-committed configuration, ERCOT shall create a proxy Energy Offer Curve as described below:   |  |  | | --- | --- | | **MW** | **Price (per MWh)** | | HSL of RUC-committed configuration (if more than highest MW in Energy Offer Curve) | Greater of $4,500 or price associated with the highest MW in QSE-submitted Energy Offer Curve | | Energy Offer Curve for MW at and above HSL of QSE-committed configuration | Greater of $4,500 or the QSE-submitted Energy Offer Curve | | HSL of QSE-committed configuration (if more than highest MW in Energy Offer Curve and price associated with highest MW in Energy Offer Curve is less than $4,500) | $4,500 | | HSL of QSE-committed configuration (if more than highest MW in Energy Offer Curve) | Price associated with the highest MW in QSE-submitted Energy Offer Curve | | Energy Offer Curve for MW at and below HSL of QSE-committed configuration | The QSE-submitted Energy Offer Curve | | 1 MW below lowest MW in Energy Offer Curve (if more than LSL) | -$249.99 | | LSL (if less than lowest MW in Energy Offer Curve) | -$250.00 | |

(5) For use as SCED inputs for determining energy Dispatch and Ancillary Service awards, ERCOT shall use the available capacity of all On-Line ESRs by creating proxy Energy Bid/Offer Curves for certain Resources as follows:

(a) For each ESR for which its QSE has submitted an Energy Bid/Offer Curve that does not cover the full offer range (LSL to HSL) of the Resource’s available capacity, ERCOT shall create a proxy Energy Bid/Offer Curve that extends the submitted Energy Bid/Offer Curve to use the entire available capacity of the Resource above the highest MW point on the Energy Bid/Offer Curve to the Resource’s HSL and from the lowest MW point on the Energy Bid/Offer Curve to LSL, using these prices for the corresponding MW segments:

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

(b) At the time of SCED execution, if a valid Energy Bid/Offer Curve or Output Schedule does not exist for an ESR that has a status of On-Line, then ERCOT shall notify the QSE and create a proxy Energy Bid/Offer Curve priced at -$250/MWh for the MW portion of the curve less than zero MW, and priced at the RTSWCAP for the MW portion of the curve greater than zero MW.

(c) At the time of SCED execution, if a QSE representing an ESR has submitted an Output Schedule instead of an Energy Bid/Offer Curve, ERCOT shall create a proxy Energy Bid/Offer Curve priced at -$250/MWh for the MW portion of the curve from its LSL to the MW amount on the Output Schedule, and priced at the RTSWCAP for the MW portion of the curve from the MW amount on the Output Schedule to its HSL.

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

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

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

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

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

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| ***[NPRR986: Replace paragraph (9) above with the following upon system implementation:]***  (9) If a Controllable Load Resource telemeters a status of OUTL, it is not considered as dispatchable capacity by SCED. A QSE may use this function to inform ERCOT of instances when the Controllable Load Resource is unable to follow SCED Dispatch Instructions. Under all telemetered statuses including OUTL, the remaining telemetry quantities submitted by the QSE shall represent the operating conditions of the Controllable Load Resource that can be verified by ERCOT. A QSE representing a Controllable Load Resource with a telemetered status of OUTL is still obligated to provide any applicable Ancillary Service Resource Responsibilities previously awarded to that Controllable Load Resource. This paragraph does not apply to Energy Storage Resources (ESRs). |

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

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

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

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

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

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

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

(iii) Use RTM Energy Bid curves for all available Controllable Load Resources, whether submitted by QSEs or created by ERCOT. There is no mitigation of RTM Energy Bids; and

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| ***[NPRR986: Replace paragraph (iii) above with the following upon system implementation:]***  (iii) Use RTM Energy Bid curves for all available Controllable Load Resources, whether submitted by QSEs or created by ERCOT. There is no mitigation of RTM Energy Bids. An RTM Energy Bid from a Controllable Load Resource represents the bid for energy distributed across all nodes in the Load Zone in which the Controllable Load Resource is located. For an ESR, an RTM Energy Bid represents a bid for energy at the ESR’s Resource Node; and |

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

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

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

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

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

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

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

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| ***[NPRR986: Insert paragraph (18) below upon system implementation:]***  (18) The QSE representing an ESR may withdraw energy from the ERCOT System only when dispatched by SCED to do so. An ESR may telemeter a status of OUT only if the ESR is in Outage status. |

**6.5.7.3.1Determination of Real-Time On-Line Reliability Deployment Price Adder**

(1) The following categories of reliability deployments are considered in the determination of the Real-Time On-Line Reliability Deployment Price Adder:

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

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

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

(d) Deployed Emergency Response Service (ERS);

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

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

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

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

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

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| [NPRR1006: Insert paragraph (i) below upon system implementation:]  (i) ERCOT-directed deployment of Transmission and/or Distribution Service Provider (TDSP) standard offer Load management programs. |

(2) The Real-Time On-Line Reliability Deployment Price Adder is an estimation of the impact to energy prices due to the above categories of reliability deployments. For intervals where there are reliability deployments as described in paragraph (1) above, after the two-step SCED process and also after the Real-Time On-Line Reserve Price Adder and Real-Time Off-Line Reserve Price Adder have been determined, the Real-Time On-Line Reliability Deployment Price Adder is determined as follows:

(a) For RUC-committed Resources with a telemetered Resource Status of ONRUC and for RMR Resources that are On-Line, set the LSL, LASL, and LDL to zero.

(b) Notwithstanding item (a) above, for RUC-committed Combined Cycle Generation Resources with a telemetered Resource Status of ONRUC that were instructed by ERCOT to transition to a different configuration to provide additional capacity, set the LSL, LASL, and LDL equal to the minimum of their current value and the COP HSL of the QSE-committed configuration for the RUC hour at the snapshot time of the RUC instruction.

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

(i) Set LDL to the greater of Aggregated Resource Output - (60 minutes \* SCED Down Ramp Rate), or LASL; and

(ii) Set HDL to the lesser of Aggregated Resource Output + (60 minutes\*SCED Up Ramp Rate), or HASL.

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

(d) For all On-Line ESRs:

(i) If the ESR SCED Base Point is not at LDL, set LDL to the greater of Aggregated Resource Output - (60 minutes \* Normal Down Ramp Rate), or LSL; and

(ii) If the ESR SCED Base Point is not at HDL, set HDL to the lesser of Aggregated Resource Output + (60 minutes \* Normal Up Ramp Rate), or HSL.

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

(i) Set LDL to the greater of Aggregated Resource Output - (60 minutes \* SCED Up Ramp Rate), or LASL; and

(ii) Set HDL to the lesser of Aggregated Resource Output + (60 minutes\*SCED Down Ramp Rate), or HASL.

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

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

(g) Add the deployed MW from ERS to GTBD. The amount of deployed MW is determined from the XML messages and ERS contracted capacities for the ERS Time Periods when ERS is deployed. After recall, an approximation of the amount of un-restored ERS shall be used. After ERCOT recalls each group, GTBD shall be adjusted to reflect restoration on a linear curve over the assumed restoration period (“RHours”).

The above parameter is defined as follows:

| Parameter | Unit | Current Value\* |
| --- | --- | --- |
| RHours | Hours | 4.5 |
| \* Changes to the current value of the parameter(s) referenced in this table above may be recommended by TAC and approved by the ERCOT Board. ERCOT shall update parameter values on the first day of the month following ERCOT Board approval unless otherwise directed by the ERCOT Board. ERCOT shall provide a Market Notice prior to implementation of a revised parameter value. | | |

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

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

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

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

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

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| --- |
| [NPRR1006: Insert paragraph (l) below upon system implementation and renumber accordingly:]  (l) Add the deployed MWs from TDSP standard offer Load management programs to GTBD, if ERCOT instructs TDSPs to deploy their standard offer Load management programs. The amount of deployed MW is the value ERCOT provided for all TDSP standard offer Load management programs in the most current May Report on Capacity, Demand and Reserves in the ERCOT Region, unless modified as specified in this paragraph. If ERCOT is informed that all or a portion of a TDSP’s standard offer Load management program has been fully exhausted, or has been expanded as the result of a Public Utility Commission of Texas (PUCT) proceeding, ERCOT will remove the associated MW value of any exhausted capacity from the amount of deployed MW or, in the case of an expansion, ERCOT will request an updated MW value from the relevant TDSPs to use in place of the May Report on Capacity, Demand and Reserves in the ERCOT Region value for that year. The initial value ERCOT will use for deployed MW under this paragraph for each calendar year, as well as any subsequent changes to this value, will be communicated to Market Participants in a Market Notice. After recall, an approximation of the amount of un-restored TDSP standard offer Load management programs shall be used. GTBD shall be adjusted to reflect restoration on a linear curve over the assumed restoration period (“RHours”) defined by item (g) above. |

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

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

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

(o) Determine the positive difference between the System Lambda from item (m) above and the System Lambda of the second step in the two-step SCED process described in paragraph (10)(b) of Section 6.5.7.3, Security Constrained Economic Dispatch.

(p) Determine the amount given by the Value of Lost Load (VOLL) minus the sum of the System Lambda of the second step in the two step SCED process described in paragraph (10)(b) of Section 6.5.7.3 and the Real-Time On-Line Reserve Price Adder.

(q) The Real-Time On-Line Reliability Deployment Price Adder is the minimum of items (o) and (p) above.

**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 and ESRs in the form of PFR;

(ii) Load Resources, excluding Controllable Load Resources;

(iii) Controllable Load Resources; and

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

(b) Ancillary Service Resource Responsibility for RRS from:

(i) Generation Resources and ESRs in the form of PFR;

(ii) Load Resources excluding Controllable Load Resources;

(iii) Controllable Load Resources; and

(iv) Resources capable of FFR;

(c) RRS deployed to Generation and Controllable Load Resources;

|  |
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| ***[NPRR863: Replace item (c) above with the following upon system implementation and renumber accordingly:]***  (c) ECRS capacity from:  (i) Generation Resources;  (ii) Load Resources excluding Controllable Load Resources;  (iii) Controllable Load Resources;  (iv) Quick Start Generation Resources (QSGRs); and  (v) ESRs.  (d) Ancillary Service Resource Responsibility for ECRS from:  (i) Generation Resources;  (ii) Load Resources excluding Controllable Load Resources; and  (iii) Controllable Load Resources;  (iv) QSGRs; and  (v) ESRs.  (e) ECRS 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;

(iv) Resources with Output Schedules; and

(v) ESRs.

(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 Quick Start Generation Resources (QSGRs);

(v) QSGRs; and

(vi) ESRs.

(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) With Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to increase ESR Base Points in SCED;

(viii) With Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to decrease ESR Base Points in SCED;

(ix) Without Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to increase ESR Base Points in SCED;

(x) Without Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to decrease ESR Base Points in SCED;

(xi) 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;

|  |
| --- |
| ***[NPRR863: Replace item (xi) above with the following upon system implementation:]***  (xi) From Resources participating in SCED plus the Reg-Up, RRS, and ECRS from Load Resources and the Net Power Consumption minus the Low Power Consumption from Load Resources with a validated Real-Time RRS and ECRS Schedule; |

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

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

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

(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.

