|  |  |  |  |
| --- | --- | --- | --- |
| NPRR Number | [987](http://www.ercot.com/mktrules/issues/NPRR987) | NPRR Title | BESTF-3 Energy Storage Resource Contribution to Physical Responsive Capability and Real-Time On-Line Reserve Capacity Calculations |
| Date of Decision | | May 15, 2020 | |
| Action | | Recommended Approval | |
| Timeline | | Urgent | |
| Proposed Effective Date | | Upon system implementation | |
| Priority and Rank Assigned | | Priority – 2020; Rank – 3010 | |
| Nodal Protocol Sections Requiring Revision | | 6.5.7.5, Ancillary Services Capacity Monitor  6.7.5, Real-Time Ancillary Service Imbalance Payment or Charge | |
| Related Documents Requiring Revision/Related Revision Requests | | Other Binding Document Revision Request (OBDRR) 017, Related to NPRR987, BESTF-3 Energy Storage Resource Contribution to Physical Responsive Capability and Real-Time On-Line Reserve Capacity Calculations | |
| Revision Description | | This Nodal Protocol Revision Request (NPRR) implements Battery Energy Storage Task Force (BESTF) Key Topics and Concepts (KTCs) #2, which received consensus support at BESTF and was approved by TAC at its November 20, 2019, meeting. This NPRR implements the inclusion of the contribution of Energy Storage Resources (ESRs) to Physical Responsive Capability (PRC) and the Real-Time On-Line Reserve Capacity (RTOLCAP) in the Ancillary Service Imbalance Calculation, as follows:   * Revision to Section 6.5.7.5 establishes the ESR contribution to PRC; and * Revision to Section 6.7.5 exclude ESRs from payments or charges related to Ancillary Service imbalance.   The PRC-related changes are applicable during both the current “combo model” era for ESRs (where ESRs are modeled as a combination Generation Resource and Controllable Load Resource) and the future “single model” era which is projected for implementation in 2024. The RTOLCAP-related changes are applicable only during the current “combo model” era and are not required following the implementation of Real-Time Co-optimization of Energy and Ancillary Services, also scheduled for 2024. ERCOT will remove the RTOLCAP as a part of implementation of Real-Time Co-optimization. | |
| Reason for Revision | | Addresses current operational issues.  Meets Strategic goals (tied to the [ERCOT Strategic Plan](http://www.ercot.com/content/news/presentations/2013/ERCOT%20Strat%20Plan%20FINAL%20112213.pdf) or directed by the ERCOT Board).  Market efficiencies or enhancements  Administrative  Regulatory requirements  Other: (explain)  *(please select all that apply)* | |
| Business Case | | The Protocols need to be revised to ensure appropriate treatment of ESR capacity in the calculation of PRC and the RTOLCAP. | |
| Credit Work Group Review | | ERCOT Credit Staff and the Credit Work Group (Credit WG) have reviewed NPRR987 and do not believe that it requires changes to credit monitoring activity or the calculation of liability. | |
| PRS Decision | | On 1/16/20, PRS unanimously voted to table NPRR987 and refer the issue to ROS and WMS. All Market Segments were present for the vote.  On 4/20/20, PRS unanimously voted via email to recommend approval of NPRR987 as amended by the 2/21/20 ERCOT comments. All Market Segments participated in the email vote.  On 5/15/20, PRS unanimously voted via email to grant NPRR987 Urgent status and to endorse and forward to TAC the 4/20/20 PRS Report and Impact Analysis for NPRR987 with a recommended priority of 2020 and rank of 3010. All Market Segments participated in the email vote. | |
| Summary of PRS Discussion | | On 1/16/20, there was no discussion.  On 4/20/20, there was no discussion.  On 5/15/20, there was no discussion. | |

|  |  |
| --- | --- |
| Sponsor | |
| Name | Sandip Sharma / Austin Rosel |
| E-mail Address | [Sandip.Sharma@ercot.com](mailto:Sandip.Sharma@ercot.com) / [Austin.Rosel@ercot.com](mailto:Austin.Rosel@ercot.com) |
| Company | ERCOT |
| Phone Number | 512-248-4298 / 512-248-6686 |
| Cell Number |  |
| Market Segment | Not applicable |

|  |  |
| --- | --- |
| **Market Rules Staff Contact** | |
| **Name** | Cory Phillips |
| **E-Mail Address** | [Cory.Phillips@ercot.com](mailto:Cory.Phillips@ercot.com) |
| **Phone Number** | 512-248-6464 |

|  |  |
| --- | --- |
| **Comments Received** | |
| Comment Author | **Comment Summary** |
| ERCOT 013120 | Corrected a formula issue within paragraph (7) of Section 6.7.5 |
| WMS 020620 | Requested PRS continue to table NPRR987 for further review by the Wholesale Market Working Group (WMWG) |
| ROS 020620 | Requested PRS continue to table NPRR987 for further review by the Performance, Disturbance, Compliance Working Group (PDCWG) |
| ERCOT 022120 | Proposed additional edits within the calculation of PRC along with minor language revisions |
| WMS 030920 | Endorsed NPRR987 as amended by the 2/21/20 ERCOT comments |
| ROS 031020 | Endorsed NPRR987 as amended by the 2/21/20 ERCOT comments |

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

Please note the baseline Protocol language in the following sections has been updated to reflect the incorporation of the following NPRRs into the Protocols:

* NPRR863, Creation of ERCOT Contingency Reserve Service and Revisions to Responsive Reserve (partially unboxed 2/7/20 and 3/1/20)
  + Section 6.5.7.5

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

* NPRR1006, Update Real-Time On-Line Reliability Deployment Price Adder Inputs to Match Actual Data
  + Section 6.7.5
* NPRR1010, RTC – NP 6: Adjustment Period and Real-Time Operations
  + Section 6.5.7.5
  + Section 6.7.5
* NPRR1014, BESTF-4 Energy Storage Resource Single Model
  + Section 6.5.7.5

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

**6.5.7.5 Ancillary Services Capacity Monitor**

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

(a) RRS capacity from:

(i) Generation Resources;

(ii) Load Resources excluding Controllable Load Resources;

(iii) Controllable Load Resources; and

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

(b) Ancillary Service Resource Responsibility for RRS from:

(i) Generation Resources;

(ii) Load Resources excluding Controllable Load Resources;

(iii) Controllable Load Resources; and

(iv) Resources capable of FFR;

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

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

(d) Non-Spin available from:

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

(ii) Undeployed Load Resources;

(iii) Off-Line Generation Resources; and

(iv) Resources with Output Schedules;

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

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

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

(iii) Load Resources;

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

(v) QSGRs;

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

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

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

(i) Available capacity:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

****

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

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

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

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





***WGRs***

***online***

***All***

***WGR***

***online***

***i***

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

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

****

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

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

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





***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

|  |
| --- |
| ***[NPRR863: Replace the formula “PRC4“ above with the following upon system implementation:]***      ***resources***  ***load***  ***online***  ***All***  ***resource***  ***load***  ***online***  ***i***  **PRC4 = (Min(Max((Actual Net Telemetered Consumption – LPC), 0.0), ECRS and RRS Ancillary Service Resource 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** |

**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***





***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

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





***resources***

***FFR***

***online***

***All***

***resource***

***FFR***

***online***

***i***

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

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





***ESR***

***online***

***All***

***ESR***

***online***

***i***

**Excludes ESR capacity used to provide FFR**

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

The above variables are defined as follows:

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

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

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

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

***6.7.5 Real-Time Ancillary Service Imbalance Payment or Charge***

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

(2) The payment or charge to each QSE for Ancillary Service imbalance is calculated based on the price calculation set forth in paragraph (12) of Section 6.5.7.3, Security Constrained Economic Dispatch, and applied to the following amounts for each QSE:

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

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

|  |
| --- |
| ***[NPRR863: Replace paragraph (b) above with the following upon system implementation:]***  (b) The amount of On-Line capacity based on the telemetered High Sustained Limit (HSL) for all On-Line Generation Resources and ESRs, the telemetered consumption from Load Resources with a validated Ancillary Service Schedule for ECRS or RRS controlled by high-set under-frequency relay, and the capacity from Controllable Load Resources available to SCED, including capacity from modeled Controllable Load Resources associated with ESRs; |

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

|  |
| --- |
| ***[NPRR863: Replace paragraph (c) above with the following upon system implementation:]***  (c) The amount of Ancillary Service Resource Responsibility for Reg-Up, ECRS, RRS and Non-Spin for all Generation Resources, ESRs, and Load Resources represented by the QSE for the 15-minute Settlement Interval. |

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

(a) Nuclear Resources;

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

(c) Resources with a telemetered net real power (in MW) less than 95% of their telemetered Low Sustained Limit (LSL) excluding the following:

(i) Resources telemetering both STARTUP Resource Status and greater than zero Non-Spin Ancillary Service Responsibility; or

(ii) Energy Storage Resources (ESRs).