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

***WGRs***

***online***

***All***

***WGR***

***online***

***i***

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



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

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| ***[NPRR863: Replace the formula “PRC3“ above with the following upon system implementation:]***  **PRC3 = ((Synchronous condenser output)i as qualified by item (8) of Operating Guide Section 2.3.1.2, Additional Operational Details for Responsive Reserve and ERCOT Contingency Reserve Service Providers))** |

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

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***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

|  |
| --- |
| ***[NPRR863: Replace the formula “PRC4“ above with the following upon system implementation:]***      ***resources***  ***load***  ***online***  ***All***  ***resource***  ***load***  ***online***  ***i***  **PRC4 = (Min(Max((Actual Net Telemetered Consumption – LPC), 0.0), ECRS and RRS Ancillary Service Resource Responsibility \* 1.5) from all Load Resources controlled by high-set under frequency relays carrying an ECRS and/or RRS Ancillary Service Resource Responsibility)i**      ***resources***  ***load***  ***online***  ***All***  ***resource***  ***load***  ***online***  ***i*** |

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





***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

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

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





***resources***

***FFR***

***online***

***All***

***resource***

***FFR***

***online***

***i***

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

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Unit** | **Description** |
| PRC1 | MW | Generation On-Line greater than 0 MW |
| PRC2 | MW | WGRs On-Line greater than 0 MW |
| PRC3 | MW | Hydro-synchronous condenser output   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  Synchronous condenser output | |
| PRC4 | MW | Capacity from Load Resources controlled by high-set under-frequency relays carrying RRS Ancillary Service Resource Responsibility   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  Capacity from Load Resources carrying ECRS Ancillary Service Resource Responsibility | |
| PRC5 | MW | Capacity from Controllable Load Resources active in SCED and carrying Ancillary Service Resource Responsibility |
| PRC6 | MW | Capacity from Controllable Load Resources active in SCED and not carrying Ancillary Service Resource Responsibility |
| PRC7 | MW | Capacity from Resources capable of providing FFR |
| 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.

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

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

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

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

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

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

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

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

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

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

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

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

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

Where:

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

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

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

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

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

The above variables are defined as follows:

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

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

The WSL is settled as follows:

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

Where the price for Settlement Meter is determined as follows:

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

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

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

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

Where:

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

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

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

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

The above variables are defined as follows:

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

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| ***[NPRR986: Replace paragraph (3) above with the following upon system implementation:]***  (3) For a facility with Settlement Meters that measure ESR Load, the total payment or charge for ESR Load is calculated for a QSE, ESR, and Settlement Point for each 15-minute Settlement Interval.  The WSL is settled as follows:  **WSLAMTTOT *q, r, p* =**  **(RTRMPRESR *b* \* MEBL** ***q, r, b*)**  The ESR Load that is not WSL is settled as follows:  **ESRNWSLAMTTOT *q, r, p* =**  **(RTRMPRESR *b* \* MEBR** ***q, r, b*)**  Where the price for Settlement Meter is determined as follows:  **RTRMPRESR *b* = Max [-$251, (image010(RNWFL *b, y* \* RTLMP *b, y*) + RTRSVPOR + RTRDP)]**  Where the weighting factor for the Electrical Bus associated with the meter is:  **RNWFL *b, y* = [Max (0.001, ABS(**image001**Min(0, BP *r, y*))) \* TLMP *y*] /**  **[image010Max (0.001, ABS(**image001**Min(0, BP *r, y*))) \* TLMP *y*]**  Where:  RTRSVPOR = image010(RNWF  *y* \* RTORPA *y*)  RTRDP = (RNWF  *y* \* RTORDPA *y*)  RNWF *y* = TLMP *y* / TLMP *y*  The summation is over all ESR Load *r* associated to the individual meter. The determination of which Resources are associated to an individual meter is static and based on the normal system configuration of the generation site code, *gsc*.  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | RTLMP *b, y* | $/MWh | *Real-Time Locational Marginal Price at bus per interval*⎯The Real-Time LMP for the meter at Electrical Bus *b*, for the SCED interval *y*. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the SCED interval *y*. | | 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. | | 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*. | | 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 Settlement Interval. | | MEBL*q,r,b* | MWh | *Metered Energy for Wholesale Storage Load at bus*⎯The WSL energy metered by the Settlement Meter which measures WSL for the 15-minute Settlement Interval represented as a negative value, for the QSE *q*, Resource *r*, at bus *b*. | | MEBR *q, r, b* | MWh | *Metered Energy for Energy Storage Resource Load at Bus* - The energy metered by the Settlement Meter which measures ESR Load that is not WSL for the 15-minute Settlement Interval represented as a negative value, for the QSE *q*, Resource *r*, at bus *b*. | | WSLAMTTOT*q, r, p* | $ | *Wholesale Storage Load Settlement*—The total payment or charge to QSE *q*, Resource *r*, at Settlement Point *p*, for WSL for each 15-minute Settlement Interval. | | ESRNWSLAMTTOT*q, r, p* | $ | *Energy Storage Resource Non-WSL Settlement*—The total payment or charge to QSE *q*, Resource *r*, at Settlement Point *p*, for ESR Load that is not WSL for each 15-minute Settlement Interval. | | RNWFL*b, y* | none | *Net meter Weighting Factor per interval for the Energy Metered as Energy Storage Resource Load*The weight factor used in net meter price calculation for meters in Electrical Bus *b*, for the SCED interval *y*, for the ESR Load associated with an ESR. The weighting factor used in the net meter price calculation shall not be recalculated after the fact due to revisions in the association of Resources to Settlement Meters. | | RTRMPRESR*b* | $/MWh | *Real-Time Price for the Energy Metered as Energy Storage Resource Load at bus*⎯The Real-Time price for the Settlement Meter which measures ESR Load at Electrical Bus *b*, for the 15-minute Settlement Interval. | | BP *r, y* | MW | *Base Point per Resource per interval* - The Base Point of Resource *r*, for the SCED interval *y*. | | *q* | none | A QSE. | | *gsc* | none | A generation site code. | | *r* | none | An ESR. | | *p* | none | A Resource Node Settlement Point. | | *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. | | *b* | none | An Electrical Bus. | |

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

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

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

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

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

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

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

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

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

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

**RNWF *b, y* = [Max (0.001,** **Max(0,** **BP *r, y*)) \* TLMP *y*] /**

**[image010Max (0.001,**  **Max(0,** **BP *r, y*)) \* TLMP *y*]**

Where:

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

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

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

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

The above variables are defined as follows:

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

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

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

The above variables are defined as follows:

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

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

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

The above variables are defined as follows:

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

**6.6.5.1 Resource Base Point Deviation Charge**

(1) A QSE for a Generation Resource, ESR, or Controllable Load Resource shall pay a Base Point Deviation Charge if the Resource did not follow Dispatch Instructions and Ancillary Service deployments within defined tolerances, except when the Dispatch Instructions and Ancillary Service deployments violate the Resource Parameters. The Base Point Deviation Charge does not apply to Generation Resources when Adjusted Aggregated Base Point (AABP) is less than the Resource’s average telemetered LSL, the QSE’s Generation Resources or ESRs 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, ESR, or 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***

**Where:**

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

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

**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 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 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 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 for the Regulation Instruction for 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 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 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 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*. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |
| *r* | none | A Generation Resource, ESR, or Controllable Load Resource. |
| *i* | None | A 15-minute Settlement Interval |
| *y* | none | A five-minute clock interval in the Settlement Interval. |

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| ***[NPRR963: Replace Section 6.6.5.1 above with the following upon system implementation:]***  **6.6.5.1 Resource Base Point Deviation Charge**  (1) A QSE for a Generation Resource, Controllable Load Resource, or ESR shall pay a Base Point Deviation Charge if the Resource did not follow Dispatch Instructions and Regulation Up Service (Reg-Up) and Regulation Down Service (Reg-Down) deployments within defined tolerances, except when the Dispatch Instructions and Reg-Up and Reg-Down deployments violate the Resource Parameters.  (2) The desired output from a Generation Resource, ESR, or 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***  Where:  AVGBP*q, r, p, i* =  (AVGBP5M *q, r, p, i, y*) / 3  AVGREG*q, r, p, i* =  (AVGREG5M *q, r, p, i, y*) / 3  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 Reg-Up and Reg-Down deployments of 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 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 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 for the Regulation Instruction for 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 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 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 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*. | | *q* | none | A QSE. | | *p* | none | A Settlement Point. | | *r* | none | A Generation Resource, ESR, or Controllable Load Resource. | | *i* | None | A 15-minute Settlement Interval | | *y* | none | A five-minute clock interval in the Settlement Interval. | |

**6.6.5.1.1.3 Controllable Load Resource Base Point Deviation Charge for Over Consumption**

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

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

(b) YO MW for power consumption above the average of the Base Points in the Settlement Interval adjusted for any Ancillary Service deployments.

(2) The Controllable Load Resource Base Point Deviation Charge for over-consumption variables XO and YO shall be subject to review and approval by the Technical Advisory Committee (TAC) and shall be posted to the MIS Public Area no later than three Business Days after TAC approval.

(3) The charge to each QSE for non-excused over-consumption for each Controllable Load Resource during a 15-minute Settlement Interval in which the Controllable Load Resource has received a Base Point is calculated as follows:

BPDAMT *q, r, p, i* = -1 \* Min (PRZ1, RTSPP *p, i*) \* Min (1, KP1) \* OCONSM*q, r, p, i*

Where:

OCONSM *q, r, p, i*  = Max [0, (ATPC *q, r, p, i* - ¼\* Max (((1 + KLR1) \* AABP *q, r, p, i*), (AABP *q, r, p, i* + QLR1)))]

ATPC *q, r, p, i* = ( (AVGTPC5M *q, r, p, i, y*) / 3) \* ¼

The above variables are defined as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Unit | Definition | |
| **BPDAMT *q, r, p, i*** | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource or Controllable Load Resource *r* at Settlement Point *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. | |
| RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | |
| ATPC *q, r, p, i* | MWh | *Average Telemetered Power Consumption per QSE per Settlement Point per Controllable Load Resource*—The average telemetered power consumption of the Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i.* |
| 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 Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i*. |
| AVGTPC5M *q, r, p, i, y* | MW | *Average Telemetered Power Consumption for the 5 Minutes*—The average telemetered power consumption of 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*. | |
| OCONSM *q, r, p, i* | MWh | *Over-Consumption Volumes per QSE per Settlement Point per Controllable Load Resource*—The amount over-consumed by the Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* for the 15-minute Settlement Interval *i*. | |
| KP1 | none | The coefficient applied to the Settlement Point Price for over-consumption charge, 1.0. | |
| PRZ1 | $/MWh | The price to use for the charge calculation when RTSPP is greater than -$20, -$20/MWh. | |
| KLR1 | none | The percentage tolerance for over-consumption of a Controllable Load Resource, XO%. | |
| QLR1 | MW | The MW tolerance for over-consumption of a Controllable Load Resource, YO MW. | |
| *q* | none | A QSE. | |
| *p* | none | A Settlement Point. | |
| *r* | none | A Controllable Load Resource. | |
| *i* | none | A 15-minute Settlement Interval. | |
| *y* | none | A five-minute clock interval in the Settlement Interval. | |