(4) Reliability Must-Run (RMR) Units and Reliability Unit Commitment (RUC) Resources On-Line during the hour due to an ERCOT instruction, except for any RUC Resource committed by a RUC Dispatch Instruction where that Resource’s QSE subsequently opted out of RUC Settlement pursuant to paragraph (12) of Section 5.5.2, Reliability Unit Commitment (RUC) Process, those RUC Resources that had a Three-Part Supply Offer cleared in the DAM for the hour, 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 Energy Emergency Alert (EEA) condition, will be excluded from the amounts calculated for the 15-minute Settlement Interval pursuant to paragraphs (2)(a), (b), and (c) above.

|  |
| --- |
| ***[NPRR884 and NPRR885: Replace applicable portions of paragraph (4) above with the following upon system implementation:]***  (4) Reliability Must-Run (RMR) Units, and Must-Run Alternatives (MRAs), and Reliability Unit Commitment (RUC) Resources On-Line during the hour due to an ERCOT instruction, except for any RUC Resource committed by a RUC Dispatch Instruction where that Resource’s QSE subsequently opted out of RUC Settlement pursuant to paragraph (12) of Section 5.5.2, Reliability Unit Commitment (RUC) Process, those RUC Resources that had a Three-Part Supply Offer cleared in the DAM for the hour, 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 Energy Emergency Alert (EEA) condition, and any Combined Cycle Generation Resource that was RUC-committed from one On-Line configuration to a different configuration with additional capacity, as described in paragraph (3) of Section 5.5.2, will be excluded from the amounts calculated for the 15-minute Settlement Interval pursuant to paragraphs (2)(a), (b), and (c) above. |

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

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

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

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

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

Where:

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

Where:

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

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

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

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

|  |
| --- |
| ***[NPRR863: Replace the formula “RTRMRRESP q” above with the following upon system implementation:]***  RTRMRRESP *q* = SYS\_GEN\_DISCFACTOR \* (HRRADJ *q, r, p* + HECRADJ *q, r, p* + HRUADJ *q, r, p* + HNSADJ *q, r, p*) \* ¼ |

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

Where:

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

|  |
| --- |
| ***[NPRR863: Replace the formula “RTNCLRCAP q” above with the following upon system implementation:]***  RTNCLRCAP *q* = Min(Max(RTNCLRNPC *q* – RTNCLRLPC *q*, 0.0), (RTNCLRECRS *q +* RTNCLRRRS *q*) \* 1.5) |

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

|  |
| --- |
| ***[NPRR863: Insert the formula “RTNCLRECRS q” below upon system implementation:]***  RTNCLRECRS *q =* SYS\_GEN\_DISCFACTOR \*  RTNCLRECRSR *q, r, p* |

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

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

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

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

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

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

Where for a Controllable Load Resource other than a modeled Controllable Load Resource associated with an Energy Storage Resource (ESR):

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

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

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

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

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

Where:

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

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

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

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

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

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

Where for an ESR:

RTESRCAP *q* = ( RTESRCAPR *q, g, p*)

Where:

RTESRCAPR *q, g, p* *=* Min[(RTOLHSLRA *q, r, p* – RTMGA *q, r, p* + RTCLRNPCR *q, r, p*),(RTCLRNPCR *q, r, p* + SOCT *q, r* – SOCOM *q, r*)]

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| RTASIAMT *q* | $ | *Real-Time Ancillary Service Imbalance Amount*—The total payment or charge to QSE *q* for the Real-Time Ancillary Service imbalance associated with Operating Reserve Demand Curve (ORDC) for each 15-minute Settlement Interval. |
| RTRDASIAMT *q* | $ | *Real-Time Reliability Deployment Ancillary Service Imbalance Amount*—The total payment or charge to QSE *q* for the Real-Time Ancillary Service imbalance associated with Reliability Deployments for each 15-minute Settlement Interval. |
| RTASOLIMB *q* | MWh | *Real Time Ancillary Service On-Line Reserve Imbalance for the QSE* ⎯The Real-Time Ancillary Service On-Line reserve imbalance for the QSE *q*, for each 15-minute Settlement Interval. |
| RTORPA*y* | $/MWh | *Real-Time On-Line Reserve Price Adder per interval*⎯The Real-Time Price Adder for On-Line Reserves for the SCED interval *y*. |
| RTOFFPA *y* | $/MWh | *Real-Time Off-Line Reserve Price Adder per interval*⎯The Real-Time Price Adder for Off-Line Reserves for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the SCED interval *y*. |
| RTRDP | $/MWh | *Real-Time On-Line Reliability Deployment Price*⎯The Real-Time price for the 15-minute Settlement Interval, reflecting the impact of reliability deployments on energy prices that is calculated from the Real-time On-Line Reliability Deployment Price Adder. |
| RTORDPA*y* | $/MWh | *Real-Time On-Line Reliability Deployment Price Adder*⎯The Real-Time Price Adder that captures the impact of reliability deployments on energy prices for the SCED interval *y*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| RTRSVPOR | $/MWh | *Real-Time Reserve Price for On-Line Reserves*⎯The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval. |
| RTRSVPOFF | $/MWh | *Real-Time Reserve Price for Off-Line Reserves*⎯The Real-Time Reserve Price for Off-Line Reserves for the 15-minute Settlement Interval. |
| RTOLCAP *q* | MWh | *Real-Time On-Line Reserve Capacity for the QSE*⎯The Real-Time reserve capacity of On-Line Resources available for the QSE *q*, for the 15-minute Settlement Interval. |
| RTOLHSLRA *q, r, p* | MWh | *Real-Time Adjusted On-Line High Sustained Limit for the Resource*⎯The Real-Time telemetered HSL for the Resource *r* represented by QSE *q* at Resource Node *p* that is available to SCED, integrated over the 15-minute Settlement Interval, and adjusted pursuant to paragraphs (3) and (4) above. |
| RTOLHSL *q* | MWh | *Real-Time On-Line High Sustained Limit for the QSE*⎯The integrated Real-Time telemetered HSL for all Generation Resources, not including modeled Generation Resources associated with ESRs, available to SCED, pursuant to paragraphs (3) and (4) above, integrated over the 15-minute Settlement Interval for the QSE *q*, discounted by the system-wide discount factor. |
| RTASRESP *q* | MW | *Real-Time Ancillary Service Supply Responsibility for the QSE*⎯The Real-Time Ancillary Service Supply Responsibility for Reg-Up, RRS and Non-Spin pursuant to Section 4.4.7.4, Ancillary Service Supply Responsibility, for all Generation and Load Resources for the QSE *q*, for the 15-minute Settlement Interval.   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time Ancillary Service Supply Responsibility for the QSE*⎯The Real-Time Ancillary Service Supply Responsibility for Reg-Up, ECRS, RRS and Non-Spin pursuant to Section 4.4.7.4, Ancillary Service Supply Responsibility, for all Generation and Load Resources for the QSE *q*, for the 15-minute Settlement Interval. | |
| RTCLRCAP *q* | MWh | *Real-Time Capacity from Controllable Load Resources for the QSE*—The Real-Time capacity and Reg-Up minus Non-Spin available from all Controllable Load Resources, not including modeled Controllable Load Resources associated with ESRs available to SCED for the QSE *q*, integrated over the 15-minute Settlement Interval. |
| RTNCLRCAP ***q*** | MWh | *Real-Time Capacity from Non-Controllable Load Resources carrying Responsive Reserve for the QSE*—The Real-Time capacity for all Load Resources other than Controllable Load Resources that have a validated Real-Time RRS Ancillary Service Schedule for the QSE *q*, integrated over the 15-minute Settlement Interval.   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time Capacity from Non-Controllable Load Resources carrying ERCOT Contingency Reserve or Responsive Reserve for the QSE*—The Real-Time capacity for all Load Resources other than Controllable Load Resources that have a validated Real-Time ECRS or RRS Ancillary Service Schedule for the QSE *q*, integrated over the 15-minute Settlement Interval. | |
| RTNCLRRRS *q* | MWh | *Real-Time Non-Controllable Load Resources Responsive Reserve for the QSE—*The validated Real-Time telemetered RRS Ancillary Service Supply Responsibility for all Load Resources other than Controllable Load Resources for QSE *q* discounted by the system-wide discount factor, integrated over the 15-minute Settlement Interval. |