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| [NPRR963: Replace Section 6.6.5.1.1.3 above with the following upon system implementation and renumber accordingly:]  6.6.5.3 Controllable Load Resource Base Point Deviation Charge for Over Consumption  (1) ERCOT shall charge a QSE of a Controllable Load Resource, for over-consumption that exceeds the following tolerance. The tolerance is the greater of:  (a) XO% of the Adjusted Aggregated Base Point in the Settlement Interval; or  (b) YO MW above the Adjusted Aggregated Base Point in the Settlement Interval.  (2) The Controllable Load Resource Base Point Deviation Charge for over-consumption variables XO and YO shall be subject to review and approval by the Technical Advisory Committee (TAC) and shall be posted to the MIS Public Area no later than three Business Days after TAC approval.  (3) The charge to each QSE for non-excused over-consumption for each Controllable Load Resource, during a 15-minute Settlement Interval in which the Controllable Load Resource has received a Base Point is calculated as follows:  BPDAMT *q, r, p, i* = -1 \* Min (PRZ1, RTSPP *p, i*) \* Min (1, KP1) \* OCONSM*q, r, p, i*  Where:  OCONSM *q, r, p, i*  = Max [0, (ATPC *q, r, p, i* - ¼\* Max (((1 + KLR1) \* AABP *q, r, p, i*), (AABP *q, r, p, i* + QLR1)))]  ATPC *q, r, p, i* = ( (AVGTPC5M *q, r, p, i, y*) / 3) \* ¼  The above variables are defined as follows:   |  |  |  |  | | --- | --- | --- | --- | | Variable | Unit | Definition | | | **BPDAMT *q, r, p, i*** | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Controllable Load Resource *r* at Settlement Point *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. | | | RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | | | ATPC *q, r, p, i* | MWh | *Average Telemetered Power Consumption per QSE per Settlement Point per Controllable Load Resource*—The average telemetered power consumption of the Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i.* | | AABP *q, r, p, i* | MW | *Adjusted Aggregated Base Point for Resource per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Reg-Up and Reg-Down deployments of Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | | AVGTPC5M *q, r, p, i, y* | MW | *Average Telemetered Power Consumption for the 5 Minutes*—The average telemetered power consumption of 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*. | | | OCONSM *q, r, p, i* | MWh | *Over-Consumption Volumes per QSE per Settlement Point per Controllable Load Resource*—The amount over-consumed by the Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* for the 15-minute Settlement Interval *i*. | | | KP1 | none | The coefficient applied to the Settlement Point Price for over-consumption charge, 1.0. | | | PRZ1 | $/MWh | The price to use for the charge calculation when RTSPP is greater than -$20, -$20/MWh. | | | KLR1 | none | The percentage tolerance for over-consumption of a Controllable Load Resource, XO%. | | | QLR1 | MW | The MW tolerance for over-consumption of a Controllable Load Resource, YO MW. | | | *q* | none | A QSE. | | | *p* | none | A Settlement Point. | | | *r* | none | A Controllable Load Resource. | | | *i* | none | A 15-minute Settlement Interval. | | | *y* | none | A five-minute clock interval in the Settlement Interval. | | |

6.6.5.1.1.4 Controllable Load Resource Base Point Deviation Charge for Under Consumption

(1) ERCOT shall charge a QSE for a Controllable Load Resource for under-consumption if the average telemetered power consumption is below than the lesser of:

(a) [100-XU]% of the average of the Base Points in the Settlement Interval adjusted for any Ancillary Service deployments; or

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

(2) The Controllable Load Resource Base Point Deviation Charge for under-consumption variables XU and YU shall be subject to review and approval by TAC and shall be posted to the MIS Public Area no later than three Business Days after TAC approval.

(3) The charge to each QSE for non-excused under-consumption of each Controllable Load Resource during a 15-minute Settlement Interval in which the Controllable Load Resource has received a Base Point is calculated as follows:

BPDAMT *q, r, p, i* = Max (PRZ2, RTSPP *p, i*) \* UCONSM*q, r, p, i*

Where:

UCONSM *q, r, p, i*  = Max [0, [Min ((1 – KLR2) \* ¼\* AABP *q, r, p, i* ,¼ \* (AABP *q, r, p, i* – QLR2)) – ATPC *q, r, p, i*]]

ATPC *q, r, p, i =*  ( (AVGTPC5M *q, r, p, i, y*) / 3) \* ¼

The above variables are defined as follows:

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| Variable | Unit | Definition | |
| **BPDAMT *q, r, p, i*** | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource or Controllable Load Resource *r* at Settlement Point *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. | |
| RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | |
| ATPC *q, r, p, i* | MWh | *Average Telemetered Power Consumption per QSE per Settlement Point per Controllable Load Resource*—The average telemetered power consumption of the Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i.* |
| 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 Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i*. |
| AVGTPC5M *q, r, p, i, y* | MW | *Average Telemetered Power Consumption for the 5 Minutes*—The average telemetered power consumption of 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*. | |
| UCONSM *q, r, p, i* | MWh | *Under Consumption Volumes per QSE per Settlement Point per Controllable Load Resource*—The amount under-consumed by the Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* for the 15-minute Settlement Interval *i*. | |
| PRZ2 | $/MWh | The price to use for the Base Point Deviation Charge for under-consumption calculation when RTSPP is less than $20/MWh, $20/MWh. | |
| KLR2 |  | The percentage tolerance for under-consumption of a Controllable Load Resource, XU%. | |
| QLR2 | MW | The MW tolerance for under-consumption of a Controllable Load Resource, YU MW. | |
| *q* | none | A QSE. | |
| *p* | none | A Settlement Point. | |
| *r* | none | A Controllable Load Resource. | |
| *i* | none | A 15-minute Settlement Interval. | |
| *y* | none | A five-minute clock interval in the Settlement Interval. | |

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| [NPRR963: Replace Section 6.6.5.1.1.4 above with the following upon system implementation:]  6.6.5.3.1 Controllable Load Resource Base Point Deviation Charge for Under Consumption  (1) ERCOT shall charge a QSE for a Controllable Load Resource, for under-consumption if the average telemetered power consumption is below than the lesser of:  (a) [100-XU]% of the Adjusted Aggregated Base Point in the Settlement Interval; or  (b) The Adjusted Aggregated Base Point in the Settlement Interval minus YU MW.  (2) The Controllable Load Resource Base Point Deviation Charge for under-consumption variables XU and YU shall be subject to review and approval by TAC and shall be posted to the MIS Public Area no later than three Business Days after TAC approval.  (3) The charge to each QSE for non-excused under-consumption of each Controllable Load Resource, during a 15-minute Settlement Interval in which the Controllable Load Resource has received a Base Point is calculated as follows:  BPDAMT *q, r, p, i* = Max (PRZ2, RTSPP *p, i*) \* UCONSM*q, r, p, i*  Where:  UCONSM *q, r, p, i*  = Max [0, [Min ((1 – KLR2) \* ¼\* AABP *q, r, p, i* ,¼ \* (AABP *q, r, p, i* – QLR2)) – ATPC *q, r, p, i*]]  ATPC *q, r, p, i =*  ( (AVGTPC5M *q, r, p, i, y*) / 3) \* ¼  The above variables are defined as follows:   |  |  |  |  | | --- | --- | --- | --- | | Variable | Unit | Definition | | | **BPDAMT *q, r, p, i*** | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Controllable Load Resource *r* at Settlement Point *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. | | | RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | | | ATPC *q, r, p, i* | MWh | *Average Telemetered Power Consumption per QSE per Settlement Point per Controllable Load Resource*—The average telemetered power consumption of the Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i.* | | AABP *q, r, p, i* | MW | *Adjusted Aggregated Base Point for the Resource per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Reg-Up and Reg-Down deployments of Resource *r* represented by QSE *q* at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | | AVGTPC5M *q, r, p, i, y* | MW | *Average Telemetered Power Consumption for the 5 Minutes*—The average telemetered power consumption of 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*. | | | UCONSM *q, r, p, i* | MWh | *Under-Consumption Volumes per QSE per Settlement Point per Controllable Load Resource*—The amount under-consumed by the Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* for the 15-minute Settlement Interval *i*. | | | PRZ2 | $/MWh | The price to use for the Base Point Deviation Charge for under-consumption calculation when RTSPP is less than $20/MWh, $20/MWh. | | | KLR2 |  | The percentage tolerance for under-consumption of a Controllable Load Resource, XU%. | | | QLR2 | MW | The MW tolerance for under-consumption of a Controllable Load Resource, YU MW. | | | *q* | none | A QSE. | | | *p* | none | A Settlement Point. | | | *r* | none | A Controllable Load Resource. | | | *i* | none | A 15-minute Settlement Interval. | | | *y* | none | A five-minute clock interval in the Settlement Interval. | | |

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| [NPRR963: Insert Section 6.6.5.5 below upon system implementation and renumber accordingly:]  **6.6.5.5 Energy Storage Resource Base Point Deviation Charge for Over Performance**  (1) ERCOT shall charge a QSE for an ESR a Base Point Deviation Charge for over-performance if the telemetered generation or consumption exceeds the specified tolerances.  (2) The tolerance is the greater of 3% of the Adjusted Aggregated Base Point (AABP) for the ESR in the Settlement Interval, or three MW above the AABP for the ESR in the Settlement Interval if the Resource meets the following conditions:  (a) The ESR is not a DC-Coupled Resource; or  (b) The ESR is DC-Coupled Resource and meets the conditions to be treated in the same manner as an ESR as specified in paragraph (1) of Section 3.8.7, DC-Coupled Resources, anytime during the Settlement Interval.  (3) The tolerance will be 10% of the AABP for the DC-Coupled Resource in the Settlement Interval if the ESR meets the conditions to be treated in the same manner as an IRR as specified in paragraph (2) of Section 3.8.7.  (4) The deviation charge for over-performance for each QSE for each ESR at each Resource Node Settlement Point will be calculated as follows:  If the ESR meets the conditions of paragraph (3) above and the flag signifying that the DC-Coupled Resource has received a Base Point below the HDL used by SCED is not set in all SCED intervals within the 15-minute Settlement Interval, then:  **BPDAMT *q, r, p, i* = 0**  Otherwise:  **BPDAMT *q, r, p, i* = Max (PR3, RTSPP *p, i*) \* OPESR*q, r, p, i***  Where:  If the ESR meets the conditions of paragraph (2) above, then:  OPESR *q, r, p, i*  = Max [0, (TWTG*q, r, p, i* – ¼ \* Max [(AABP *q, r, p,i +* ABS (K3\* AABP *q, r,p, i* )) *,* (AABP *q, r,p, i* + Q3)])]    If the ESR meets the conditions of paragraph (3) above, then:  OPESR *q, r, p, i*  = Max [0, (TWTG *q, r,p, i* – ¼ \* (AABP *q, r, p,i +* ABS (K5\* AABP *q, r,p, i* )))]  Where:  TWTG *q, r, p, i =*  ( (AVGTG5M *q, r, p, i, y*) / 3) \* ¼  The above variables are defined as follows:   | Variable | Unit | Definition | | --- | --- | --- | | BPDAMT *q, r, p, i* | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. | | RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | | TWTG *q, r, p, i* | MWh | *Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation or consumption of Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval *i*. | | AABP *q, r, p, i* | MW | *Adjusted Aggregated Base Point per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Reg-Up and Reg-Down Service deployments, of Resource *r* represented by QSE *q* at Settlement Point *p,* for the 15-minute Settlement Interval *i*. | | AVGTG5M *q, r, p, i, y* | MW | *Average Telemetered Generation for the 5 Minutes*—The average telemetered generation or consumption of Resource *r* represented by QSE *q* at Resource Node *p*, for the five-minute clock interval *y*, within the 15-minute Settlement Interval *i*. | | OPESR *q, r, p, i* | MWh | *Over-Performance Volumes per QSE per Settlement Point per Resource*—The amount the ESR *r* over-performed*,* represented by QSE *q* at Resource Node *p,* for the 15-minute Settlement Interval *i*. | | PR3 | $/MWh | The price to use for the Base Point Deviation Charge for over-performance when RTSPP is less than $20/MWh, $20/MWh. | | K3 | none | The percentage tolerance for over-performance per paragraph (2) above, 3%. | | K5 | none | The percentage tolerance for over-performance per paragraph (3) above, 10%. | | Q3 | MW | The MW tolerance for over-performance, three MW. | | *q* | none | A QSE. | | *p* | none | A Settlement Point. | | *r* | none | An ESR. | | *y* | none | A five-minute clock interval in the Settlement Interval. | | *i* | none | A 15-minute Settlement Interval. | |
| [NPRR963: Insert Section 6.6.5.5.1 below upon system implementation:]  **6.6.5.5.1 Energy Storage Resource Base Point Deviation Charge for Under Performance**  (1) ERCOT shall charge a QSE for an ESR a Base Point Deviation Charge for under-performance if the telemetered generation or consumption is below the specified tolerances.  (2) The tolerance is the lesser of 3% of the Adjusted Aggregated Base Point (AABP) for the ESR in the Settlement Interval, or three MW below the AABP for the ESR in the Settlement Interval, if the Resource meets the following conditions:  (a) The ESR is not a DC-Coupled Resource; or  (b) The ESR is DC-Coupled Resource and meets the conditions to be treated in the same manner as an ESR as specified in paragraph (1) of Section 3.8.7, DC-Coupled Resources, anytime during the Settlement Interval.  (3) The deviation charge for under-performance for each QSE for each ESR at each Resource Node Settlement Point will be calculated as follows:  **BPDAMT *q, r, p, i* = (-1) \* Min (PR4, RTSPP *p, i*) \* Min (1, KP2) \* UPESR*q, r, p, i***  Where:  If the ESR meets the conditions of paragraph (2) above, then:  UPESR *q, r, p, i*  = Max [0, ¼ \* Min [(AABP *q, r, p, i* - ABS (K4 \* AABP *q, r, p, i*)), (AABP *q, r, p, i* - Q4)] - TWTG *q, r, p, i* ]  Else:  UPESR *q, r, p, i* = 0  Where:  TWTG *q, r, p, i =*  ( (AVGTG5M *q, r, p, i, y*) / 3) \* ¼  The above variables are defined as follows:   | Variable | Unit | Definition | | --- | --- | --- | | **BPDAMT *q, r, p, i*** | $ | *Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval *i*. | | RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | | TWTG *q, r, p, i* | MWh | *Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation or consumption of Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval *i*. | | AABP *q, r, p, i* | MW | *Adjusted Aggregated Base Point per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Reg-Up and Reg-Down deployments, of Resource *r* represented by QSE *q* at Settlement Point *p,* for the 15-minute Settlement Interval *i*. | | AVGTG5M *q, r, p, i, y* | MW | *Average Telemetered Generation for the 5 Minutes*—The average telemetered generation or consumption of Resource *r* represented by QSE *q* at Resource Node *p*, for the five-minute clock interval *y*, within the 15-minute Settlement Interval *i*. | | UPESR *q, r, p, i* | MWh | *Under-Performance Volumes per QSE per Settlement Point per Resource*—The amount the ESR *r* under-performed*,* represented by QSE *q* at Resource Node *p,* for the 15-minute Settlement Interval *i*. | | PR4 | $/MWh | The price to use for the Base Point Deviation Charge for under-performance when RTSPP is greater than -$20/MWh, -$20/MWh. | | K4 | none | The percentage tolerance for under-performance, 3%. | | Q4 | MW | The MW tolerance for under-performance, three MW. | | KP2 | none | The coefficient applied to the Settlement Point Price for under-performance charge, 1.0. | | *q* | none | A QSE. | | *p* | none | A Settlement Point. | | *r* | none | An ESR. | | *y* | none | A five-minute clock interval in the Settlement Interval. | | *i* | none | A 15-minute Settlement Interval. | |