| RTNCLRRRSR *q, r, p* | MWh | *Real-Time Non-Controllable Load Resource Responsive Reserve—*The validated Real-Time telemetered RRS Ancillary Service Resource Responsibility for the Load Resource *r* (which is not a Controllable Load Resource) represented by QSE *q* at Resource Node *p*, integrated over the 15-minute Settlement Interval. |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | ***[NPRR863: Insert the variables “RTNCLRECRS**q” and “RTNCLRECRSR**q, r, p” below upon system implementation:]***   |  |  |  | | --- | --- | --- | | RTNCLRECRS *q* | MWh | *Real-Time Non-Controllable Load Resources ERCOT Contingency Reserve for the QSE—*The validated Real-Time telemetered ECRS Ancillary Service Supply Responsibility for all Load Resources other than Controllable Load Resources for QSE *q* discounted by the system-wide discount factor, integrated over the 15-minute Settlement Interval. | | RTNCLRECRSR *q, r, p* | MWh | *Real-Time Non-Controllable Load Resource ERCOT Contingency Reserve —*The validated Real-Time telemetered ECRS Ancillary Service Resource Responsibility for the Load Resource *r* (which is not a Controllable Load Resource) represented by QSE *q* at Resource Node *p*, integrated over the 15-minute Settlement Interval. | | | | |
| RTNCLRNPCR *q, r, p* | MWh | *Real-Time Non-Controllable Load Resource Net Power Consumption—*The Real-Time net real power consumption from the Load Resource *r* (which is not a Controllable Load Resource)represented by QSE *q* at Resource Node *p* that has a validated Real-Time RRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval.   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time Non-Controllable Load Resource Net Power Consumption—*The Real-Time net real power consumption from the Load Resource *r* (which is not a Controllable Load Resource)represented by QSE *q* at Resource Node *p* that has a validated Real-Time ECRS or RRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval. | |
| RTNCLRLPCR *q, r, p* | MWh | *Real-Time Non-Controllable Load Resource Low Power Consumption—*The Real-Time Low Power Consumption (LPC) from the Load Resource *r* (which is not a Controllable Load Resource)represented by QSE *q* at Resource Node *p* that has a validated Real-Time RRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval.   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time Non-Controllable Load Resource Low Power Consumption—*The Real-Time Low Power Consumption (LPC) from the Load Resource *r* (which is not a Controllable Load Resource)represented by QSE *q* at Resource Node *p* that has a validated Real-Time ECRS or RRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval | |
| RTNCLRNPC *q* | MWh | *Real-Time Non-Controllable Load Resource Net Power Consumption for the QSE—*The Real-Time net real power consumption from all Load Resources other than Controllable Load Resources for QSE *q* that have a validated Real-Time RRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor.   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time Non-Controllable Load Resource Net Power Consumption for the QSE—*The Real-Time net real power consumption from all Load Resources other than Controllable Load Resources for QSE *q* that have a validated Real-Time ECRS or RRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. | |
| RTNCLRLPC *q* | MWh | *Real-Time Non-Controllable Load Resource Low Power Consumption for the QSE—*The Real-Time LPC from all Load Resources other than Controllable Load Resourcesfor QSE *q* that have a validated Real-Time RRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor.   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time Non-Controllable Load Resource Low Power Consumption for the QSE—*The Real-Time LPC from all Load Resources other than Controllable Load Resourcesfor QSE *q* that have a validated Real-Time ECRS or RRS Ancillary Service Schedule integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. | |
| RTCLRNPCR *q, r, p* | MWh | *Real-Time Net Power Consumption from the Controllable Load Resource—*The Real-Time net real power consumption from the Controllable Load Resource or modeled Controllable Load Resource associated with an ESR, *r* represented by QSE *q* at Resource Node *p* available to SCED integrated over the 15-minute Settlement Interval. |
| RTCLRNPC *q* | MWh | *Real-Time Net Power Consumption from Controllable Load Resources for the QSE*—The Real-Time net real power consumption from all Controllable Load Resources, not including modeled Controllable Load Resources associated with ESRs, available to SCED integrated over the 15-minute Settlement Interval for the QSE *q* discounted by the system-wide discount factor. |
| RTCLRLPCR *q, r, p* | MWh | *Real-Time Low Power Consumption for the Controllable Load Resource—*The Real-Time LPC from the Controllable Load Resource or modeled Controllable Load Resource associated with an ESR, *r* represented by QSE *q* at Resource Node *p* available to SCED integrated over the 15-minute Settlement Interval. |
| RTCLRLPC *q* | MWh | *Real-Time Low Power Consumption from Controllable Load Resources for the QSE*—The Real-Time LPC from Controllable Load Resources, not including modeled Controllable Load Resources associated with ESRs, available to SCED integrated over the 15-minute Settlement Interval for the QSE *q* discounted by the system-wide discount factor. |
| RTCLRREG *q* | MWh | *Real-Time Controllable Load Resources Regulation-Up Schedule for the QSE*—The Real-Time Reg-Up Ancillary Service Schedule from all Controllable Load Resources, not including modeled Controllable Load Resources associated with ESRs, with Primary Frequency Response for the QSE *q*, integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. |