6.6.5.3 Resources Exempt from Deviation Charges

(1) Resource Base Point Deviation Charges do not apply to the following:

(a) Reliability Must-Run (RMR) Units;

(b) Dynamically Scheduled Resources (DSRs) (except as described in Section 6.4.2.2, Output Schedules for Dynamically Scheduled Resources);

(c) Qualifying Facilities (QFs) that do not submit an Energy Offer Curve for the Settlement Interval;

(d) Quick Start Generation Resources (QSGRs) during the 15-minute Settlement Interval after the start of the first SCED interval in which the QSGR is deployed; or

(e) Settlement Intervals in which Emergency Base Points were issued to the Resource.

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| [NPRR863 and NPRR963: Replace applicable portions of Section 6.6.5.3 above with the following upon system implementation and renumber accordingly:]  6.6.5.6 Resources Exempt from Deviation Charges  (1) Base Point Deviation Charges do not apply to any QSE for the 15-minute Settlement Interval during the following events:  (a) Responsive Reserve (RRS) was manually deployed by ERCOT;  (b) ERCOT Contingency Reserve Service (ECRS) was deployed; or  (c) ERCOT System Frequency deviation is both greater than +0.05 Hz and less than -0.05 Hz within the same Settlement Interval.  (2) Base Point Deviation Charges to not apply to the QSE for the Resource for the 15-minute Interval for the following:  (a) The deviation of the Resource over the 15-minute Settlement Interval is in a direction that contributes to frequency corrections that resolve an ERCOT System frequency deviation and ERCOT System frequency deviation is greater than +/-0.05 Hz at any time during the 15-minute Settlement Interval;  (b) The Resource is a Reliability Must-Run (RMR) Unit;  (c) Emergency Base Points were issued to the Resource; or  (d) Resource is operating in Constant Frequency Control (CFC) mode.  (3) In addition to the exemptions listed in paragraph (1) and (2) of this Section, Base Point Deviation Charges do not apply to the QSE for a Generation Resource for the 15-minute Settlement Interval for the following:  (a) AABP is less than the Resource’s average telemetered LSL;  (b) The Generation Resource is telemetering a status of ONTEST or STARTUP anytime during the Settlement Interval;  (c) Qualifying Facilities (QFs) that do not submit an Energy Offer Curve for the Settlement Interval;  (d) Quick Start Generation Resources (QSGRs) during the 15-minute Settlement Interval after the start of the first SCED interval in which the QSGR is deployed;  (e) Dynamically Scheduled Resources (DSRs) (except as described in paragraph (2)(c) in Section 6.4.2.2, Output Schedules for Dynamically Scheduled Resources); or  (f) The flag signifying that an IRR has received a Base Point below the HDL used by SCED is not set in all SCED intervals within the 15-minute Settlement Interval. For IRR Groups, the flag signifying that an IRR has received a Base Point below the HDL used by SCED is not set in all SCED intervals within the 15-minute Settlement Interval for any of the IRRs within the IRR Group.  (4) In addition to the exemptions listed in paragraph (1) and (2) of this Section, Base Point Deviation Charges do not apply to the QSE for the Controllable Load Resource for the 15-minute Settlement Interval if the following occur:  (a) The computed Base Point is equal to the snapshot of its telemetered power consumption for all SCED runs during the Settlement Interval; or  (b) The Controllable Load Resource is telemetering a status of OUTL anytime during the Settlement Interval.  (5) In addition to the exemptions listed in paragraph (1) and (2) of this Section, Base Point Deviation Charges do not apply to the QSE for the ESR for the 15-minute Settlement Interval if the following occur:  (a) The ESR is telemetering a status of ONTEST anytime during the Settlement Interval;  (b) The AABP is less than its average telemetered LSL; or  (c) The ESR is a Qualifying Facility (QF) that did not submit an Energy Bid/Offer Curve for all SCED Intervals for the Settlement Interval. |

**6.6.7.1 Voltage Support Service Payments**

(1) All other Generation Resources or ESRs shall be eligible for compensation for Reactive Power production in accordance with Section 6.5.7.7, Voltage Support Service, only if ERCOT issues a Dispatch Instruction that results in the following unit operation:

(a) When ERCOT instructs the Generation Resource or ESR to exceed its Unit Reactive Limit (URL) and the Generation Resource or ESR provides additional Reactive Power, then ERCOT shall pay for the additional Reactive Power provided at a price that recognizes the avoided cost of reactive support Resources on the transmission network.

(b) Any real power reduction directed by ERCOT through VDIs to provide for additional reactive capability for voltage support must be compensated as a lost opportunity payment

(2) The payment for a given 15-minute Settlement Interval to each QSE representing a Generation Resource or ESR that operates in accordance with an ERCOT Dispatch Instruction is calculated as follows:

Depending on the Dispatch Instruction, payment for Volt-Amperes reactive (VAr):

If VSSVARLAG *q, r* > 0

VSSVARAMT *q, r* = (-1) \* VSSVARPR \* VSSVARLAG *q, r*

If VSSVARLEAD *q, r* > 0

VSSVARAMT *q, r* = (-1) \* VSSVARPR \* VSSVARLEAD *q, r*

Where:

VSSVARLAG *q, r* = Max [0, Min (¼ \* VSSVARIOL *q, r*, RTVAR *q, r*) – (¼ \* URLLAG *q, r*)]

VSSVARLEAD *q, r* = Max {0, [(¼ \* URLLEAD *q, r* ) – Max ((¼ \* VSSVARIOL *q, r*), RTVAR *q, r*)]}

And:

If an ESR has a net withdrawal for the Settlement Interval , then:

URLLAG *q,r* = 0.32868 \* ABS(LSL *q,r*)

URLLEAD *q,r* = (-1) \* 0.32868 \* ABS(LSL *q,r*)

Otherwise:

URLLAG *q,r* = 0.32868 \* HSL *q,r*

URLLEAD *q,r* = (-1) \* 0.32868 \* HSL *q,r*

The above variables are defined as follows:

| Variable | **Unit** | **Definition** |
| --- | --- | --- |
| **VSSVARAMT *q, r*** | $ | *Voltage Support Service VAr Amount per QSE per Resource -* The payment to QSE *q* for the VSS provided by Resource *r*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| VSSVARPR | $/MVArh | *Voltage Support Service VAr Price -* The price for instructed MVAr beyond a Resource’s URL currently is $2.65/MVArh (based on $50.00/installed kVAr). |
| VSSVARLAG *q, r* | MVArh | *Voltage Support Service VAr Lagging per QSE per Resource -* The instructed portion of the Reactive Power above the Generation Resource’s lagging URL for Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| VSSVARLEAD *q, r* | MVArh | *Voltage Support Service VAr Leading per QSE per Resource* - The instructed portion of the Reactive Power below the Resource’s leading URL for Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| VSSVARIOL *q, r* | MVAr | *Voltage Support Service VAr Instructed Output Level per QSE per Resource*—The instructed Reactive Power output level of Resource *r* represented by QSE *q*, lagging Reactive Power if positive and leading Reactive Power if negative, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| RTVAR *q, r* | MVArh | *Real-Time VAr per QSE per Resource*—The netted Reactive Energy measured for Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| URLLAG *q, r* | MVAr | *Unit Reactive Limit Lagging per QSE per Resource*—The URL for lagging Reactive Power of the Resource *r* represented by QSE *q* as determined in accordance with these Protocols. Its value is positive. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| URLLEAD *q, r* | MVAr | *Unit Reactive Limit Leading per QSE per Resource*—The URL for leading Reactive Power of the Resource *r* represented by QSE *q* as determined in accordance with these Protocols. Its value is negative. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| HSL *q, r* | MW | *High Sustained Limit*—The HSL of Resource *r* represented by QSE *q* as defined in Section 2, Definitions, for the hour that includes the Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource. |
| LSL *q, r* | MW | *Low Sustained Limit*—The LSL for Resource *r* represented by QSE *q*, as defined in Section 2, Definitions, for the hour that includes the Settlement Interval. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource or Energy Storage Resource. |

(3) The total additional compensation to each QSE for voltage support service for the 15-minute Settlement Interval is calculated as follows:

**VSSVARAMTQSETOTq =**  **VSSVARAMT***q,r*

| Variable | **Unit** | **Definition** |
| --- | --- | --- |
| **VSSVARAMT *q, r*** | $ | *Voltage Support Service VAr Amount per QSE per Resource*—The payment to QSE *q* for the VSS provided by Resource *r*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| VSSVARAMTQSETOT *q* | $ | *Voltage Support VAr Amount QSE total per QSE*—The total of the payments to QSE *q* as compensation for VSS by this QSE for the 15-minute settlement interval. |
| *q* | None | A QSE. |
| *r* | None | A Generation Resource or Energy Storage Resource. |

(4) The lost opportunity payment, if applicable:

If an ESR has a net withdrawal for the Settlement Interval, then:

**VSSEAMT *q, r* = (-1) \* Max (0, RTSPP*p* ) \* Max (0, (ABS(LSL *q, r* \* ¼ - NETVSSA *q, r*)))**

**Otherwise:**

VSSEAMT *q, r* = (-1) \* Max (0, (RTSPP p - RTEOCOST *q, r, i* ) \* Max (0, (HSL *q, r* \* ¼ - NETVSSA *q, r*)))

|  |
| --- |
| [NPRR971: Replace the language above with the following upon system implementation:]  VSSEAMT *q, r* = (-1) \* Max (0, (RTSPP*p* – RTEOCOST *q, r, i*) \* Max (0, (HSL *q, r* \* ¼ - NETVSSA *q, r*))) |

**Where:**

NETVSSA *q, r* = RTMC *q, r +* RTMG *q, r*

For an ESR that is not a Wholesale Storage Load (WSL):

RTMC *q, r* =  MEBR *q, r, b*

And for an ESR that is a WSL:

RTMC *q, r* =  MEBL *q, r, b*

The above variables are defined as follows:

| Variable | Unit | Definition |
| --- | --- | --- |
| **VSSEAMT *q, r*** | $ | *Voltage Support Service Energy Amount per QSE per Resource*—The lost opportunity payment to QSE *q* for ERCOT-directed VSS from Resource r for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| RTMG *q, r* | MWh | *Real-Time Metered Generation per QSE per Resource*—The Real-Time metered generation of Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| RTSPP *p* | $/MWh | *Real-Time Settlement Point Price*—The Real-Time Settlement Point Price at the Resource Node for the 15-minute Settlement Interval. |
| RTVSSAIEC *q, r* | $/MWh | *Real-Time Average Incremental Energy Cost per QSE per Resource*—The average incremental cost to operate (not subject to cost cap) the Generation Resource *r* represented by QSE *q* from its LSL to its metered MW output, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource. |
| RTICHSL *q, r* | $ | *Real-Time Incremental Cost Corresponding with HSL per QSE per Resource*—The incremental cost to operate (not subject to cost cap) Generation Resource *r* represented by QSE *q* from its LSL to its HSL, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource. |
| RTHSLAIEC *q, r* | $/MWh | *Real-Time Average Incremental Energy Cost for the entire Energy Offer Curve through the HSL per QSE per Resource—*The average incremental cost to operate (not subject to cost cap) the Generation Resource *r* represented by QSE *q* from its LSL to its HSL, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource. |
| |  |  |  |  | | --- | --- | --- | --- | | [NPRR971: Replace the variables “RTVSSAIEC q, r”, “RTICHSL q, r”, “RTHSLAIEC q, r” above with the following upon system implementation:]   |  |  |  | | --- | --- | --- | | RTEOCOST *q, r, i* | $/MWh | Real-Time Energy Offer Curve Cost - The Energy Offer Curve Cost for Resource *r* represented by QSE *q*, for the Resource’s generation above the LSL for the Settlement Interval *i*. See Section 4.4.9.3.3, Energy Offer Curve Costs. Where for an ESR, RTEOCOST shall be set to zero. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. | | | | |
| NETVSSA *q, r* | MWh | *Net VSS Activity*—The sum of the total energy metered by the Settlement Meter which measures ESR load and the RTMG, for Resource *r* represented by the QSE *q* for the 15-minute Settlement Interval. |
| RTMC *q, r* | MWh | *Real-Time Metered Consumption per QSE per Resource* —The total energy metered by the Settlement Meter which measures ESR load for Resource *r* represented by the QSE *q* for the 15-minute Settlement Interval. |
| MEBL *q, r, b* | MWh | *Metered Energy for Wholesale Storage Load at bus*⎯The WSL energy metered by the Settlement Meter which measures WSL for the 15-minute Settlement Interval represented as a negative value, for the QSE *q*, Resource *r*, at bus *b*. |
| MEBR *q, r, b* | MWh | *Metered Energy for Energy Storage Resource load at Bus* - The energy metered by the Settlement Meter which measures ESR load that is not WSL for the 15-minute Settlement Interval represented as a negative value, for the QSE *q*, Resource *r*, at bus *b*. |
| HSL *q, r* | MW | *High Sustained Limit per QSE per Settlement Point per Resource*—The HSL of Resource *r* represented by QSE *q* at Resource Node p for the hour that includes the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource. |
| LSL *q, r* | MW | *Low Sustained Limit per QSE per Settlement Point per Resource*—The LSL of Resource *r* represented by QSE *q* at Resource Node p for the hour that includes the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource or ESR. |
| *p* | none | A Resource Node Settlement Point. |
| *b* | none | An Electrical Bus. |

(5) The total of the payments to each QSE for ERCOT-directed power reduction to provide VSS for a given 15-minute Settlement Interval is calculated as follows:

**VSSEAMTQSETOT *q* =** **VSSEAMT *q, r***

The above variables are defined as follows:

| Variable | **Unit** | **Definition** |
| --- | --- | --- |
| **VSSEAMTQSETOT *q*** | $ | *Voltage Support Service Lost Opportunity Amount QSE Total per QSE*⎯The total of the lost opportunity payments to QSE *q* for providing VSS for providing ERCOT-directed VSS for the 15-minute Settlement Interval. |
| VSSEAMT *q, r* | $ | *Voltage Support Service Energy Amount per QSE per Settlement Point per Resource*—The lost opportunity payment to QSE *q* for ERCOT-directed VSS from Resource *r* for the 15-minute Settlement Interval for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource or ESR. |

**7.9.1.3 Minimum and Maximum Resource Prices**

(1) For purposes of Section 7.9.1, Day-Ahead CRR Payments and Charges, Settlements data published to the MIS Secure Area shall include the association of the Resource Category for each Generation Resource and Energy Storage Resource (ESR). The following prices specified in paragraphs (2) and (3) below are used in the CRR hedge value calculation for CRRs settled in the DAM.

(2) Minimum Resource Prices of source Settlement Points are:

**MINRESPR** *j* **= Min ( MINRESRPR** *j, r* **)** *r*

Where:

Minimum Resource Prices for Resources located at source Settlement Points (**MINRESRPR** *j, r*) are:

(a) Nuclear = -$20.00/MWh;

(b) Hydro = -$20.00/MWh;

(c) Coal and Lignite = $0.00/MWh;

(d) Combined Cycle greater than 90 MW = Fuel Index Price (FIP) \* 5 MMBtu/MWh;

(e) Combined Cycle less than or equal to 90 MW = FIP \* 6 MMBtu/MWh;

(f) Gas -Steam Supercritical Boiler = FIP \* 6.5 MMBtu/MWh;

(g) Gas Steam Reheat Boiler = FIP \* 7.5 MMBtu/MWh;

(h) Gas Steam Non-Reheat or Boiler without Air-Preheater = FIP \* 10.5 MMBtu/MWh;

(i) Simple Cycle greater than 90 MW = FIP \* 10 MMBtu/MWh;

(j) Simple Cycle less than or equal to 90 MW = FIP \* 11 MMBtu/MWh;

(k) Diesel = FIP \* 12 MMBtu/MWh;

(l) Wind = -$35/MWh;

(m) PhotoVoltaic (PV) = -$10;

(n) Reliability Must-Run (RMR) Resource = RMR contract price Energy Offer Curve at Low Sustained Limit (LSL);

(o) ESR = -$20/MWh; and

(p) Other = -$20/MWh.

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| MINRESPR *j* | $/MWh | *Minimum Resource Price for source*—The lowest Minimum Resource Price for the Resources located at the source Settlement Point *j*. |
| MINRESRPR *j* | $/MWh | *Minimum Resource Price for Resource*—The Minimum Resource Price for the Resources located at the source Settlement Point *j*. |
| *r* | none | A Generation Resource or ESR located at the source Settlement Point *j*. |
| *j* | none | A source Settlement Point. |

(3) Maximum Resource Prices of sink Settlement Points are:

**MAXRESPR** *k* **= Max (MAXRESRPR** *k, r* **)** *r*

Where:

Maximum Resource Prices for Resources located at sink Settlement Points **(MAXRESRPR** *k, r* **)** are:

(a) Nuclear = $15.00/MWh;

(b) Hydro = $10.00/MWh;

(c) Coal and Lignite = $18.00/MWh;

(d) Combined Cycle greater than 90 MW = FIP \* 9 MMBtu/MWh;

(e) Combined Cycle less than or equal to 90 MW = FIP \* 10 MMBtu/MWh;

(f) Gas -Steam Supercritical Boiler = FIP \* 10.5 MMBtu/MWh;

(g) Gas Steam Reheat Boiler = FIP \* 11.5 MMBtu/MWh;

(h) Gas Steam Non-Reheat or Boiler without Air-Preheater = FIP \* 14.5 MMBtu/MWh;

(i) Simple Cycle greater than 90 MW = FIP \* 14 MMBtu/MWh;

(j) Simple Cycle less than or equal to 90 MW = FIP \* 15 MMBtu/MWh;

(k) Diesel = FIP \* 16 MMBtu/MWh;

(l) Wind = $0/MWh;

(m) PV = $0/MWh;

(n) RMR Resource = RMR contract price Energy Offer Curve at HSL;

(o) ESR = $100/MWh; and

(p) Other = $100/MWh.

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| MAXRESPR *k* | $/MWh | *Maximum Resource Price for source*—The highest Maximum Resource Price for the Resources located at the sink Settlement Point *k*. |
| MAXRESRPR *k* | $/MWh | *Maximum Resource Price for Resource*—The Maximum Resource Price for the Resources located at the sink Settlement Point *k*. |
| *r* | none | A Generation Resource or ESR located at the sink Settlement Point *k*. |
| *k* | none | A sink Settlement Point. |

**8.1.1.2.1.1 Regulation Service Qualification**

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

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

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

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

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

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

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

(c) ERCOT shall measure and record the average real power output for each minute of the Resource(s) being tested represented by the QSE.

(i) During at least one five minute duration interval selected to evaluate each of the Reg-Up and Reg-Down amounts being tested, the Generation/Controllable Load Resource Energy Deployment Performance (GREDP/CLREDP) calculated in accordance with Section 8.1.1.4.1, Regulation Service and Generation Resource/Controllable Load Resource Energy Deployment Performance, over the entire five minute interval must be less than or equal to 3.5%.

(ii) Additionally, in all other test sequence intervals, the Resource’s measured GREDP/CLREDP must be less than or equal to 5% as calculated for the entire duration of each test interval.

(iii) During at least one five-minute duration interval selected to evaluate each of the Reg-Up and Reg-Down amounts being tested, the Energy Storage Resource Energy Deployment Performance (ESREDP) calculated in accordance with Section 8.1.1.4.1, Regulation Service and Generation Resource/Controllable Load Resource Energy Deployment Performance, over the entire five minute interval must be less than or equal to 3.0%.

(iv) For an Energy Storage Resource (ESR), in all other test sequence intervals, the Resource’s measured ESREDP must be less than or equal to 3.0% as calculated for the entire duration of each test interval.

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

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

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

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

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

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

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

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

**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) Load Resources controlled by high-set under-frequency relays;

(c) Hydro RRS; or

(d) Controllable Load Resources.

(2) The amount of RRS provided by individual Generation Resources and Controllable Load Resources is specified in the Operating Guides. Each Resource providing RRS must be On-Line and capable of ramping the Resource’s Ancillary Service Resources Responsibility for RRS within ten minutes of the notice to deploy RRS, must be immediately responsive to system frequency, 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 QSE’s Load Resource must be loaded and capable of unloading the scheduled amount of RRS within ten minutes of instruction by ERCOT and must either be immediately responsive to system frequency or be interrupted by action of under-frequency relays with settings as specified by the Operating Guides.

(4) Any QSE providing RRS shall provide communications equipment to 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.

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| ***[NPRR863: Replace Section 8.1.1.2.1.2 above with the following upon system implementation:]***  **8.1.1.2.1.2 Responsive Reserve Qualification**  (1) RRS may be provided by:  (a) On-Line Generation Resource capacity;  (b) Resources capable of providing FFR;  (c) Generation Resources operating in the synchronous condenser fast-response mode;  (d) Load Resources controlled by high-set under-frequency relays; and  (e) Energy Storage Resources (ESRs).  (2) The amount of RRS provided by individual Generation Resources or ESRs is limited by the ERCOT-calculated maximum MW amount of RRS for the Generation Resource or ESR subject to its verified droop performance as described in the Nodal Operating Guide. The default value for any newly qualified Generation Resource or ESR shall be 20% of its HSL. A Private Use Network with a registered Resource may use the gross HSL for qualification and establishing a limit on the amount of RRS capacity that the Resource within the Private Use Network can provide.  (3) Any QSE providing RRS shall provide communications equipment to provide ERCOT with telemetry for the output of the Resource.  (4) Resources capable of FFR providing RRS 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 RRS must meet additional technical requirements specified in this Section.  (6) Generation Resources providing RRS shall have their Governors in service.  (7) Generation Resources and Resources capable of FFR providing RRS shall have a Governor droop setting that is no greater than 5.0%.  (8) Resources may be provisionally qualified by ERCOT to provide RRS for 90 days. Within the 90-day provisional window, a Resource must successfully complete one of the Governor tests identified in the Nodal Operating Guide Section 8, Attachment C, Turbine Governor Speed Tests, before being declared fully qualified to provide RRS. |

**8.1.1.4.1 Regulation Service and Generation Resource/Controllable Load Resource Energy Deployment Performance**

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| [NPRR963: Replace the title for Section 8.1.1.4.1 above with the following upon system implementation:]  **8.1.1.4.1 Regulation Service and Generation Resource/Controllable Load Resource/Energy Storage Resource Energy Deployment Performance** |

(1) ERCOT shall limit the deployment of Regulation Service of each QSE for each LFC cycle equal to 125% of the total amount of Regulation Service in the ERCOT System divided by the number of control cycles in five minutes.

(2) For those Resources that do not have a Resource Status of ONDSR or ONDSRREG or Intermittent Renewable Resource (IRR) Groups with no member IRR having a status of ONDSR or ONDSRREG, ERCOT shall compute the GREDP for each Generation Resource that is On-Line and released to SCED Base Point Dispatch Instructions. The GREDP is calculated for each five-minute clock interval as a percentage and in MWs for those Resources with a Resource Status that is not ONDSR or ONDSRREG as follows:

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| --- |
| [NPRR963: Replace paragraph (2) above with the following upon system implementation:]  (2) For those Resources that do not have a Resource Status of ONDSR or ONDSRREG and are not part of an ESR, or Intermittent Renewable Resource (IRR) Groups with no member IRR having a status of ONDSR or ONDSRREG, ERCOT shall compute the GREDP for each Generation Resource that is On-Line and released to SCED Base Point Dispatch Instructions. The GREDP is calculated for each five-minute clock interval as a percentage and in MWs for those Resources with a Resource Status that is not ONDSR or ONDSRREG as follows: |

**GREDP (%) = ABS[((ATG – AEPFR)/(ABP + ARI)) – 1.0] \* 100**

**GREDP (MW) = ABS(ATG – AEPFR – ABP - ARI)**

Where:

ATG = Average Telemetered Generation = the average telemetered generation of the Generation Resource or for the aggregate of the IRRs within a IRR Group for the five-minute clock interval

ARI = Average Regulation Instruction = the amount of regulation that the Generation Resource or IRR Group should have produced based on the LFC deployment signals, calculated by LFC, during each five-minute clock interval

∆frequency is actual frequency minus 60 Hz

EPFR = Estimated Primary Frequency Response (MW) = if │∆frequency│≤ Governor Dead-Band then EPFR = zero, if not then if ∆frequency > zero, EPFR = (∆frequency - Governor Dead-Band)/((droop value \* 60) – Governor Dead-Band) \* HSL \* -1, if not then if ∆frequency < zero, EPFR = (∆frequency + Governor Dead-Band)/((droop value \* 60) – Governor Dead-Band) \* HSL \* -1

AEPFR = Average Estimated Primary Frequency Response = the Estimated Primary Frequency Response (MW) will be calculated every four seconds using a Resource specific droop value where 5% droop = 0.05 the Governor Dead-Band (Hz) and Resource HSL (MW) provided by the Resource Entity, and the frequency deviation (Hz) from 60 Hz and averaged for the five-minute clock interval. For Combined Cycle Generation Resources, or Generation Resources that have been approved to telemeter Non-Frequency Responsive Capacity (NFRC), the HSL will be reduced by the telemetered NFRC MW to calculate the EPFR. For Combined Cycle Generation Resources, 5.78% Governor droop shall be used. The Resource-specific calculations will be aggregated for IRR Groups.

ABP = Average Base Point = the time-weighted average of a linearly ramped Base Point or sum of Base Points for IRR Groups, for the five-minute clock interval. 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 period. 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). In the event that the SCED Base Point is received after the five-minute ramp period, the linearly ramped Base Point will continue at a constant value equal to the ending four-second value of the five-minute ramp.

(3) For all of a QSE’s Resources that have a Resource Status of ONDSR or ONDSRREG (“Dynamically Scheduled Resource (DSR) Portfolio”), ERCOT shall calculate an aggregate GREDP as a percentage and in MWs for those Resources as follows:

**GREDP (%) = ABS[(∑*DSR* ATG – ∑*DSR*DBPOS + Intra-QSE Purchase – Intra-QSE Sale – ARRDDSRLR – ANSDDSRLR – ∑*DSR* AEPFR) / (ATDSRL + ∑*DSR* ARI) – 1.0] \* 100**

**GREDP (MW) = ABS(∑*DSR*ATG – ∑*DSR* DBPOS – ATDSRL– ARRDDSRLR – ANSDDSRLR + Intra-QSE Purchase - Intra-QSE Sale – ∑*DSR* AEPFR – ∑*DSR*ARI)**

Where:

∑*DSR* ATG = Sum of Average Telemetered Generation for all Resources with a Resource Status of ONDSR or ONDSRREG of the QSE for the five-minute clock interval

∑*DSR*ARI = Sum of Average Regulation Instruction for all Resources with a Resource Status of ONDSR or ONDSRREG of the QSE for the five-minute clock interval

ATDSRL = Average Telemetered DSR Load = the average telemetered DSR Load for the QSE for the five-minute clock interval

Intra-QSE Purchase = Energy Trade where the QSE is both the buyer and seller with the flag set to “Purchase”

Intra-QSE Sale = Energy Trade where the QSE is both the buyer and seller with the flag set to “Sale”

∑*DSR*AEPFR = Sum of Average Estimated Primary Frequency Response for all Resources with a Resource Status of ONDSR or ONDSRREG of the QSE for the five-minute clock interval

∑*DSR*DBPOS = Sum of the difference between a linearly ramped Base Point minus Output Schedule for all Resources with a Resource Status of ONDSR or ONDSRREG of the QSE for the five-minute clock interval. 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 period

ARRDDSRLR = Average Responsive Reserve Deployment DSR Load Resource = the average RRS energy deployment for the five-minute clock interval from Load Resources that are part of the DSR Load

ANSDDSRLR = Average Non-Spin Deployment DSR Load Resource = the average Non-Spin energy deployment for the five-minute clock interval from Load Resources that are part of the DSR Load

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| ***[NPRR863: Replace paragraph (3) above with the following upon system implementation:]***  (3) For all of a QSE’s Resources that have a Resource Status of ONDSR or ONDSRREG (“Dynamically Scheduled Resource (DSR) Portfolio”), ERCOT shall calculate an aggregate GREDP as a percentage and in MWs for those Resources as follows:  **GREDP (%) = ABS[(∑*DSR* ATG – ∑*DSR*DBPOS + Intra-QSE Purchase – Intra-QSE Sale – ARRDDSRLR - AECRDDSRLR – ANSDDSRLR – ∑*DSR* AEPFR) / (ATDSRL + ∑*DSR* ARI) – 1.0] \* 100**  **GREDP (MW) = ABS(∑*DSR*ATG – ∑*DSR* DBPOS – ATDSRL– ARRDDSRLR - AECRDDSRLR – ANSDDSRLR + Intra-QSE Purchase - Intra-QSE Sale – ∑*DSR* AEPFR – ∑*DSR*ARI)**  Where:  ∑*DSR* ATG = Sum of Average Telemetered Generation for all Resources with a Resource Status of ONDSR or ONDSRREG of the QSE for the five-minute clock interval  ∑*DSR*ARI = Sum of Average Regulation Instruction for all Resources with a Resource Status of ONDSR or ONDSRREG of the QSE for the five-minute clock interval  ATDSRL = Average Telemetered DSR Load = the average telemetered DSR Load for the QSE for the five-minute clock interval  Intra-QSE Purchase = Energy Trade where the QSE is both the buyer and seller with the flag set to “Purchase”  Intra-QSE Sale = Energy Trade where the QSE is both the buyer and seller with the flag set to “Sale”  ∑*DSR*AEPFR = Sum of Average Estimated Primary Frequency Response for all Resources with a Resource Status of ONDSR or ONDSRREG of the QSE for the five-minute clock interval  ∑*DSR*DBPOS = Sum of the difference between a linearly ramped Base Point minus Output Schedule for all Resources with a Resource Status of ONDSR or ONDSRREG of the QSE for the five-minute clock interval. 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 period  ARRDDSRLR = Average Responsive Reserve Deployment DSR Load Resource = the average RRS energy deployment for the five-minute clock interval from Load Resources that are part of the DSR Load  AECRDDSRLR = Average ERCOT Contingency Response Deployment DSR Load Resource = the average ECRS energy deployment for the five-minute clock interval from Load Resources that are part of the DSR Load  ANSDDSRLR = Average Non-Spin Deployment DSR Load Resource = the average Non-Spin energy deployment for the five-minute clock interval from Load Resources that are part of the DSR Load |

(4) For Controllable Load Resources that have a Resource Status of ONRGL or ONCLR, ERCOT shall compute the CLREDP. The CLREDP will be calculated both as a percentage and in MWs as follows:

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| [NPRR963: Replace paragraph (4) above with the following upon system implementation:]  (4) For Controllable Load Resources that have a Resource Status of ONRGL or ONCLR and are not part of an ESR, ERCOT shall compute the CLREDP. The CLREDP will be calculated both as a percentage and in MWs as follows: |

**CLREDP (%) = ABS[((ATPC + AEPFR)/(ABP – ARI)) – 1.0] \* 100**

**CLREDP (MW) = ABS(ATPC – (ABP – AEPFR – ARI))**

Where:

ATPC = Average Telemetered Power Consumption = the average telemetered power consumption of the Controllable Load Resource for the five-minute clock interval

ARI = Average Regulation Instruction = the amount of regulation that the Controllable Load Resource should have produced based on the LFC deployment signals, calculated by LFC, during each five-minute clock interval. Reg-Up is considered a positive value for this calculation

AEPFR = Average Estimated Primary Frequency Response = the Estimated Primary Frequency Response (MW) will be calculated every four seconds using a Resource specific droop value where 5% droop = 0.05, the Governor Dead-Band (Hz) and Resource HSL (MW) provided by the Resource Entity, and the frequency deviation (Hz) from 60 Hz and averaged for the five-minute clock interval

ABP = Average Base Point = the time-weighted average of a linearly ramped Base Point for the five-minute clock interval. 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 period. 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 EMS. In the event that the SCED Base Point is received after the five minute ramp period, the linearly ramped Base Point will continue at a constant value equal to the ending four second value of the five-minute ramp.