| RTCLRREGR*q, r, p* | MWh | *Real-Time Controllable Load Resource Regulation-Up Schedule for the Resource*—The validated Real-Time Reg-Up Ancillary Service Schedule for the Controllable Load Resource or modeled Controllable Load Resource associated with an ESR, *r* represented by QSE *q* at Resource Node *p* with Primary Frequency Response, integrated over the 15-minute Settlement Interval. |
| RTMGA *q, r, p* | MWh | *Real-Time Adjusted Metered Generation per QSE per Settlement Point per Resource*—The adjusted metered generation, pursuant to paragraphs (3) and (4) above, of Generation Resource *r* represented by QSE *q* at Resource Node *p* in Real-Time for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTMGQ *q* | MWh | *Real-Time Metered Generation per QSE*—The metered generation, discounted by the system-wide discount factor, of all Generation Resources, not including modeled Generation Resources associated with ESRs, represented by QSE *q* in Real-Time for the 15-minute Settlement Interval, pursuant to paragraphs (3) and (4) above. |
| RTESRCAPR *q, g, p* | MWh | *Real-Time Capacity from an Energy Storage Resource* –Capacity provided by an ESR *g*, represented by QSE *q* at Resource Node *p,* which considers energy limitations of the ESR and potentially higher contribution when charging for the15-minute Settlement Interval*.* |
| RTESRCAP *q* | MWh | *Real-Time Capacity from Energy Storage Resources per QSE –* Capacity provided by all ESRs, represented by QSE *q*, for the 15-minute Settlement Interval. |
| SOCT *q, r* | MWh | *State of Charge Telemetered by an Energy Storage Resource –* The average telemetered state of charge of Resource *r*, represented by QSE *q*, over the 15-minute Settlement Interval. |
| SOCOM *q, r* | MWh | *State of Charge Operating Minimum for an Energy Storage Resource* –The average telemetered state of charge operating minimum of Resource *r*, represented by QSE *q*, over the 15-minute Settlement Interval. |
| RTASOFFIMB *q* | MWh | *Real-Time Ancillary Service Off-Line Reserve Imbalance for the QSE*⎯The Real-Time Ancillary Service Off-Line reserve imbalance for the QSE *q*, for each 15-minute Settlement Interval. |
| RTOFFCAP *q* | MWh | *Real-Time Off-Line Reserve Capacity for the QSE*⎯The Real-Time reserve capacity of Off-Line Resources available for the QSE *q*, for the 15-minute Settlement Interval. |
| RTCST30HSL *q* | MWh | *Real-Time Generation Resources with Cold Start Available in 30 Minutes*⎯The Real-Time telemetered HSLs of Generation Resources, excluding Intermittent Renewable Resources (IRRs), that have telemetered an OFF Resource Status and can be started from a cold temperature state in 30 minutes for the QSE *q*, time-weighted over the 15-minute Settlement Interval. |
| RTOFFNSHSL *q* | MWh | *Real-Time Generation Resources with Off-Line Non-Spin Schedule*⎯The Real-Time telemetered HSLs of Generation Resources that have telemetered an OFFNS Resource Status for the QSE *q*, time-weighted over the 15-minute Settlement Interval. |
| RTASOFFR *q, r, p* | MWh | *Real-Time Ancillary Service Schedule for the Off-Line Generation Resource*⎯The validated Real-Time telemetered Ancillary Service Schedule for the Off-Line Generation Resource *r* represented by QSE *q* at Resource Node *p*, integrated over the 15-minute Settlement Interval. |
| RTASOFF *q* | MWh | *Real-Time Ancillary Service Schedule for Off-Line Generation Resources for the QSE*⎯The Real-Time telemetered Ancillary Service Schedule for all Off-Line Generation Resources discounted by the system-wide discount factor for the QSE *q*, integrated over the 15-minute Settlement Interval. |
| HRRADJ *q, r, p* | MW | *Ancillary Service Resource Responsibility Capacity for Responsive Reserve at Adjustment Period—*The RRS Ancillary Service Resource Responsibility for the Resource *r* represented by QSE *q* at Resource Node *p* as seen in the last Current Operating Plan (COP) and Trades Snapshot at the end of the Adjustment Period, for the hour that includes the 15-minute Settlement Interval. |
| |  |  |  |  | | --- | --- | --- | --- | | ***[NPRR863: Insert the variable “HECRADJ q, r, p” below upon system implementation:]***   |  |  |  | | --- | --- | --- | | HECRADJ *q, r, p* | MW | *Ancillary Service Resource Responsibility Capacity for ERCOT Contingency Reserve Service at Adjustment Period—*The ECRS Ancillary Service Resource Responsibility for the Resource *r* represented by QSE *q* at Resource Node *p* as seen in the last Current Operating Plan (COP) and Trades Snapshot at the end of the Adjustment Period, for the hour that includes the 15-minute Settlement Interval. | | | | |
| HRUADJ *q, r, p* | MW | *Ancillary Service Resource Responsibility Capacity for Reg-Up at Adjustment Period—*The Regulation Up Ancillary Service Resource Responsibility for the Resource *r* represented by QSE *q* at Resource Node *p* as seen in the last COP and Trades Snapshot at the end of the Adjustment Period, for the hour that includes the 15-minute Settlement Interval. |
| HNSADJ *q, r, p* | MW | *Ancillary Service Resource Responsibility Capacity for Non-Spin at Adjustment Period—*The Non-Spin Ancillary Service Resource Responsibility for the Resource *r* represented by QSE *q* at Resource Node *p* as seen in the last COP and Trades Snapshot at the end of the Adjustment Period, for the hour that includes the 15-minute Settlement Interval. |