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| [NPRR963: Insert paragraph (5) below upon system implementation and renumber accordingly:]  (5) ERCOT shall compute the ESREDP for ESRs. The ESREDP is calculated for each five-minute clock interval as a percentage and in MWs as follows:  **ESREDP (%) = ABS[((ATPF – AEPFR)/(ASP)) – 1.0] \* 100**  **ESREDP (MW) = ABS(ATPF – AEPFR – ASP)**  Where:  ATPF = Average Telemetered Power Flow = the average telemetered power flow of the Energy Storage Resource for the five-minute clock interval.  ASP = Average Set Point = the time-weighted average of UDSP, for the five-minute clock interval.  ∆frequency is actual frequency minus 60 Hz.  EPFR = Estimated Primary Frequency Response (MW) = If │∆frequency│≤ Governor Dead-Band then EPFR = zero, if not then if ∆frequency > zero, EPFR = (∆frequency - Governor Dead-Band)/((droop value \* 60) – Governor Dead-Band) \* ABS(HSL-LSL) \* -1, if not then if ∆frequency < zero, EPFR = (∆frequency + Governor Dead-Band)/((droop value \* 60) – Governor Dead-Band) \* ABS(HSL-LSL) \* -1.  AEPFR = Average Estimated Primary Frequency Response = the Estimated Primary Frequency Response (MW) will be calculated every four seconds using a Resource-specific droop value where 5% droop = 0.05, the Governor Dead-Band (Hz), Resource LSL (MW) and Resource HSL (MW) provided by the Resource Entity, and the frequency deviation (Hz) from 60 Hz and averaged for the five-minute clock interval. |

(5) ERCOT shall post to the MIS Certified Area for each QSE and for all Generation Resources or Wind-powered Generation Resource (WGR) Groups that are not part of a DSR Portfolio, for the DSR Portfolios, and for all Controllable Load Resources:

(a) The percentage of the monthly five-minute clock intervals during which the Generation Resource or IRR Group was On-Line and released to SCED Base Point Dispatch Instructions;

(b) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR;

(c) The percentage of the monthly five-minute clock intervals during which the Generation Resource, IRR or Controllable Load Resource was providing Regulation Service;

(d) The percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group, or the DSR Portfolio was released to SCED that the GREDP was less than 2.5% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group, or the DSR Portfolio was released to SCED that the GREDP was less than 2.5 MW;

(e) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was less than 2.5% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was less than 2.5 MW;

(f) The percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group, or the DSR Portfolio was released to SCED that the GREDP was equal to or greater than 2.5% and equal to or less than 5.0% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group, or the DSR Portfolio was released to SCED that the GREDP was equal to or greater than 2.5 MW and equal to or less than 5.0 MW;

(g) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was equal to or greater than 2.5% and equal to or less than 5.0% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was equal to or greater than 2.5 MW and equal to or less than 5.0 MW;

(h) The percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group, or the DSR Portfolio was released to SCED that the GREDP was greater than 5.0% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group, or the DSR Portfolio was released to SCED that the GREDP was greater than 5.0 MW;

(i) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was greater than 5.0% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was greater than 5.0 MW;

(j) The percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was less than 2.5% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was less than 2.5 MW;

(k) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was less than 2.5% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was less than 2.5 MW;

(l) The percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was equal to or greater than 2.5% and equal to or less than 5.0% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was equal to or greater than 2.5 MW and equal to or less than 5.0 MW;

(m) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was equal to or greater than 2.5% and equal to or less than 5.0% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was equal to or greater than 2.5 MW and equal to or less than 5.0 MW;

(n) The percent of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was greater than 5.0% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was greater than 5.0 MW; and

(o) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was greater than 5.0% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was greater than 5.0 MW.

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| [NPRR963: Replace paragraph (5) above with the following upon system implementation:]  (5) ERCOT shall post to the MIS Certified Area for each QSE and for all Generation Resources, ESRs, or Wind-powered Generation Resource (WGR) Groups that are not part of a DSR Portfolio, for the DSR Portfolios, and for all Controllable Load Resources:  (a) The percentage of the monthly five-minute clock intervals during which the Generation Resource or IRR Group was On-Line and released to SCED Base Point Dispatch Instructions;  (b) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR;  (c) The percentage of the monthly five-minute clock intervals during which the ESR was On-Line;  (d) The percentage of the monthly five-minute clock intervals during which the Generation Resource, IRR, ESR, or Controllable Load Resource was providing Regulation Service;  (e) The percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group, or the DSR Portfolio was released to SCED that the GREDP was less than 2.5% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group, or the DSR Portfolio was released to SCED that the GREDP was less than 2.5 MW;  (f) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was less than 2.5% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was less than 2.5 MW;  (g) The percentage of the monthly five-minute clock intervals during which the ESR was released to SCED that the ESREDP was less than 2.5% and the percentage of the monthly five-minute clock intervals during which the ESR was released to SCED that the ESREDP was less than 2.5 MW;  (h) The percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group, or the DSR Portfolio was released to SCED that the GREDP was equal to or greater than 2.5% and equal to or less than 5.0% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group or the DSR Portfolio was released to SCED that the GREDP was equal to or greater than 2.5 MW and equal to or less than 5.0 MW;  (i) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was equal to or greater than 2.5% and equal to or less than 5.0% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was equal to or greater than 2.5 MW and equal to or less than 5.0 MW;  (j) The percentage of the monthly five-minute clock intervals during which the ESR was released to SCED that the ESREDP was equal to or greater than 2.5% and equal to or less than 5.0% and the percentage of the monthly five-minute clock intervals during which the ESR was released to SCED that the ESREDP was equal to or greater than 2.5 MW and equal to or less than 5.0 MW;  (k) The percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group, or the DSR Portfolio was released to SCED that the GREDP was greater than 5.0% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR Group or the DSR Portfolio was released to SCED that the GREDP was greater than 5.0 MW;  (l) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was greater than 5.0% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource had a Resource Status of either ONRGL or ONCLR that the CLREDP was greater than 5.0 MW;  (m) The percentage of the monthly five-minute clock intervals during which the ESR was released to SCED that the ESREDP was greater than 5.0% and the percentage of the monthly five-minute clock intervals during which the ESR was released to SCED that the ESREDP was greater than 5.0 MW;  (n) The percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was less than 2.5% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was less than 2.5 MW;  (o) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was less than 2.5% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was less than 2.5 MW;  (p) The percentage of the monthly five-minute clock intervals during which the ESR was providing Regulation Service that the ESREDP was less than 2.5% and the percentage of the monthly five-minute clock intervals during which the ESR was providing Regulation Service that the ESREDP was less than 2.5 MW;  (q) The percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was equal to or greater than 2.5% and equal to or less than 5.0% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was equal to or greater than 2.5 MW and equal to or less than 5.0 MW;  (r) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was equal to or greater than 2.5% and equal to or less than 5.0% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was equal to or greater than 2.5 MW and equal to or less than 5.0 MW;  (s) The percentage of the monthly five-minute clock intervals during which the ESR was providing Regulation Service that the ESREDP was equal to or greater than 2.5% and equal to or less than 5.0% and the percentage of the monthly five-minute clock intervals during which the ESR was providing Regulation Service that the ESREDP was equal to or greater than 2.5 MW and equal to or less than 5.0 MW;  (t) The percent of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was greater than 5.0% and the percentage of the monthly five-minute clock intervals during which the Generation Resource, the IRR, or the DSR Portfolio was providing Regulation Service that the GREDP was greater than 5.0 MW;  (u) The percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was greater than 5.0% and the percentage of the monthly five-minute clock intervals during which the Controllable Load Resource was providing Regulation Service that the CLREDP was greater than 5.0 MW; and  (v) The percent of the monthly five-minute clock intervals during which the ESR was providing Regulation Service that the ESREDP was greater than 5.0% and the percentage of the monthly five-minute clock intervals during which the ESR was providing Regulation Service that the ESREDP was greater than 5.0 MW. |

(6) ERCOT shall calculate the GREDP/CLREDP under normal operating conditions. ERCOT shall not consider five-minute clock intervals during which any of the following events has occurred:

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| [NPRR963: Replace paragraph (6) above with the following upon system implementation:]  (6) ERCOT shall calculate the GREDP/CLREDP/ESREDP under normal operating conditions. ERCOT shall not consider five-minute clock intervals during which any of the following events has occurred: |

(a) The five-minute intervals within the 20-minute period following an event in which ERCOT has experienced a Forced Outage causing an ERCOT frequency deviation of greater than 0.05 Hz;

(b) Five-minute clock intervals in which ERCOT has issued Emergency Base Points to the QSE;

(c) The five-minute clock interval following the Forced Outage of any Resource within the QSE’s DSR Portfolio that has a Resource Status of ONDSR or ONDSRREG;

(d) The five-minute clock intervals following a documented Forced Derate or Startup Loading Failure of a Generation Resource or any member IRR of an IRR Group. Upon request of the reliability monitor, the QSE shall provide the following documentation regarding each Forced Derate or Startup Loading Failure:

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| [NPRR963: Replace paragraph (d) above with the following upon system implementation:]  (d) The five-minute clock intervals following a documented Forced Derate or Startup Loading Failure of a Generation Resource, ESR, or any member IRR of an IRR Group. Upon request of the reliability monitor, the QSE shall provide the following documentation regarding each Forced Derate or Startup Loading Failure: |

(i) Its generation log documenting the Forced Outage, Forced Derate or Startup Loading Failure;

(ii) QSE (COP) for the intervals prior to, and after the event; and

(iii) Equipment failure documentation which may include, but not be limited to, Generation Availability Data System (GADS) reports, plant operator logs, work orders, or other applicable information;

(e) The five-minute clock intervals where the telemetered Resource Status is set to ONTEST such as intervals during Ancillary Service Qualification and Testing as outlined in Section 8.1.1.1, Ancillary Service Qualification and Testing, or the five-minute clock intervals during general capacity testing requirements as outlined in Section 8.1.1.2, General Capacity Testing Requirements;

(f) The five-minute clock intervals where the telemetered Resource Status is set to STARTUP;

(g) The five-minute clock intervals where a Generation Resource’s ABP is below the average telemetered LSL;

(h) Certain other periods of abnormal operations as determined by ERCOT in its sole discretion; and

(i) For a Controllable Load Resource, the five-minute clock intervals in which the computed Base Points are equal to the snapshot of its telemetered power consumption.

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| [NPRR965: Insert paragraph (j) below upon system implementation:]  (j) For QSGRs, the five-minute clock intervals in which the QSGR has a telemetered status of SHUTDOWN or telemeters an LSL of zero pursuant to Section 3.8.3.1, Quick Start Generation Resource Decommitment Decision Process. |

(7) All Generation Resources that are not part of a DSR Portfolio, excluding IRRs, and all DSR Portfolios shall meet the following GREDP criteria for each month. ERCOT will report non-compliance of the following performance criteria to the reliability monitor:

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| [NPRR963: Replace paragraph (7) above with the following upon system implementation:]  (7) All Generation Resources that are not part of an ESR or DSR Portfolio, excluding IRRs, and all DSR Portfolios shall meet the following GREDP criteria for each month. ERCOT will report non-compliance of the following performance criteria to the reliability monitor: |

(a) A Generation Resource or DSR Portfolio, excluding an IRR, must have a GREDP less than the greater of X% or Y MW for 85% of the five-minute clock intervals in the month during which GREDP was calculated.

(b) If at the end of the month during which GREDP was calculated a DSR Portfolio has a GREDP less than X% or Y MW for 85% of the five-minute clock intervals, the reliability monitor shall, at the request of the QSE with the DSR Portfolio, recalculate GREDP excluding the five-minute clock intervals following the Forced Outage of any Resource within the QSE’s DSR Portfolio that has a Resource Status of ONDSR or ONDSRREG continuing until the start of the next Operating Hour for which the QSE is able to adjust. If the Forced Outage of the Resource occurs within ten minutes of the start of the next Operating Hour, then the reliability monitor shall not consider any of the five-minute intervals between the time of the Forced Outage and continuing until the start of the second Operating Hour for which the QSE is able to adjust. The requesting QSE shall provide to the reliability monitor information validating the Forced Outage including the time of the occurrence of the Forced Outage and documentation of the last submitted COP status prior to the Forced Outage of the Resource for the intervals in dispute.

(c) Additionally, all Generation Resources that are not part of a DSR Portfolio, excluding IRRs, and all DSR Portfolios will also be measured for performance specifically during intervals in which ERCOT has declared EEA Level 1 or greater. These Resources must meet the following GREDP criteria for the time window that includes all five-minute clock intervals during which EEA was declared. ERCOT will report non-compliance of the following performance criteria to the reliability monitor:

(i) A Generation Resource or DSR Portfolio, excluding an IRR, must have a GREDP less than the greater of X% or Y MW. A Generation Resource or DSR Portfolio cannot fail this criteria more than three five-minute clock intervals during which EEA was declared and GREDP was calculated. The performance will be measured separately for each instance in which ERCOT has declared EEA.

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| [NPRR963: Replace paragraph (c) above with the following upon system implementation:]  (c) Additionally, all Generation Resources that are not part of an ESR or DSR Portfolio, excluding IRRs, and all DSR Portfolios will also be measured for performance specifically during intervals in which ERCOT has declared EEA Level 1 or greater. These Resources must meet the following GREDP criteria for the time window that includes all five-minute clock intervals during which EEA was declared. ERCOT will report non-compliance of the following performance criteria to the reliability monitor:  (i) A Generation Resource or DSR Portfolio, excluding an IRR or Generation Resource part of an ESR, must have a GREDP less than the greater of X% or Y MW. A Generation Resource or DSR Portfolio cannot fail this criteria more than three five-minute clock intervals during which EEA was declared and GREDP was calculated. The performance will be measured separately for each instance in which ERCOT has declared EEA. |

(8) All IRRs and IRR Groups shall meet the following GREDP criteria for each month. ERCOT will report non-compliance of the following performance criteria to the reliability monitor:

(a) An IRR or IRR Group must have a GREDP less than Z% or the ATG must be less than the expected MW output for 95% of the five-minute clock intervals in the month when the Resource or a member IRR of an IRR Group received a Base Point Dispatch Instruction in which the Base Point was two MW or more below the IRR’s HSL used by SCED. The expected MW output includes the Resource’s Base Point, Regulation Service instructions, and any expected Primary Frequency Response.

(b) Additionally, all IRRs and IRR Groups will also be measured for performance specifically during intervals in which ERCOT has declared EEA Level 1 or greater. These Resources and IRR Groups must meet the following GREDP criteria for the time window that includes all five-minute clock intervals during which EEA was declared. ERCOT will report non-compliance of the following performance criteria to the reliability monitor:

(i) An IRR or IRR Group must have a GREDP less than Z% or the ATG must be less than the expected MW output. An IRR or IRR Group cannot fail this criteria more than three five-minute clock intervals during which EEA was declared and the Resource or a member of an IRR Group received a Base Point Dispatch Instruction in which the Base Point was two MW or more below the IRR’s HSL used by SCED. The performance will be measured separately for each instance in which ERCOT has declared EEA.

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| ***[NPRR879: Replace paragraph (8) above with the following upon system implementation:]***  (8) All IRRs and IRR Groups shall meet the following GREDP criteria for each month. ERCOT will report non-compliance of the following performance criteria to the reliability monitor:  (a) An IRR or IRR Group must have a GREDP less than Z% or the ATG must be less than the expected MW output for 95% of the five-minute clock intervals in the month when the Resource or a member IRR of an IRR Group was not carrying an Ancillary Service Resource Responsibility and received a Base Point Dispatch Instruction in which the Base Point was two MW or more below the IRR’s HSL used by SCED. The expected MW output includes the Resource’s Base Point, Regulation Service instructions, and any expected Primary Frequency Response.  (b) An IRR or IRR Group must have a GREDP less than the greater of X% or Y MW for 85% of the five-minute clock intervals in the month during which the Resource or a member IRR of an IRR Group was carrying an Ancillary Service Resource Responsibility.  (c) Additionally, all IRRs and IRR Groups will also be measured for performance specifically during intervals in which ERCOT has declared EEA Level 1 or greater. These Resources and IRR Groups must meet the following GREDP criteria for the time window that includes all five-minute clock intervals during which EEA was declared. ERCOT will report non-compliance of the following performance criteria to the reliability monitor:  (i) An IRR or IRR Group must have a GREDP less than Z% or the ATG must be less than the expected MW output. An IRR or IRR Group cannot fail this criteria more than three five-minute clock intervals during which EEA was declared and the Resource or a member of an IRR Group was not carrying an Ancillary Service Resource Responsibility and received a Base Point Dispatch Instruction in which the Base Point was two MW or more below the IRR’s HSL used by SCED. The performance will be measured separately for each instance in which ERCOT has declared EEA.  (ii) An IRR or IRR Group must have a GREDP less than the greater of X% or Y MW when the Resource or a member IRR of an IRR Group was carrying an Ancillary Service Resource Responsibility. An IRR or IRR Group cannot fail this criteria more than three five-minute clock intervals during which EEA was declared. The performance will be measured separately for each instance in which ERCOT has declared EEA. |

(9) All Controllable Load Resources shall meet the following CLREDP criteria each month. ERCOT will report non-compliance of the following performance criteria to the reliability monitor:

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| [NPRR963: Replace paragraph (9) above with the following upon system implementation:]  (9) All Controllable Load Resources that are not part of an ESR shall meet the following CLREDP criteria each month. ERCOT will report non-compliance of the following performance criteria to the reliability monitor: |

(a) A Controllable Load Resource must have a CLREDP less than the greater of X% or Y MW for 85% of the five-minute clock intervals in the month during which CLREDP was calculated.

(b) Additionally, all Controllable Load Resources will also be measured for performance specifically during intervals in which ERCOT has declared EEA Level 1 or greater. These Resources must meet the following CLREDP criteria for the time window that includes all five-minute clock intervals during which EEA was declared. ERCOT will report non-compliance of the following Performance criteria to the reliability monitor:

(i) A Controllable Load Resource must have a CLREDP less than the greater of X% or Y MW. A Controllable Load Resource cannot fail this criteria more than three five-minute clock intervals during which EEA was declared and CLREDP was calculated. The performance will be measured separately for each instance in which ERCOT has declared EEA.

(c) For Controllable Load Resources which are providing RRS or Non-Spin, the following intervals will be excluded from these calculations:

(i) Five-minute clock intervals which begin ten minutes or less after a deployment of RRS was deployed to the Resource;

(ii) Five-minute clock intervals which begin ten minutes or less after a recall of RRS when the Resource was deployed for RRS;

(iii) Five-minute clock intervals which begin 30 minutes or less after a deployment of Non-Spin was deployed to the Resource; and

(iv) Five-minute clock intervals which begin 30 minutes or less after a recall of Non-Spin when the Resource was deployed for Non-Spin.

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| ***[NPRR863: Replace paragraph (c) above with the following upon system implementation:]***  (c) For Controllable Load Resources which are providing RRS, ECRS, or Non-Spin, the following intervals will be excluded from these calculations:  (i) Five-minute clock intervals which begin ten minutes or less after a deployment of RRS or ECRS was deployed to the Resource;  (ii) Five-minute clock intervals which begin ten minutes or less after a recall of RRS or ECRS when the Resource was deployed for RRS or ECRS;  (iii) Five-minute clock intervals which begin 30 minutes or less after a deployment of Non-Spin was deployed to the Resource; and  (iv) Five-minute clock intervals which begin 30 minutes or less after a recall of Non-Spin when the Resource was deployed for Non-Spin. |

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| [NPRR963: Insert paragraph (11) below upon system implementation and renumber accordingly:]  (11) All ESRs shall meet the following ESREDP criteria each month. ERCOT will report non-compliance of the following performance criteria to the Reliability Monitor:  (a) An ESR must have an ESREDP less than the greater of V% or W MW for 85% of the five-minute clock intervals in the month during which ESREDP was calculated.  (b) Additionally, all ESRs will also be measured for performance specifically during intervals in which ERCOT has declared EEA Level 1 or greater. These Resources must meet the following ESREDP criteria for the time window that includes all five-minute clock intervals during which EEA was declared. ERCOT will report non-compliance of the following performance criteria to the Reliability Monitor:  (i) An ESR must have an ESREDP less than the greater of V% or W MW. An ESR cannot fail this criteria more than three five-minute clock intervals during which EEA was declared and ESREDP was calculated. The performance will be measured separately for each instance in which ERCOT has declared EEA. |

(10) The GREDP/CLREDP performance criteria in paragraphs (7) through (9) above shall be subject to review and approval by TAC. The GREDP/CLREDP performance criteria variables X, Y, and Z shall be posted to the MIS Public Area no later than three Business Days after TAC approval.

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| [NPRR963: Replace paragraph (10) above with the following upon system implementation:]  (10) The GREDP/CLREDP/ESREDP performance criteria in paragraphs (8) through (11) above shall be subject to review and approval by TAC. The GREDP/CLREDP/ESREDP performance criteria variables V, W, X, Y, and Z shall be posted to the MIS Public Area no later than three Business Days after TAC approval. |

(11) If at the end of the month during which GREDP was calculated, a non-DSR Resource or a QSE with DSR Resources, has a GREDP less than X% or Y MW for 85% of the five-minute clock intervals, the reliability monitor shall, at the request of the QSE, recalculate GREDP excluding the five-minute clock intervals when a Resource is deployed above the unit’s ramp rate due to ramp rate sharing between energy and Regulation Service, as described in Section 6.5.7.2, Resource Limit Calculator. The requesting QSE shall provide to the reliability monitor information validating the ramp rate violation for the intervals in dispute.