| RTRUCNBBRESP *q* | MWh | *Real-Time RUC Ancillary Service Supply Responsibility for the QSE in Non-Buy-Back hours*⎯The Real-Time Ancillary Service Supply Responsibility for Reg-Up, RRS and Non-Spin pursuant to the Ancillary Service awards, for the 15-minute Settlement Interval that falls within a RUC-Committed Hour, discounted by the system-wide discount factor for the QSE *q.*   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time RUC Ancillary Service Supply Responsibility for the QSE in Non-Buy-Back hours*⎯The Real-Time Ancillary Service Supply Responsibility for Reg-Up, ECRS, RRS, and Non-Spin pursuant to the Ancillary Service awards, for the 15-minute Settlement Interval that falls within a RUC-Committed Hour, discounted by the system-wide discount factor for the QSE *q.* | |
| RTRUCASA *q, r* | MW | *Real-Time RUC Ancillary Service Awards*⎯The Real-Time Ancillary Service award to the RUC Resource *r* for Reg-Up, RRS, and Non-Spin for the hour that includes the 15-minute Settlement Interval that falls within a RUC-Committed Hour for the QSE *q.*   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time RUC Ancillary Service Awards*⎯The Real-Time Ancillary Service award to the RUC Resource *r* for Reg-Up, ECRS, RRS, and Non-Spin for the hour that includes the 15-minute Settlement Interval that falls within a RUC-Committed Hour for the QSE *q.* | |
| RTCLRNSRESP *q* | MWh | *Real-Time Controllable Load Resource Non-Spin Responsibility for the QSE*⎯The Real Time telemetered Non-Spin Ancillary Service Supply Responsibility for all Controllable Load Resources available to SCED discounted by the system-wide discount factor for the QSE *q*, integrated over the 15-minute Settlement Interval. |
| RTCLRNSRESPR *q, r, p* | MWh | *Real-Time Controllable Load Resource Non-Spin Responsibility for the Resource*⎯The Real-Time telemetered Non-Spin Ancillary Service Resource Responsibility for the Controllable Load Resource *r* represented by QSE *q* at Resource Node *p* available to SCED, integrated over the 15-minute Settlement Interval. |
| RTRMRRESP *q* | MWh | *Real-Time Ancillary Service Supply Responsibility for RMR Units represented by the QSE*⎯The Real-Time Ancillary Service Supply Responsibility as set forth in the end of the Adjustment Period COP for Reg-Up, RRS, and Non-Spin for all RMR Units discounted by the system-wide discount factor for the QSE *q*, integrated over the 15-minute Settlement Interval.   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time Ancillary Service Supply Responsibility for RMR Units represented by the QSE*⎯The Real-Time Ancillary Service Supply Responsibility as set forth in the end of the Adjustment Period COP for Reg-Up, ECRS, RRS, and Non-Spin for all RMR Units discounted by the system-wide discount factor for the QSE *q*, integrated over the 15-minute Settlement Interval. | |
| RTCLRNSR *q, r, p* | MWh | *Real-Time Non-Spin Schedule for the Controllable Load Resource ⎯*The validated Real Time telemetered Non-Spin Ancillary Service Schedule for the Controllable Load Resourceor modeled Controllable Load Resource associated with an ESR, *r* represented by QSE *q* at Resource Node *p*, integrated over the 15-minute Settlement Interval. |
| RTCLRNS *q* | MWh | *Real-Time Non-Spin Schedule for Controllable Load Resources for the QSE*⎯The Real-Time telemetered Non-Spin Ancillary Service Schedule for all Controllable Load Resources, not including modeled Controllable Load Resources associated with ESRs, for the QSE *q*, integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. |
| SYS\_GEN\_DISCFACTOR | none | *System-Wide Discount Factor* – The system-wide discount factor used to discount inputs used in the calculation of Real-Time Ancillary Services Imbalance payment or charge is calculated as the average of the currently approved Reserve Discount Factors (RDFs) applied to the temperatures from the current Season from the year prior. |
| UGEN *q, r, p* | MWh | *Under Generation Volumes per QSE per Settlement Point per Resource*—The amount under-generated by the Generation Resource *r* represented by QSE *q* at Resource Node *p* for the 15-minute Settlement Interval. |
| UGENA *q, r, p* | MWh | *Adjusted Under Generation Volumes per QSE per Settlement Point per Resource*—The amount under-generated by the Generation Resource *r* represented by QSE *q* at Resource Node *p* for the 15-minute Settlement Interval adjusted pursuant to paragraph (6) above. |
| UPESR *q, r, p* | MWh | *Under-Performance Volumes per QSE per Settlement Point per Resource*—The amount the ESR under-performed divided evenly among the modeled Generation and Controllable Load Resources *r* in the ESR*,* represented by QSE *q* at Resource Node *p,* for the 15-minute Settlement Interval. |
| UPESRA *q, r, p* | MWh | *Adjusted Under-Performance Volumes per QSE per Settlement Point per Resource* — The amount the ESR under-performed divided evenly among the modeled Generation and Controllable Load Resources *r* in the ESR*,* represented by QSE *q* at Resource Node *p,* for the 15-minute Settlement Interval adjusted pursuant to paragraph (6) above. |
| *r* | none | A Generation or Load Resource. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |
| *q* | none | A QSE. |
| *p* | none | A Resource Node Settlement Point. |
| *g* | none | An ESR. |

(8) The payment to each QSE for the Ancillary Service reserves associated with RUC Resources that have received a RUC Dispatch to provide Ancillary Services in which the 15-minute Settlement Interval is part of a RUC Buy-Back Hour based on the RUC opt out provision set forth in paragraph (12) of Section 5.5.2 for a given 15-minute Settlement Interval is calculated as follows:

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

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

Where:

RTRUCRESP *q* =  RTRUCASA *q, r* \* ¼

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| RTRUCRSVAMT*q* | $ | *Real-Time RUC Ancillary Service Reserve Amount*—The total payment |to QSE *q* for the Real-Time RUC Ancillary Service Reserve payment associated with ORDC for each 15-minute Settlement Interval. |
| RTRDRUCRSVAMT *q* | $ | *Real-Time Reliability Deployment RUC Ancillary Service Reserve Amount*—The total payment |to QSE *q* for the Real-Time RUC Ancillary Service Reserve payment associated with reliability deployments for each 15-minute Settlement Interval. |
| RTRUCRESP *q* | MWh | *Real-Time RUC Ancillary Service Supply Responsibility for the QSE*⎯The Real-Time Ancillary Service Supply Responsibility pursuant to the Ancillary Service awards for Reg-Up, RRS, and Non-Spin for all RUC Resources that have opted out per paragraph (12) of Section 5.5.2 for the QSE *q*, for the 15-minute Settlement Interval.   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time RUC Ancillary Service Supply Responsibility for the QSE*⎯The Real-Time Ancillary Service Supply Responsibility pursuant to the Ancillary Service awards for Reg-Up, ECRS, RRS, and Non-Spin for all RUC Resources that have opted out per paragraph (12) of Section 5.5.2 for the QSE *q*, for the 15-minute Settlement Interval. | |
| RTRUCASA *q, r* | MW | *Real-Time RUC Ancillary Service Awards*⎯The Real-Time Ancillary Service award to the RUC Resource *r* for Reg-Up, RRS, and Non-Spin for the 15-minute Settlement Interval that falls within a RUC-Committed Hour for the QSE *q.*   |  | | --- | | ***[NPRR863: Replace the description above with the following upon system implementation:]***  *Real-Time RUC Ancillary Service Awards*⎯The Real-Time Ancillary Service award to the RUC Resource *r* for Reg-Up, ECRS, RRS, and Non-Spin for the 15-minute Settlement Interval that falls within a RUC-Committed Hour for the QSE *q.* | |
| RTRSVPOR | $/MWh | *Real-Time Reserve Price for On-Line Reserves*⎯The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval. |
| RTRDP | $/MWh | *Real-Time On-Line Reliability Deployment Price* ⎯The Real-Time price for the 15-minute Settlement Interval, reflecting the impact of reliability deployments on energy prices that is calculated from the Real-time On-Line Reliability Deployment Price Adder. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |