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| **NPRR Number** | [**1214**](https://www.ercot.com/mktrules/issues/NPRR1214) | **NPRR Title** | **Reliability Deployment Price Adder Fix to Provide Locational Price Signals, Reduce Uplift and Risk** |
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| **Date** | | December XX, 2024 | |
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| **Submitter’s Information** | | | |
| **Name** | |  | |
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| **Cell Number** | |  | |
| **Market Segment** | |  | |

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| **Comments** |

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| **Revised Cover Page Language** |

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| Nodal Protocol Sections Requiring Revision | 3.5.2.1, North 345 kV Hub (North 345)  3.5.2.2, South 345 kV Hub (South 345)  3.5.2.3, Houston 345 kV Hub (Houston 345)  3.5.2.4, West 345 kV Hub (West 345)  3.5.2.5, Panhandle 345 kV Hub (Pan 345)  3.5.2.6, Lower Rio Grande Valley Hub (LRGV 138/345)  3.5.2.7, ERCOT Bus Average 345 kV Hub (ERCOT 345 Bus)  6.5.7.3.1, Determination of Real-Time On-Line Reliability Deployment Price Adder  6.6.1.2, Real-Time Settlement Point Price for a Load Zone  6.6.3.1, Real-Time Energy Imbalance Payment or Charge at a Resource Node  6.6.3.6, Real-Time High Dispatch Limit Override Energy Payment  6.6.3.8, Real-Time Payment or Charge for Energy from a Settlement Only Distribution Generator (SODG) or a Settlement Only Transmission Generator (SOTG)  6.7.5, Real-Time Ancillary Service Imbalance Payment or Charge  6.7.6, Real-Time Ancillary Service Imbalance Revenue Neutrality Allocation  6.9, Reliability Deployment Indifference Payment and Allocation (new)  6.9.1, Reliability Deployment Indifference Payment (new)  6.9.2, Reliability Deployment Indifference Allocation (new) |
| Revision Description | This Nodal Protocol Revision Request (NPRR) revises the Real-Time On-Line Reliability Deployment Price Adder (RTRDPA) to:   * Send appropriate locational price signals to avoid counterproductive Load and Resource responses to RTRDPA price signals under Real-Time Co-Optimization (RTC); * Limit Resource payment to the actual “indifference payment” (consistent with its definition), thereby reducing associated uplift by eliminating future need of RTRDPA payments to Resources that exacerbate constraints and eliminating payments to available capacity not requiring an indifference payment; * Eliminate any future need for Ancillary Service Imbalance Payments or Charges (ASIP/C) type of indifference payment associated with RTRDPA, thereby reducing the risk associated with providing Ancillary Services; * Provide Resources an indifference payment under Real-Time Co-optimization (RTC) to eliminate the potentially large incentive to ignore Base Point instructions that are likely to cause serious reliability issues; and   Provide a stronger locational price signal around Resources committed by the Reliability Unit Commitment (RUC) process or other reliability actions for congestion, thereby reducing RUC Make-Whole Payment-related charges and uplifts and appropriately compensating impacted Qualified Scheduling Entities (QSEs). |
| Justification of Reason for Revision and Market Impacts | This NPRR fixes RTRDPA implementation by making it consistent with the definition of RTRDPA in the Nodal Protocols. RTRDPA is an energy price adder to undo the price-suppressing impact of reliability deployments. The associated indifference payment is supposed to pay Resources to keep them indifferent between being dispatched at the adjusted price that includes the RTRDPA or receiving the indifference payment – thereby eliminating any incentive to chase prices and ignore Base Point instructions.  Unfortunately, the current implementation of RTRDPA treats RTRDPA as an operating reserve-related price adder, effectively making it the same as the Operating Reserve Demand Curve (ORDC) price adder. Its current application is inconsistent with its definition and results in counter-productive outcomes including compensation to capacity exacerbating a constraint and compensation to capacity with Energy Offer Curves above the resulting energy prices after adding the RTRDPA (both part of RTRDPA-related ASIP Settlement). This inconsistent treatment of RTRDPA resulted in an unnecessary ASIP-related uplift to Load and Direct Current Tie (DC Tie) exports of $10 million on a single Operating Day (4/22/2022) and many tens of millions of dollars in ASIC-related charges to Resources providing Ancillary Services deployed during Winter Storm Uri in February 2021. Without the changes in this NPRR making RTRDPA locational, the same issue may arise if the obvious lack of indifference payment under RTC is similarly addressed for post-RTC system-wide RTRDPA.  Drs. Hogan and Pope, in their paper “[Priorities for the Evolution of an Energy-Only Electricity Market Design in ERCOT](https://hepg.hks.harvard.edu/publications/priorities-evolution-energy-only-electricity-market-design-ercot-1)” (2017) pointed out that “The Reliability Deployment Price Adder implemented in August 2014 does not attribute local scarcity value to capacity deployments occurring to relieve local reliability problems” and “It does not confer value to reliability actions causing changes in relative locational prices within ERCOT, as measured by changes in the congestion components of LMPs in different locations. A RUC commitment and other reliability deployments may decrease prices in a local area, due to relieving a transmission constraint, for example, yet have little or no effect on prices outside of this local area, so that the estimated change in the system reference price will often be close to zero.”  This NPRR elegantly addresses this issue using ERCOT systems that are already in use – the RTRDPA Security-Constrained Economic Dispatch (SCED) pricing run.  To appropriately reflect the impact of reliability deployments on energy prices, ERCOT reliability actions taken to address localized issues must, by necessity, be reflected in the appropriate locational RTRDPA. Otherwise, the post-RTC system-wide RTRDPA for a local issue provides inefficient and inappropriate price signals throughout the market. For example, a RUC commitment required in East Texas due to congestion limiting supply from West Texas could result in a high RTRDPA that is added to prices throughout the system, potentially causing thousands of MWs of Large Flexible Loads (LFLs) in West Texas to unnecessarily curtail their consumption in response to this price signal. This counterproductive price response by LFLs would also result in unnecessary curtailment of Wind and Solar generators in West Texas while sending the wrong price signal for investment in West Texas. This is a very inefficient outcome for the market that needs to be addressed urgently due to the dramatic ongoing increase of LFLs in ERCOT. Moreover, locational RTRDPA sends better congestion price signals throughout the system.  Another benefit from more accurate locational RTRDPA will be appropriate compensation for QSEs that are adversely impacted by the reliability action. For example, say a QSE purchases energy in the Day-Ahead Market (DAM) at $100/MWh for a DC Tie export. ERCOT curtails the DC Tie export in real-time for local congestion issues, a reliability action that reduces the Locational Marginal Price (LMP) at the corresponding DC Tie Load Zone to $40/MWh. If the resulting system-wide RTRDPA at that time is $5/MWh, then the QSE whose exports were curtailed lost $55/MWh on energy it purchased in the DAM on top of bilateral losses due to the curtailed export. However, the proposed locational RTRDPA calculated by the RTRDPA SCED pricing run for the DC Tie Load Zone could be $1,000/MWh since exports were curtailed. Then, the QSE receives a net payment of $900/MWh for its DAM purchase that the QSE can use to offset its bilateral losses.  Even though the current RTRDPA implementation pays Resources much more than the amount required as indifference payment through the ASIP, RTC will eliminate the ASIP. Thus, there will be no indifference payment for the RTRDPA under RTC. RTRDPA can be thousands of dollars per MWh during scarcity and thus, absent any indifference payment, Resources will have a strong incentive to generate above their Base Points during scarcity events. This NPRR fixes this misaligned incentive and associated reliability concerns by applying indifference payment once RTC is implemented.  The current 60-minute ramp relaxation in RTRDPA SCED pricing run results in meaningless price adders in many cases. Given the many fast ramp rate Resources, this NPRR changes the ramp relaxation to a realistic value.  Since ERCOT’s current systems already calculate locational RTRDPA, the changes required to implement this NPRR are mostly Settlements-related – making its implementation less challenging than NPRRs that require changes in market systems.  This NPRR addresses all the issues described above by using the locational RTRDPA from the current RTRDPA SCED pricing run, eliminating the need for future ASIC/P-type indifference payment using system-wide RTRDPA, and introducing an indifference payment associated with RTRDPA that is paid to Resources only to the extent required to keep such Resources from chasing prices and ignoring Base Point instructions. |

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| **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:

* NPRR1092, Reduce RUC Offer Floor and Limit RUC Opt-Out Provision (unboxed 1/26/24)
  + Section 6.7.5
* NPRR1131, Controllable Load Resource Participation in Non-Spin (unboxed 8/23/24)
  + Section 6.7.5
* NPRR1149, Implementation of Systematic Ancillary Service Failed Quantity Charges (unboxed 6/28/24)
  + Section 6.7.5

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

* NPRR1188, Implement Nodal Dispatch and Energy Settlement for Controllable Load Resources
  + Section 6.5.7.3.1
* NPRR1235, Dispatchable Reliability Reserve Service as a Stand-Alone Ancillary Service
  + Section 6.5.7.3.1
* NPRR1238, Voluntary Registration of Loads with Curtailable Load Capabilities
  + Section 6.5.7.3.1
* NPRR1245, Additional Clarifying Revisions to Real-Time Co-Optimization
  + Section 6.5.7.3.1
  + Section 6.7.5

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| Revised Proposed Protocol Language |

3.5.2.1 North 345 kV Hub (North 345)

(1) The North 345 kV Hub is composed of the following Hub Buses:

|  | ERCOT Operations | |  |
| --- | --- | --- | --- |
| No. | Hub Bus | kV | Hub |
| 1 | ANASW | 345 | NORTH |
| 2 | CN345 | 345 | NORTH |
| 3 | WLSH | 345 | NORTH |
| 4 | FMRVL | 345 | NORTH |
| 5 | LPCCS | 345 | NORTH |
| 6 | MNSES | 345 | NORTH |
| 7 | PRSSW | 345 | NORTH |
| 8 | SSPSW | 345 | NORTH |
| 9 | VLSES | 345 | NORTH |
| 10 | ALNSW | 345 | NORTH |
| 11 | ALLNC | 345 | NORTH |
| 12 | BNDVS | 345 | NORTH |
| 13 | BNBSW | 345 | NORTH |
| 14 | BBSES | 345 | NORTH |
| 15 | BOSQUESW | 345 | NORTH |
| 16 | CDHSW | 345 | NORTH |
| 17 | CNTRY | 345 | NORTH |
| 18 | CRLNW | 345 | NORTH |
| 19 | CMNSW | 345 | NORTH |
| 20 | CNRSW | 345 | NORTH |
| 21 | CRTLD | 345 | NORTH |
| 22 | DCSES | 345 | NORTH |
| 23 | EMSES | 345 | NORTH |
| 24 | ELKTN | 345 | NORTH |
| 25 | ELMOT | 345 | NORTH |
| 26 | EVRSW | 345 | NORTH |
| 27 | KWASS | 345 | NORTH |
| 28 | FGRSW | 345 | NORTH |
| 29 | FORSW | 345 | NORTH |
| 30 | FRNYPP | 345 | NORTH |
| 31 | GIBCRK | 345 | NORTH |
| 32 | HKBRY | 345 | NORTH |
| 33 | VLYRN | 345 | NORTH |
| 34 | JEWET | 345 | NORTH |
| 35 | KNEDL | 345 | NORTH |
| 36 | KLNSW | 345 | NORTH |
| 37 | LCSES | 345 | NORTH |
| 38 | LIGSW | 345 | NORTH |
| 39 | LEG | 345 | NORTH |
| 40 | LFKSW | 345 | NORTH |
| 41 | LWSSW | 345 | NORTH |
| 42 | MLSES | 345 | NORTH |
| 43 | MCCREE | 345 | NORTH |
| 44 | MDANP | 345 | NORTH |
| 45 | ENTPR | 345 | NORTH |
| 46 | NCDSE | 345 | NORTH |
| 47 | NORSW | 345 | NORTH |
| 48 | NUCOR | 345 | NORTH |
| 49 | PKRSW | 345 | NORTH |
| 50 | KMCHI | 345 | NORTH |
| 51 | PTENN | 345 | NORTH |
| 52 | RENSW | 345 | NORTH |
| 53 | RCHBR | 345 | NORTH |
| 54 | RNKSW | 345 | NORTH |
| 55 | RKCRK | 345 | NORTH |
| 56 | RYSSW | 345 | NORTH |
| 57 | SGVSW | 345 | NORTH |
| 58 | SHBSW | 345 | NORTH |
| 59 | SHRSW | 345 | NORTH |
| 60 | SCSES | 345 | NORTH |
| 61 | SYCRK | 345 | NORTH |
| 62 | THSES | 345 | NORTH |
| 63 | TMPSW | 345 | NORTH |
| 64 | TNP\_ONE | 345 | NORTH |
| 65 | TRCNR | 345 | NORTH |
| 66 | TRSES | 345 | NORTH |
| 67 | TOKSW | 345 | NORTH |
| 68 | VENSW | 345 | NORTH |
| 69 | WLVEE | 345 | NORTH |
| 70 | W\_DENT | 345 | NORTH |
| 71 | WTRML | 345 | NORTH |
| 72 | WCSWS | 345 | NORTH |
| 73 | WEBBS | 345 | NORTH |
| 74 | WHTNY | 345 | NORTH |
| 75 | WCPP | 345 | NORTH |

(2) The North 345 kV Hub Price uses the aggregated Shift Factors of the Hub Buses for each hour of the Settlement Interval of the Day-Ahead Market (DAM) in the Day-Ahead and is the simple average of the time-weighted Hub Bus prices for each 15-minute Settlement Interval in Real-Time, for each Hub Bus included in this Hub.

(3) The Day-Ahead Settlement Point Price of the Hub for a given Operating Hour is calculated as follows:

**DASPP** *North345* **= DASL – (DAHUBSF***North345, c***\* DASP** *c***),**

**if HBBC***North345***≠0**

**DASPP** *North345* **= DASPP** *ERCOT345Bus***, if HBBC***North345***=0**

Where:

DAHUBSF *North345, c =* (HUBDF *hb, North345, c* \* DAHBSF *hb, North345, c*)

DAHBSF *hb, North345, c =* (HBDF *pb, hb, North345, c* \* DASF *pb, hb, North345, c*)

HUBDF *hb, North345, c =* IF(HB*North345, c*=0, 0, 1 **/** HB *North345, c*)

HBDF *pb, hb, North345, c =* IF(PB*hb, North345, c*=0, 0, 1 **/** PB *hb, North345, c*)

The above variables are defined as follows:

| Variable | Unit | Definition |
| --- | --- | --- |
| DASPP *North345* | $/MWh | *Day-Ahead Settlement Point Price*⎯The DAM Settlement Point Price at the Hub, for the hour. |
| DASL | $/MWh | *Day-Ahead System Lambda*⎯The DAM Shadow Price for the system power balance constraint for the hour. |
| DASP *c* | $/MWh | *Day-Ahead Shadow Price for a binding transmission constraint*⎯The DAM Shadow Price for the constraint *c* for the hour. |
| DAHUBSF *North345,c* | none | *Day-Ahead Shift Factor of the Hub ⎯*The DAM aggregated Shift Factor of a Hub for the constraint *c* for the hour. |
| DAHBSF *hb,North345,c* | none | *Day-Ahead Shift Factor of the Hub Bus⎯*The DAM aggregated Shift Factor of a Hub Bus *hb* for the constraint *c* for the hour. |
| DASF *pb,hb,North345,c* | none | *Day-Ahead Shift Factor of the power flow bus⎯*The DAM Shift Factor of a power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| HUBDF *hb, North345,c* | none | *Hub Distribution Factor per Hub Bus in a constraint*⎯The distribution factor of Hub Bus *hb* for the constraint *c* for the hour. |
| HBDF *pb, hb, North345,c* | none | *Hub Bus Distribution Factor per power flow bus of Hub Bus in a constraint*⎯The distribution factor of power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| *pb* | none | An energized power flow bus that is a component of a Hub Bus for the constraint *c*. |
| PB *hb, North345,c* | none | The total number of energized power flow buses in Hub Bus *hb* for the constraint *c*. |
| *hb* | none | A Hub Bus that is a component of the Hub with at least one energized power flow bus for the constraint *c*. |
| HBBC *North345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus in base case. |
| HB *North345,c* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus for the constraint *c*. |
| *c* | none | A DAM binding transmission constraint for the hour caused by either base case or a contingency. |

(4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:

RTSPP *North345* = Max [-$251, (RTRSVPOR + RTRDP +

(HUBDF *hb, North345* \* ((RTHBP *hb, North345, y* \*

TLMP *y*) / (TLMP *y*))))], if HB*North345*≠0

RTSPP North345 = RTSPP ERCOT345Bus, if HB North345=0

Where:

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

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

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

RTHBP *hb, North345, y* = (HBDF *b, hb, North345* \* RTLMP *b, hb, North345, y*)

HUBDF *hb, North345* = IF(HB*North345*=0, 0, 1 **/** HB *North345*)

HBDF *b, hb, North345* = IF(B*hb, North345*=0, 0, 1 **/** B *hb, North345*)

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| RTSPP *North345* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub, for the 15-minute Settlement Interval. |
| RTHBP *hb, North345, y* | $/MWh | *Real-Time Hub Bus Price at Hub Bus per Security-Constrained Economic Dispatch* (*SCED) interval*⎯The Real-Time energy price at Hub Bus *hb* for 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 price adder for On-Line Reserves 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 are 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, hb, North345, y* | $/MWh | *Real-Time Locational Marginal Price at Electrical Bus of Hub Bus per interval*⎯The Real-Time LMP at Electrical Bus *b* that is a component of Hub Bus *hb*, for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval |
| HUBDF *hb, North345* | none | *Hub Distribution Factor per Hub Bus*⎯The distribution factor of Hub Bus *hb*. |
| HBDF *b, hb, North345* | none | *Hub Bus Distribution Factor per Electrical Bus of Hub Bus*⎯The distribution factor of Electrical Bus *b* that is a component of Hub Bus *hb*. |
| *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 energized Electrical Bus that is a component of a Hub Bus. |
| B *hb, North345* | none | The total number of energized Electrical Buses in Hub Bus *hb*. |
| *hb* | none | A Hub Bus that is a component of the Hub. |
| HB*North345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR1007 and NPRR1057: Replace applicable portions of paragraph (4) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1057:]***  (4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:  **RTSPP***North345* **= Max [-$251, (LRTRDP** *North345***+**  **(HUBLMP** *North345, y* **\* RNWF** *y***))]**  Where:  LRTRDP*p* = (RNWF *y* \* RTRDPA *p,* *y*)  RNWF *y* = TLMP *y* / TLMP *y*  The above variables are defined as follows:   |  |  |  | | --- | --- | --- | | **Variable** | **Unit** | **Description** | | RTSPP *North345* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub, for the 15-minute Settlement Interval. | | LRTRDP*p* | $/MWh | *Locational Real-Time Reliability Deployment Price for Energy* ⎯The Real-Time price for the 15-minute Settlement Interval at Settlement Point *p*, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | RTRDPA *p,* *y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy* ⎯The Real-Time Price Adder that captures the impact of reliability deployments on energy prices at Settlement Point *p*, 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. | | HUBLMP*North345, y* | $/MWh | *Hub Locational Marginal Price*⎯The Hub LMP for the Hub for the SCED Interval *y*. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval | | *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. | | *p* | none | A Settlement Point | |

3.5.2.2 South 345 kV Hub (South 345)

(1) The South 345 kV Hub is composed of the following Hub Buses:

|  | ERCOT Operations | |  |
| --- | --- | --- | --- |
| No. | Hub Bus | kV | Hub |
| 1 | AUSTRO | 345 | SOUTH |
| 2 | BLESSING | 345 | SOUTH |
| 3 | CAGNON | 345 | SOUTH |
| 4 | COLETO | 345 | SOUTH |
| 5 | CLEASP | 345 | SOUTH |
| 6 | NEDIN | 345 | SOUTH |
| 7 | FAYETT | 345 | SOUTH |
| 8 | FPPYD1 | 345 | SOUTH |
| 9 | FPPYD2 | 345 | SOUTH |
| 10 | GARFIE | 345 | SOUTH |
| 11 | GUADG | 345 | SOUTH |
| 12 | HAYSEN | 345 | SOUTH |
| 13 | HILLCTRY | 345 | SOUTH |
| 14 | HOLMAN | 345 | SOUTH |
| 15 | KENDAL | 345 | SOUTH |
| 16 | LA\_PALMA | 345 | SOUTH |
| 17 | LON\_HILL | 345 | SOUTH |
| 18 | LOSTPI | 345 | SOUTH |
| 19 | LYTTON\_S | 345 | SOUTH |
| 20 | MARION | 345 | SOUTH |
| 21 | PAWNEE | 345 | SOUTH |
| 22 | RIOHONDO | 345 | SOUTH |
| 23 | RIONOG | 345 | SOUTH |
| 24 | SALEM | 345 | SOUTH |
| 25 | SANMIGL | 345 | SOUTH |
| 26 | SKYLINE | 345 | SOUTH |
| 27 | STP | 345 | SOUTH |
| 28 | CALAVERS | 345 | SOUTH |
| 29 | BRAUNIG | 345 | SOUTH |
| 30 | WHITE\_PT | 345 | SOUTH |
| 31 | ZORN | 345 | SOUTH |

(2) The South 345 kV Hub Price uses the aggregated Shift Factors of the Hub Buses for each hour of the Settlement Interval of the DAM in the Day-Ahead and is the simple average of the time-weighted Hub Bus prices for each 15-minute Settlement Interval in Real-Time, for each Hub Bus included in this Hub.

(3) The Day-Ahead Settlement Point Price of the Hub for a given Operating Hour is calculated as follows:

**DASPP** *South345* **= DASL – (DAHUBSF***South345, c***\* DASP** *c***),**

**if HBBC***South345***≠0**

**DASPP** *South345* **= DASPP** *ERCOT345Bus***, if HBBC***South345***=0**

Where:

DAHUBSF *South345, c =* (HUBDF *hb, South345, c* \* DAHBSF *hb, South345, c*)

DAHBSF *hb, South345, c =* (HBDF *pb, hb, South345, c* \* DASF *pb, hb, South345, c*)

HUBDF *hb, South345, c =* IF(HB*South345, c*=0, 0, 1 **/** HB *South345, c*)

HBDF *pb, hb, South345, c =* IF(PB*hb, South345, c*=0, 0, 1 **/** PB *hb, South345, c*)

The above variables are defined as follows:

| Variable | Unit | Definition |
| --- | --- | --- |
| DASPP *South345* | $/MWh | *Day-Ahead Settlement Point Price*⎯The DAM Settlement Point Price at the Hub, for the hour. |
| DASL | $/MWh | *Day-Ahead System Lambda*⎯The DAM Shadow Price for the system power balance constraint for the hour. |
| DASP *c* | $/MWh | *Day-Ahead Shadow Price for a binding transmission constraint*⎯The DAM Shadow Price for the constraint *c* for the hour. |
| DAHUBSF *South345,c* | none | *Day-Ahead Shift Factor of the Hub ⎯*The DAM aggregated Shift Factor of a Hub for the constraint *c* for the hour. |
| DAHBSF *hb,South345,c* | none | *Day-Ahead Shift Factor of the Hub Bus⎯*The DAM aggregated Shift Factor of a Hub Bus *hb* for the constraint *c* for the hour. |
| DASF *pb,hb,South345,c* | none | *Day-Ahead Shift Factor of the power flow bus⎯*The DAM Shift Factor of a power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| HUBDF *hb, South345,c* | none | *Hub Distribution Factor per Hub Bus in a constraint*⎯The distribution factor of Hub Bus *hb* for the constraint *c* for the hour. |
| HBDF *pb, hb, South345,c* | none | *Hub Bus Distribution Factor per power flow bus of Hub Bus in a constraint*⎯The distribution factor of power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| *pb* | none | An energized power flow bus that is a component of a Hub Bus for the constraint *c*. |
| PB *hb, South345,c* | none | The total number of energized power flow buses in Hub Bus *hb* for the constraint *c*. |
| *hb* | none | A Hub Bus that is a component of the Hub with at least one energized power flow bus for the constraint *c*. |
| HBBC *South345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus in base case. |
| HB *South345,c* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus for the constraint *c*. |
| *c* | none | A DAM binding transmission constraint for the hour caused by either base case or a contingency. |

(4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:

RTSPP *South345* = Max [-$251, (RTRSVPOR + RTRDP +

(HUBDF *hb, South345* \* ((RTHBP *hb, South345, y* \* TLMP *y*) / (TLMP *y*))))], if HB*South345*≠0

RTSPP South345 = RTSPP ERCOT345Bus, if HB South345=0

Where:

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

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

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

RTHBP *hb, South345, y* = (HBDF *b, hb, South345* \* RTLMP *b, hb, South345, y*)

HUBDF *hb, South345* = IF(HB*South345*=0, 0, 1 **/** HB*South345*)

HBDF *b, hb, South345* = IF(B*hb, South345*=0, 0, 1 **/** B *hb, South345*)

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| RTSPP *South345* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub, for the 15-minute Settlement Interval. |
| RTHBP *hb, South345, y* | $/MWh | *Real-Time Hub Bus Price at Hub Bus per SCED interval*⎯The Real-Time energy price at Hub Bus *hb* for 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 are 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, hb, South345, y* | $/MWh | *Real-Time Locational Marginal Price at Electrical Bus of Hub Bus per interval*⎯The Real-Time LMP at Electrical Bus *b* that is a component of Hub Bus *hb*, for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| HUBDF *hb, South345* | none | *Hub Distribution Factor per Hub Bus*⎯The distribution factor of Hub Bus *hb*. |
| HBDF *b, hb, South345* | none | *Hub Bus Distribution Factor per Electrical Bus of Hub Bus*⎯The distribution factor of Electrical Bus *b* that is a component of Hub Bus *hb*. |
| *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 energized Electrical Bus that is a component of a Hub Bus. |
| B *hb, South345* | none | The total number of energized Electrical Buses in Hub Bus *hb*. |
| *hb* | none | A Hub Bus that is a component of the Hub. |
| HB*South345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR1007 and NPRR1057: Replace applicable portions of paragraph (4) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1057:]***  (4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:  **RTSPP** *South345* **= Max [-$251, (LRTRDP*South345* +**  **(HUBLMP** *South345, y* **\* RNWF** *y***))]**  Where:  LRTRDP*p* = ( RNWF*y* \* RTRDPA *p, y*)  RNWF *y* = TLMP *y* / TLMP *y*  The above variables are defined as follows:   |  |  |  | | --- | --- | --- | | **Variable** | **Unit** | **Description** | | RTSPP *South345* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub, for the 15-minute Settlement Interval. | | LRTRDP*p* | $/MWh | *Locational Real-Time Reliability Deployment Price for Energy*⎯The Real-Time price for the 15-minute Settlement Interval at Settlement Point *p*, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | RTRDPA *p, y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy –*The Real-Time Price Adder that captures the impact of reliability deployments on energy prices at Settlement Point *p,* for the SCED interval *y.* | | HUBLMP*South345, y* | $/MWh | *Hub Locational Marginal Price*⎯The Hub LMP for the Hub for the SCED Interval *y*. | | RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval. | | *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. | | *p* | none | A Settlement Point | |

3.5.2.3 Houston 345 kV Hub (Houston 345)

(1) The Houston 345 kV Hub is composed of the following listed Hub Buses:

|  | ERCOT Operations | |  |
| --- | --- | --- | --- |
| No. | Hub Bus | kV | Hub |
| 1 | ADK | 345 | HOUSTON |
| 2 | BI | 345 | HOUSTON |
| 3 | CBY | 345 | HOUSTON |
| 4 | CTR | 345 | HOUSTON |
| 5 | CHB | 345 | HOUSTON |
| 6 | DPW | 345 | HOUSTON |
| 7 | DOW | 345 | HOUSTON |
| 8 | RNS | 345 | HOUSTON |
| 9 | GBY | 345 | HOUSTON |
| 10 | JN | 345 | HOUSTON |
| 11 | KG | 345 | HOUSTON |
| 12 | KDL | 345 | HOUSTON |
| 13 | NB | 345 | HOUSTON |
| 14 | OB | 345 | HOUSTON |
| 15 | PHR | 345 | HOUSTON |
| 16 | SDN | 345 | HOUSTON |
| 17 | SMITHERS | 345 | HOUSTON |
| 18 | THW | 345 | HOUSTON |
| 19 | WAP | 345 | HOUSTON |
| 20 | WO | 345 | HOUSTON |

(2) The Houston 345 kV Hub Price uses the aggregated Shift Factors of the Hub Buses for each hour of the Settlement Interval of the DAM in the Day-Ahead and is the simple average of the time-weighted Hub Bus prices for each 15-minute Settlement Interval in Real-Time, for each Hub Bus included in this Hub.

(3) The Day-Ahead Settlement Point Price of the Hub for a given Operating Hour is calculated as follows:

**DASPP** *Houston345* **= DASL – (DAHUBSF***Houston345, c***\* DASP** *c***),**

**if HBBC***Houston345***≠0**

**DASPP** *Houston345* **= DASPP** *ERCOT345Bus***, if HBBC***Houston345***=0**

Where:

DAHUBSF *Houston345, c =* (HUBDF *hb, Houston345, c* \* DAHBSF *hb, Houston345, c*)

DAHBSF *hb, Houston345, c =* (HBDF *pb, hb, Houston345, c* \* DASF *pb, hb, Houston345, c*)

HUBDF *hb, Houston345, c =* IF(HB*Houston345, c*=0, 0, 1 **/** HB *Houston345, c*)

HBDF *pb, hb, Houston345, c =* IF(PB*hb, Houston345, c*=0, 0, 1 **/** PB *hb, Houston345, c*)

The above variables are defined as follows:

| Variable | Unit | Definition |
| --- | --- | --- |
| DASPP *Houston345* | $/MWh | *Day-Ahead Settlement Point Price*⎯The DAM Settlement Point Price at the Hub, for the hour. |
| DASL | $/MWh | *Day-Ahead System Lambda*⎯The DAM Shadow Price for the system power balance constraint for the hour. |
| DASP *c* | $/MWh | *Day-Ahead Shadow Price for a binding transmission constraint*⎯The DAM Shadow Price for the constraint *c* for the hour. |
| DAHUBSF *Houston345,c* | none | *Day-Ahead Shift Factor of the Hub ⎯*The DAM aggregated Shift Factor of a Hub for the constraint *c* for the hour. |
| DAHBSF *hb,Houston345,c* | none | *Day-Ahead Shift Factor of the Hub Bus⎯*The DAM aggregated Shift Factor of a Hub Bus *hb* for the constraint *c* for the hour. |
| DASF *pb,hb,Houston345,c* | none | *Day-Ahead Shift Factor of the power flow bus⎯*The DAM Shift Factor of a power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| HUBDF *hb, Houston345,c* | none | *Hub Distribution Factor per Hub Bus in a constraint*⎯The distribution factor of Hub Bus *hb* for the constraint *c* for the hour. |
| HBDF *pb, hb, Houston345,c* | none | *Hub Bus Distribution Factor per power flow bus of Hub Bus in a constraint*⎯The distribution factor of power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| *pb* | none | An energized power flow bus that is a component of a Hub Bus for the constraint *c*. |
| PB *hb, Houston345,c* | none | The total number of energized power flow buses in Hub Bus *hb* for the constraint *c*. |
| *hb* | none | A Hub Bus that is a component of the Hub with at least one energized power flow bus for the constraint *c*. |
| HBBC *Houston345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus in base case. |
| HB *Houston345,c* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus for the constraint *c*. |
| *c* | none | A DAM binding transmission constraint for the hour caused by either base case or a contingency. |

(4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:

RTSPP *Houston345* = Max [-$251, (RTRSVPOR + RTRDP +

(HUBDF *hb, Houston345* \* ((RTHBP *hb, Houston345, y* \*

TLMP *y*) / (TLMP *y*))))], if HB*Houston345*≠0

RTSPP Houston345 = RTSPP ERCOT345Bus, if HB Houston345=0

Where:

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

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

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

RTHBP *hb, Houston345, y* = (HBDF *b, hb, Houston345* \* RTLMP *b, hb, Houston345, y*)

HUBDF *hb, Houston345* = IF(HB*Houston345*=0, 0, 1 **/** HB*Houston345*)

HBDF *b, hb, Houston345* = IF(B*hb, Houston345*=0, 0, 1 **/** B *hb, Houston345*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTSPP *Houston345* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub, for the 15-minute Settlement Interval. |
| RTHBP *hb, Houston345, y* | $/MWh | *Real-Time Hub Bus Price at Hub Bus per SCED interval*⎯The Real-Time energy price at Hub Bus *hb* for 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 are 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, hb, Houston345, y* | $/MWh | *Real-Time Locational Marginal Price at Electrical Bus of Hub Bus per interval*⎯The Real-Time LMP at Electrical Bus *b* that is a component of Hub Bus *hb*, for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval |
| HUBDF *hb, Houston345* | none | *Hub Distribution Factor per Hub Bus*⎯The distribution factor of Hub Bus *hb*. |
| HBDF *b, hb, Houston345* | none | *Hub Bus Distribution Factor per Electrical Bus of Hub Bus*⎯The distribution factor of Electrical Bus *b* that is a component of Hub Bus *hb*. |
| *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 energized Electrical Bus that is a component of a Hub Bus. |
| B *hb, Houston345* | none | The total number of energized Electrical Buses in Hub Bus *hb*. |
| *hb* | none | A Hub Bus that is a component of the Hub. |
| HB*Houston345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR1007 and NPRR1057: Replace applicable portions of paragraph (4) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1057:]***  (4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:  **RTSPP** *Houston345* **= Max [-$251, (LRTRDP*Houston345* +**  **(HUBLMP** *Houston345, y* **\* RNWF** *y* **))]**  Where:  LRTRDSPP*p* = (RNWF *y* \* RTRDPA *p, y*)  RNWF *y* = TLMP *y* / TLMP *y*  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | RTSPP *Houston345* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub, for the 15-minute Settlement Interval. | | RTRDP*p* | $/MWh | *Locational Real-Time Reliability Deployment Price for Energy* ⎯The Real-Time price for the 15-minute Settlement Interval at Settlement Point *p*, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | RTRDPA *p, y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy* ⎯The Real-Time Price Adder that captures the impact of reliability deployments on energy prices at Settlement Point *p,* for the SCED interval *y.* | | HUBLMP*Houston345, y* | $/MWh | *Hub Locational Marginal Price*⎯The Hub LMP for the Hub for the SCED Interval *y*. | | RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval | | *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. | | *p* | none | A Settlement Point | |

3.5.2.4 West 345 kV Hub (West 345)

(1) The West 345 kV Hub is composed of the following listed Hub Buses:

|  |  |  |  |
| --- | --- | --- | --- |
|  | ERCOT Operations | |  |
| No. | Hub Bus | kV | Hub |
| 1 | MULBERRY | 345 | WEST |
| 2 | BOMSW | 345 | WEST |
| 3 | OECCS | 345 | WEST |
| 4 | BITTCR | 345 | WEST |
| 5 | FSHSW | 345 | WEST |
| 6 | FLCNS | 345 | WEST |
| 7 | GRSES | 345 | WEST |
| 8 | JCKSW | 345 | WEST |
| 9 | MDLNE | 345 | WEST |
| 10 | MOSSW | 345 | WEST |
| 11 | MGSES | 345 | WEST |
| 12 | DCTM | 345 | WEST |
| 13 | ODEHV | 345 | WEST |
| 14 | OKLA | 345 | WEST |
| 15 | REDCREEK | 345 | WEST |
| 16 | SWESW | 345 | WEST |
| 17 | TWINBU | 345 | WEST |

(2) The West 345 kV Hub Price uses the aggregated Shift Factors of the Hub Buses for each hour of the Settlement Interval of the DAM in the Day-Ahead and is the simple average of the time weighted Hub Bus prices for each 15-minute Settlement Interval in Real-Time, for each Hub Bus included in this Hub.

(3) The Day-Ahead Settlement Point Price of the Hub for a given Operating Hour is calculated as follows:

**DASPP** *West345* **= DASL – (DAHUBSF***West345, c***\* DASP** *c***),**

**if HBBC***West345***≠0**

**DASPP** *West345* **= DASPP** *ERCOT345Bus***, if HBBC***West345***=0**

Where:

DAHUBSF *West345, c =* (HUBDF *hb, West345, c* \* DAHBSF *hb, West345, c*)

DAHBSF *hb, West345, c =* (HBDF *pb, hb, West345, c* \* DASF *pb, hb, West345, c*)

HUBDF *hb, West345, c =* IF(HB*West345, c*=0, 0, 1 **/** HB *West345, c*)

HBDF *pb, hb, West345, c =* IF(PB*hb, West345, c*=0, 0, 1 **/** PB *hb, West345, c*)

The above variables are defined as follows:

| Variable | Unit | Definition |
| --- | --- | --- |
| DASPP *West345* | $/MWh | *Day-Ahead Settlement Point Price*⎯The DAM Settlement Point Price at the Hub, for the hour. |
| DASL | $/MWh | *Day-Ahead System Lambda*⎯The DAM Shadow Price for the system power balance constraint for the hour. |
| DASP *c* | $/MWh | *Day-Ahead Shadow Price for a binding transmission constraint*⎯The DAM Shadow Price for the constraint *c* for the hour. |
| DAHUBSF *West345,c* | none | *Day-Ahead Shift Factor of the Hub ⎯*The DAM aggregated Shift Factor of a Hub for the constraint *c* for the hour. |
| DAHBSF *hb,West345,c* | none | *Day-Ahead Shift Factor of the Hub Bus⎯*The DAM aggregated Shift Factor of a Hub Bus *hb* for the constraint *c* for the hour. |
| DASF *pb,hb,West345,c* | none | *Day-Ahead Shift Factor of the power flow bus⎯*The DAM Shift Factor of a power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| HUBDF *hb, West345,c* | none | *Hub Distribution Factor per Hub Bus in a constraint*⎯The distribution factor of Hub Bus *hb* for the constraint *c* for the hour. |
| HBDF *pb, hb, West345,c* | none | *Hub Bus Distribution Factor per power flow bus of Hub Bus in a constraint*⎯The distribution factor of power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| *pb* | none | An energized power flow bus that is a component of a Hub Bus for the constraint *c*. |
| PB *hb, West345,c* | none | The total number of energized power flow buses in Hub Bus *hb* for the constraint *c*. |
| *hb* | none | A Hub Bus that is a component of the Hub with at least one energized power flow bus for the constraint *c*. |
| HBBC *West345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus in base case. |
| HB *West345,c* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus for the constraint *c*. |
| *c* | none | A DAM binding transmission constraint for the hour caused by either base case or a contingency. |

(4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:

RTSPP *West345* = Max [-$251, (RTRSVPOR + RTRDP +

(HUBDF *hb, West345* \* ((RTHBP *hb, West345, y* \* TLMP *y*) / (TLMP *y*))))], if HB*West345*≠0

RTSPP *West345* = RTSPP *ERCOT345Bus*, if HB*West345*=0

Where:

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

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

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

RTHBP *hb, West345, y* = (HBDF *b, hb, West345* \* RTLMP *b, hb, West345, y*)

HUBDF *hb, West345* = IF(HB *West345*=0, 0, 1 **/** HB*West345*)

HBDF *b, hb, West345* = IF(B*hb, West345*=0, 0, 1 **/** B *hb, West345*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTSPP *West345* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub, for 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. |
| 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 are 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. |
| RTHBP *hb, West345, y* | $/MWh | *Real-Time Hub Bus Price at Hub Bus per SCED interval*⎯The Real-Time energy price at Hub Bus *hb* for the SCED interval *y*. |
| RTLMP *b, hb, West345, y* | $/MWh | *Real-Time Locational Marginal Price at Electrical Bus of Hub Bus per interval*⎯The Real-Time LMP at Electrical Bus *b* that is a component of Hub Bus *hb*, for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| HUBDF *hb, West345* | none | *Hub Distribution Factor per Hub Bus*⎯The distribution factor of Hub Bus *hb*. |
| HBDF *b, hb, West345* | none | *Hub Bus Distribution Factor per Electrical Bus of Hub Bus*⎯The distribution factor of Electrical Bus *b* that is a component of Hub Bus *hb*. |
| *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 energized Electrical Bus that is a component of a Hub Bus. |
| B *hb, West345* | none | The total number of energized Electrical Buses in Hub Bus *hb*. |
| *hb* | none | A Hub Bus that is a component of the Hub. |
| HB*West345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR1007 and NPRR1057: Replace applicable portions of paragraph (4) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation of NPRR1057:]***  (4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:  **RTSPP** *West345* **= Max [-$251, (LRTRDP*West345* +**  **(HUBLMP** *West345, y* **\* RNWF** *y***))]**  Where:  LRTRDP*p* = (RNWF *y* \* RTRDPA *p, y*)  RNWF *y* = TLMP *y* / TLMP *y*  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | RTSPP *West345* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub, for the 15-minute Settlement Interval. | | LRTRDP*p* | $/MWh | *Locational Real-Time Reliability Deployment Price for Energy*⎯The Real-Time price for the 15-minute Settlement Interval at Settlement Point *p*, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | RTRDPA *p, y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy*⎯The Real-Time Price Adder that captures the impact of reliability deployments on energy prices at Settlement Point *p,* for the SCED interval *y.* | | HUBLMP*West345, y* | $/MWh | *Hub Locational Marginal Price*⎯The Hub LMP for the Hub for the SCED Interval *y*. | | RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval. | | *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. | | *p* | none | A Settlement Point | |

**3.5.2.5 Panhandle 345 kV Hub (Pan 345)**

(1) The Panhandle 345 kV Hub is composed of the following listed Hub Buses:

|  |  |  |  |
| --- | --- | --- | --- |
|  | ERCOT Operations | |  |
| No. | Hub Bus | kV | Hub |
| 1 | ABERNATH | 345 | PAN |
| 2 | AJ\_SWOPE | 345 | PAN |
| 3 | ALIBATES | 345 | PAN |
| 4 | CTT\_CROS | 345 | PAN |
| 5 | CTT\_GRAY | 345 | PAN |
| 6 | OGALLALA | 345 | PAN |
| 7 | RAILHEAD | 345 | PAN |
| 8 | TESLA | 345 | PAN |
| 9 | TULECNYN | 345 | PAN |
| 10 | W\_CW\_345 | 345 | PAN |
| 11 | WHIT\_RVR | 345 | PAN |
| 12 | WINDMILL | 345 | PAN |

(2) The Panhandle 345 kV Hub Price uses the aggregated Shift Factors of the Hub Buses for each hour of the Settlement Interval of the DAM in the Day-Ahead and is the simple average of the time weighted Hub Bus prices for each 15-minute Settlement Interval in Real-Time, for each Hub Bus included in this Hub.

(3) The Day-Ahead Settlement Point Price of the Hub for a given Operating Hour is calculated as follows:

**DASPP** *Pan345* **=**  **DASL – (DAHUBSF***Pan345, c***\* DASP** *c***),**

**if HBBC***Pan345***≠0**

**DASPP** *Pan345* **=**  **DASPP** *ERCOT345Bus***, if HBBC***Pan345***=0**

Where:

DAHUBSF *Pan345, c =* (HUBDF *hb, Pan345, c* \* DAHBSF *hb, Pan345, c*)

DAHBSF *hb, Pan345, c =* (HBDF *pb, hb, Pan345, c* \* DASF *pb, hb, Pan345, c*)

HUBDF *hb, Pan345, c =* IF(HB*Pan345, c*=0, 0, 1 **/** HB *Pan345, c*)

HBDF *pb, hb, Pan345, c =* IF(PB*hb, Pan345, c*=0, 0, 1 **/** PB *hb, Pan345, c*)

The above variables are defined as follows:

| Variable | Unit | Definition |
| --- | --- | --- |
| DASPP *Pan345* | $/MWh | *Day-Ahead Settlement Point Price*⎯The DAM Settlement Point Price at the Hub, for the hour. |
| DASL | $/MWh | *Day-Ahead System Lambda*⎯The DAM Shadow Price for the system power balance constraint for the hour. |
| DASP *c* | $/MWh | *Day-Ahead Shadow Price for a binding transmission constraint*⎯The DAM Shadow Price for the constraint *c* for the hour. |
| DAHUBSF *Pan345,c* | none | *Day-Ahead Shift Factor of the Hub ⎯*The DAM aggregated Shift Factor of a Hub for the constraint *c* for the hour. |
| DAHBSF *hb,Pan345,c* | none | *Day-Ahead Shift Factor of the Hub Bus⎯*The DAM aggregated Shift Factor of a Hub Bus *hb* for the constraint *c* for the hour. |
| DASF *pb,hb,Pan345,c* | none | *Day-Ahead Shift Factor of the power flow bus⎯*The DAM Shift Factor of a power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| HUBDF *hb, Pan345,c* | none | *Hub Distribution Factor per Hub Bus in a constraint*⎯The distribution factor of Hub Bus *hb* for the constraint *c* for the hour. |
| HBDF *pb, hb, Pan345,c* | none | *Hub Bus Distribution Factor per power flow bus of Hub Bus in a constraint*⎯The distribution factor of power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| *pb* | none | An energized power flow bus that is a component of a Hub Bus for the constraint *c*. |
| PB *hb, Pan345,c* | none | The total number of energized power flow buses in Hub Bus *hb* for the constraint *c*. |
| *hb* | none | A Hub Bus that is a component of the Hub with at least one energized power flow bus for the constraint *c*. |
| HBBC *Pan345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus in base case. |
| HB *Pan345,c* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus for the constraint *c*. |
| *c* | none | A DAM binding transmission constraint for the hour caused by either base case or a contingency. |

(4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:

**RTSPP** *Pan345* **= Max [-$251, (RTRSVPOR + RTRDP +**

 **(HUBDF** *hb, Pan345* **\* (****(RTHBP** *hb, Pan345, y* **\* TLMP** *y***) / (** **TLMP** *y***))))], if HB***Pan345***≠0**

**RTSPP** *Pan345* **= RTSPP** *ERCOT345Bus*, **if HB***Pan345***=0**

Where:

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

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

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

RTHBP *hb, Pan345, y* =  (HBDF *b, hb, Pan345* \* RTLMP *b, hb, Pan345, y*)

HUBDF *hb, Pan345* = IF(HB *Pan345*=0, 0, 1 **/** HB*Pan345*)

HBDF *b, hb, Pan345* = IF(B*hb, Pan345*=0, 0, 1 **/** B *hb, Pan345*)

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| RTSPP *Pan345* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub for 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. |
| 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 are 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. |
| RTHBP *hb, Pan345, y* | $/MWh | *Real-Time Hub Bus Price at Hub Bus per SCED interval*⎯The Real-Time energy price at Hub Bus *hb* for the SCED interval *y*. |
| RTLMP *b, hb, Pan345, y* | $/MWh | *Real-Time Locational Marginal Price at Electrical Bus of Hub Bus per interval*⎯The Real-Time LMP at Electrical Bus *b* that is a component of Hub Bus *hb* for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| HUBDF *hb, Pan345* | none | *Hub Distribution Factor per Hub Bus*⎯The distribution factor of Hub Bus *hb*. |
| HBDF *b, hb, Pan345* | none | *Hub Bus Distribution Factor per Electrical Bus of Hub Bus*⎯The distribution factor of Electrical Bus *b* that is a component of Hub Bus *hb*. |
| *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 energized Electrical Bus that is a component of a Hub Bus. |
| B *hb, Pan345* | none | The total number of energized Electrical Buses in Hub Bus *hb*. |
| *hb* | none | A Hub Bus that is a component of the Hub. |
| HB*Pan345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR1007 and NPRR1057: Replace applicable portions of paragraph (4) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1057:]***  (4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:  **RTSPP** *Pan345* **= Max [-$251, (LRTRDP*Pan345* +**  **(HUBLMP** *Pan345, y* **\* RNWF** *y* **))]**  Where:  LRTRDP*p* =  (RNWF *y* \* RTRDPA *p, y*)  RNWF *y* = TLMP *y* / TLMP *y*  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | RTSPP *Pan345* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub for the 15-minute Settlement Interval. | | RTRDP*p* | $/MWh | *Locational Real-Time Reliability Deployment Price for Energy*⎯The Real-Time price for the 15-minute Settlement Interval at Settlement Point *p*, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | RTRDPA *p, y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy*⎯The Real-Time Price Adder that captures the impact of reliability deployments on energy prices at Settlement Point *p,* for the SCED interval *y.* | | HUBLMP*Pan345, y* | $/MWh | *Hub Locational Marginal Price*⎯The Hub LMP for the Hub for the SCED Interval *y*. | | RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval. | | *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. | | *p* | none | A Settlement Point | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR941, NPRR1007, and NPRR1057: Insert applicable portions of Section 3.5.2.6 below upon system implementation for NPRR941 or NPRR1057; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; and renumber accordingly:]***  **3.5.2.6 Lower Rio Grande Valley Hub (LRGV 138/345)**  (1) The Lower Rio Grande Valley Hub 138/345 kV Hub is composed of the following listed Hub Buses:   |  |  |  |  | | --- | --- | --- | --- | |  | ERCOT Operations |  |  | | No. | Hub Bus | kV | Hub | | 1 | AIRPORT | 138 | LRGV | | 2 | ALBERTA | 138 | LRGV | | 3 | BATES | 138 | LRGV | | 4 | FRONTERA | 138 | LRGV | | 5 | GARZA | 138 | LRGV | | 6 | HARLNSW | 138 | LRGV | | 7 | HEC | 138 | LRGV | | 8 | KEY\_SW | 138 | LRGV | | 9 | LA\_PALMA\_345 | 345 | LRGV | | 10 | LA\_PALMA\_138 | 138 | LRGV | | 11 | LASPULGA | 138 | LRGV | | 12 | LISTON | 138 | LRGV | | 13 | LOMA\_ALT | 138 | LRGV | | 14 | MARCONI | 138 | LRGV | | 15 | MILHWY | 138 | LRGV | | 16 | MILITARY | 138 | LRGV | | 17 | MV\_WEDN4 | 138 | LRGV | | 18 | N\_MCALLN | 138 | LRGV | | 19 | NEDIN\_345 | 345 | LRGV | | 20 | NEDIN\_138 | 138 | LRGV | | 21 | OLEANDER | 138 | LRGV | | 22 | P\_ISABEL | 138 | LRGV | | 23 | PALMHRTP | 138 | LRGV | | 24 | PALMITO\_345 | 345 | LRGV | | 25 | PALMITO\_138 | 138 | LRGV | | 26 | PAREDES | 138 | LRGV | | 27 | PHARMVEC | 138 | LRGV | | 28 | PHARR | 138 | LRGV | | 29 | PRICE\_RD | 138 | LRGV | | 30 | RAILROAD | 138 | LRGV | | 31 | RAYMND2 | 138 | LRGV | | 32 | REDTAP | 138 | LRGV | | 33 | RIO\_GRAN | 138 | LRGV | | 34 | RIOHONDO\_345 | 345 | LRGV | | 35 | RIOHONDO\_138 | 138 | LRGV | | 36 | ROMA\_SW | 138 | LRGV | | 37 | S\_MCALLN | 138 | LRGV | | 38 | SCARBIDE | 138 | LRGV | | 39 | SILASRAY | 138 | LRGV | | 40 | STEWART | 138 | LRGV | | 41 | WESLACO | 138 | LRGV |   (2) The Lower Rio Grande Valley 138/345 kV Hub Price uses the aggregated Shift Factors of the Hub Buses for each hour of the Settlement Interval of the DAM in the Day-Ahead and is the simple average of the time weighted Hub Bus prices for each 15-minute Settlement Interval in Real-Time, for each Hub Bus included in this Hub.  (3) The Day-Ahead Settlement Point Price of the Hub for a given Operating Hour is calculated as follows:  **DASPP** *LRGV 138/345* **= DASL – (DAHUBSF***LRGV 138/345, c***\* DASP** *c***),**  **if HBBC***LRGV138/345***≠0**  **DASPP** *LRGV138/345* **= DASPP** *ERCOT345Bus***, if HBBC***LRGV138/345***=0**  Where:  DAHUBSF *LRGV138/345, c =* (HUBDF *hb, LRGV138/345, c* \* DAHBSF *hb, LRGV138/345, c*)  DAHBSF *hb, LRGV138/345, c =* (HBDF *pb, hb, LRGV138/345, c* \* DASF *pb, hb, LRGV138/345, c*)  HUBDF *hb, LRGV138/345, c =* IF(HB*LRGV138/345, c*=0, 0, 1 **/** HB *LRGV138/345, c*)  HBDF *pb, hb, LRGV138/345, c =* IF(PB*hb, LRGV138/345, c*=0, 0, 1 **/** PB *hb, LRGV138/345, c*)  The above variables are defined as follows:   | Variable | Unit | Definition | | --- | --- | --- | | DASPP *LRGV138/345* | $/MWh | *Day-Ahead Settlement Point Price*⎯The DAM Settlement Point Price at the Hub, for the hour. | | DASL | $/MWh | *Day-Ahead System Lambda*⎯The DAM Shadow Price for the system power balance constraint for the hour. | | DASP *c* | $/MWh | *Day-Ahead Shadow Price for a binding transmission constraint*⎯The DAM Shadow Price for the constraint *c* for the hour. | | DAHUBSF *LRGV138/345,c* | none | *Day-Ahead Shift Factor of the Hub ⎯*The DAM aggregated Shift Factor of a Hub for the constraint *c* for the hour. | | DAHBSF *hb, LRGV138/345,c* | none | *Day-Ahead Shift Factor of the Hub Bus⎯*The DAM aggregated Shift Factor of a Hub Bus *hb* for the constraint *c* for the hour. | | DASF *pb,hb, LRGV138/345,c* | none | *Day-Ahead Shift Factor of the power flow bus⎯*The DAM Shift Factor of a power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. | | HUBDF *hb, LRGV138/345,c* | none | *Hub Distribution Factor per Hub Bus in a constraint*⎯The distribution factor of Hub Bus *hb* for the constraint *c* for the hour. | | HBDF *pb, hb, LRGV138/345,c* | none | *Hub Bus Distribution Factor per power flow bus of Hub Bus in a constraint*⎯The distribution factor of power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. | | *pb* | none | An energized power flow bus that is a component of a Hub Bus for the constraint *c*. | | PB *hb, LRGV138/345,c* | none | The total number of energized power flow buses in Hub Bus *hb* for the constraint *c*. | | *hb* | none | A Hub Bus that is a component of the Hub with at least one energized power flow bus for the constraint *c*. | | HBBC *LRGV138/345* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus in base case. | | HB *LRGV138/345,c* | none | The total number of Hub Buses in the Hub with at least one energized component in each Hub Bus for the constraint *c*. | | *c* | none | A DAM binding transmission constraint for the hour caused by either base case or a contingency. |   (4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:  **RTSPP** *LRGV138/345* **= Max [-$251, (LRTRDP*LRGV138/345* +**  **(HUBLMP** *LRGV138/345, y* **\* RNWF** *y***))]**  Where:  LRTRDP*p* = (RNWF *y* \* RTRDPA *p, y*)  RNWF *y* = TLMP *y* / TLMP *y*  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | RTSPP *LRGV138/345kV* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub for the 15-minute Settlement Interval. | | LRTRDP*p* | $/MWh | *Locational Real-Time Reliability Deployment Price for Energy*⎯The Real-Time price for the 15-minute Settlement Interval at Settlement Point *p*, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | RTRDPA *p, y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy*⎯The Real-Time Price Adder that captures the impact of reliability deployments on energy prices at Settlement Point *p,* for the SCED interval *y.* | | HUBLMP*LRGV138/345, y* | $/MWh | *Hub Locational Marginal Price*⎯The Hub LMP for the Hub for the SCED Interval *y*. | | RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval. | | *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. | | *p* | none | A Settlement Point | |

3.5.2.7 ERCOT Bus Average 345 kV Hub (ERCOT 345 Bus)

(1) The ERCOT Bus Average 345 kV Hub is composed of the Hub Buses listed in Section 3.5.2.1, North 345 kV Hub (North 345); Section 3.5.2.2, South 345 kV Hub (South 345); Section 3.5.2.3, Houston 345 kV Hub (Houston 345); and Section 3.5.2.4, West 345 kV Hub (West 345). The Panhandle 345 kV Hub is not included in the ERCOT Bus Average 345 kV Hub price.

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| ***[NPRR941: Replace paragraph (1) above upon system implementation:]***  (1) The ERCOT Bus Average 345 kV Hub is composed of the Hub Buses listed in Section 3.5.2.1, North 345 kV Hub (North 345); Section 3.5.2.2, South 345 kV Hub (South 345); Section 3.5.2.3, Houston 345 kV Hub (Houston 345); and Section 3.5.2.4, West 345 kV Hub (West 345). The Panhandle 345 kV Hub and the Lower Rio Grande Valley 138/345 kV Hub are not included in the ERCOT Bus Average 345 kV Hub price. |

(2) The ERCOT Bus Average 345 kV Hub uses the aggregated Shift Factors of the Hub Buses for each hour of the Settlement Interval of the DAM in the Day-Ahead and is the simple average of the time weighted Hub Bus prices for each 15-minute Settlement Interval in Real-Time, for each Hub Bus included in this Hub.

(3) The Day-Ahead Settlement Point Price of the Hub for a given Operating Hour is calculated as follows:

**DASPP** *ERCOT345Bus* **= DASL – (DAHUBSF***ERCOT345Bus, c***\* DASP** *c***),**

**if HBBC***ERCOT345Bus***≠0**

**DASPP** *ERCOT345Bus* **= 0, if HBBC***ERCOT345Bus***=0**

Where:

DAHUBSF *ERCOT345Bus, c =* (HUBDF *hb, ERCOT345Bus, c* \* DAHBSF *hb, ERCOT345Bus, c*)

DAHBSF *hb, ERCOT345Bus, c  =* (HBDF *pb, hb, ERCOT345Bus, c* \* DASF *pb, hb, ERCOT345Bus, c*)

HUBDF *hb, ERCOT345Bus, c =* IF(HB*ERCOT345Bus, c*=0, 0, 1 **/** HB *ERCOT345Bus, c*)

HBDF *pb, hb, ERCOT345Bus, c =* IF(PB*hb, ERCOT345Bus, c*=0, 0, 1 **/** PB *hb, ERCOT345Bus, c*)

The above variables are defined as follows:

| Variable | Unit | Definition |
| --- | --- | --- |
| DASPP *ERCOT345Bus* | $/MWh | *Day-Ahead Settlement Point Price*⎯The DAM Settlement Point Price at the Hub, for the hour. |
| DASL | $/MWh | *Day-Ahead System Lambda*⎯The DAM Shadow Price for the system power balance constraint for the hour. |
| DASP *c* | $/MWh | *Day-Ahead Shadow Price for a binding transmission constraint*⎯The DAM Shadow Price for the constraint *c* for the hour. |
| DAHUBSF *ERCOT345Bus,c* | none | *Day-Ahead Shift Factor of the Hub ⎯*The DAM aggregated Shift Factor of a Hub for the constraint *c* for the hour. |
| DAHBSF *hb,ERCOT345Bus,c* | none | *Day-Ahead Shift Factor of the Hub Bus⎯*The DAM aggregated Shift Factor of a Hub Bus *hb* for the constraint *c* for the hour. |
| DASF *pb,hb,ERCOT345Bus,c* | none | *Day-Ahead Shift Factor of the power flow bus⎯*The DAM Shift Factor of a power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| HUBDF *hb,ERCOT345Bus,c* | none | *Hub Distribution Factor per Hub Bus in a constraint*⎯The distribution factor of Hub Bus *hb* for the constraint *c* for the hour. |
| HBDF *pb, hb, ERCOT345Bus,c* | none | *Hub Bus Distribution Factor per power flow bus of Hub Bus in a constraint*⎯The distribution factor of power flow bus *pb* that is a component of Hub Bus *hb* for the constraint *c* for the hour. |
| *pb* | none | An energized power flow bus that is a component of a Hub Bus for the constraint *c*. |
| PB *hb, ERCOT345Bus,c* | none | The total number of energized power flow buses in Hub Bus *hb* for the constraint *c*. |
| *hb* | none | A Hub Bus that is a component of the ERCOT Bus Average 345 kV Hub (ERCOT 345 Bus) with at least one energized power flow bus for the constraint *c*. The Hub “ERCOT 345 Bus” includes any Hub Bus defined in the Hub “North 345”, “South 345”, “Houston 345” and “West 345”. |
| HBBC *ERCOT345Bus* | none | The total number of Hub Buses in the ERCOT Bus Average 345 kV Hub (ERCOT 345 Bus) with at least one energized component in each Hub Bus in base case. The Hub “ERCOT 345 Bus” includes any Hub Bus defined in the Hub “North 345”, “South 345”, “Houston 345” and “West 345”. |
| HB *ERCOT345Bus,c* | none | The total number of Hub Buses in the ERCOT Bus Average 345 kV Hub (ERCOT 345 Bus) with at least one energized component in each Hub Bus for the constraint *c*. The Hub “ERCOT 345 Bus” includes any Hub Bus defined in the Hub “North 345”, “South 345”, “Houston 345” and “West 345”. |
| *c* | none | A DAM binding transmission constraint for the hour caused by either base case or a contingency. |

(4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:

RTSPP *ERCOT345Bus* = Max [-$251, (RTRSVPOR + RTRDP +

(HUBDF *hb, ERCOT345Bus* \* ((RTHBP *hb, ERCOT345Bus, y* \* TLMP *y*) / (TLMP *y*))))], if HB *ERCOT345Bus* ≠0

RTSPP ERCOT345Bus = 0, if HB ERCOT345Bus =0

Where:

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

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

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

RTHBP *hb, ERCOT345Bus, y* = (HBDF *b, hb, ERCOT345Bus* \* RTLMP *b, hb, ERCOT345Bus, y*)

HUBDF *hb, ERCOT345Bus* = 1 **/** (HB*North345* + HB*South345* + HB*Houston345* + HB*West345*)

If Electrical Bus *b* is a component of “North 345”

HBDF *b, hb, ERCOT345Bus* = IF(B *hb, North345*=0, 0, 1 **/** B *hb, North345*)

Otherwise

If Electrical Bus *b* is a component of “South 345”

HBDF *b, hb, ERCOT345Bus* = IF(B *hb, South345*=0, 0, 1 **/** B *hb, South345*)

Otherwise

If Electrical Bus *b* is a component of “Houston 345”

HBDF *b, hb, ERCOT345Bus* = IF(B *hb, Houston345*=0, 0, 1 **/** B *hb, Houston345*)

Otherwise

HBDF *b, hb, ERCOT345Bus* = IF(B *hb, West345*=0, 0, 1 **/** B *hb, West345*)

The above variables are defined as follows:

| Variable | Unit | Description |
| --- | --- | --- |
| RTSPP *ERCOT345Bus* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub, for 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. |
| 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 are 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. |
| RTHBP *hb, ERCOT345Bus, y* | $/MWh | *Real-Time Hub Bus Price at Hub Bus per SCED interval*⎯The Real-Time energy price at Hub Bus *hb* for the SCED interval *y*. |
| RTLMP *b, hb, ERCOT345Bus, y* | $/MWh | *Real-Time Locational Marginal Price at Electrical Bus of Hub Bus per interval*⎯The Real-Time LMP at Electrical Bus *b* that is a component of Hub Bus *hb*, for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| HUBDF *hb, ERCOT345Bus* | none | *Hub Distribution Factor per Hub Bus*⎯The distribution factor of Hub Bus *hb*. |
| HBDF *b, hb, ERCOT345Bus* | none | *Hub Bus Distribution Factor per Electrical Bus of Hub Bus*⎯The distribution factor of Electrical Bus *b* that is a component of Hub Bus *hb*. |
| *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 energized Electrical Bus that is a component of a Hub Bus. |
| B *hb, North345* | none | The total number of energized Electrical Buses in Hub Bus *hb* that is a component of “North 345.” |
| B *hb, South345* | none | The total number of energized Electrical Buses in Hub Bus *hb* that is a component of “South 345.” |
| B *hb, Houston345* | none | The total number of energized Electrical Buses in Hub Bus *hb* that is a component of “Houston 345.” |
| B *hb, West345* | none | The total number of energized Electrical Buses in Hub Bus *hb* that is a component of “West 345.” |
| *hb* | none | A Hub Bus that is a component of the Hub. |
| HB*North345* | none | The total number of Hub Buses in “North 345.” |
| HB*South345* | none | The total number of Hub Buses in “South 345.” |
| HB*Houston345* | none | The total number of Hub Buses in “Houston 345.” |
| HB*West345* | none | The total number of Hub Buses in “West 345.” |

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| ***[NPRR1007 and NPRR1057: Replace applicable portions of paragraph (4) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1007; or upon system implementation for NPRR1057:]***  (4) The Real-Time Settlement Point Price of the Hub for a given 15-minute Settlement Interval is calculated as follows:  **RTSPP** *ERCOT345Bus* **= Max [-$251, (LRTRDP*ERCOT345Bus* +** **(HUBLMP*ERCOT345Bus,y* \* RNWF *y*))]**  Where:  LRTRDP*p* = (RNWF *y* \* RTRDPA *p, y*)  RNWF *y* = TLMP *y* / TLMP *y*  The above variables are defined as follows:   | **Variable** | **Unit** | **Description** | | --- | --- | --- | | RTSPP *ERCOT345Bus* | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Hub, for the 15-minute Settlement Interval. | | LRTRDP*p* | $/MWh | *Locational Real-Time Reliability Deployment Price for Energy*⎯The Real-Time price for the 15-minute Settlement Interval at Settlement Point *p*, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | RTRDPA *p, y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy*⎯The Real-Time Price Adder that captures the impact of reliability deployments on energy prices at Settlement Point *p,* for the SCED interval *y.* | | HUBLMP *ERCOT345Bus,y* | $/MWh | *Hub Locational Marginal Price for the ERCOT345Bus*⎯The Hub LMP for the ERCOT Bus Average 345 kV Hub (ERCOT 345 Bus), for the SCED Interval *y*. | | RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the 15-minute Settlement Interval. | | *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. | | *p* | none | A Settlement Point | |

**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 (14) 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 (4) of Section 6.5.1.1, ERCOT Control Area Authority;

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

(d) Deployed 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;

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

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

(i) ERCOT-directed firm Load shed during EEA Level 3, as described in paragraph (3) of Section 6.5.9.4.2, EEA Levels.

(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.

(d) 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.

(e) Add the deployed MW from Load Resources that are not Controllable Load Resources and that are providing RRS or ECRS to GTBD linearly ramped over the ten-minute ramp period and add the deployed MW from Load Resources that are not Controllable Load Resources providing Non-Spin to GTBD linearly ramped over the 30-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 restoration period length and amount of MW added to GTBD during the restoration period will be determined by validated telemetry and the type of Ancillary Service deployed from the Resource. The TAC shall review the validity of the prices for the bid curve at least annually.

(f) 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. | | |

(g) 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.

(h) 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.

(i) 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.

(j) 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.

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

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

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

(n) Determine the positivedifference 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.

(o) 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.

(p) The Real-Time On-Line Reliability Deployment Price Adder is the minimum of items (n) and (o) above except when ERCOT is directing firm Load shed during EEA Level 3. When ERCOT is directing firm Load shed during EEA Level 3 to either maintain sufficient PRC or stabilize grid frequency, as described in paragraph (3) of Section 6.5.9.4.2, the Real-Time On-Line Reliability Deployment Price Adder is the 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. Once ERCOT is no longer directing firm Load shed, as described above, the Real-Time On-Line Reliability Deployment Price Adder will again be set as the minimum of items (n) and (o) above.

|  |  |  |  |  |  |  |  |  |  |
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| ***[NPRR904, NPRR1006, NPRR1010, NPRR1014, NPRR1091, and NPRR1105: Replace applicable portions of Section 6.5.7.3.1 above with the following upon system implementation for NPRR904, NPRR1006, NPRR1014, NPRR1091, or NPRR1105; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010:]***  **6.5.7.3.1Determination of Real-Time Reliability Deployment Price Adder**  (1) The following categories of reliability deployments are considered in the determination of the Real-Time Reliability Deployment Price Adder for Energy, and the Real-Time Reliability Deployment Price Adders for Ancillary Services:  (a) RUC-committed Resources, except for those whose QSEs have opted out of RUC Settlement in accordance with paragraph (14) 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 (4) of Section 6.5.1.1, ERCOT Control Area Authority;  (c) Deployed Load Resources other than Controllable Load Resources;  (d) Deployed ERS;  (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;  (j) Energy delivered to ERCOT through registered Block Load Transfers (BLTs) during an EEA;  (k) Energy delivered from ERCOT to another power pool through registered BLTs during emergency conditions in the receiving electric grid;  (l) ERCOT-directed deployment of TDSP standard offer Load management programs;  (m) ERCOT-directed deployment of distribution voltage reduction measures; and  (n) ERCOT-directed deployment of Off-Line Non-Spin.  (2) The Real-Time Reliability Deployment Price Adder for Energy, and Real-Time Reliability Deployment Price Adders for Ancillary Services are estimations of the impact to energy prices and Real-Time MCPCs due to the above categories of reliability deployments. For intervals where there are reliability deployments as described in paragraph (1) above, the Real-Time Reliability Deployment Price Adder for Energy and Real-Time Reliability Deployment Price Adders for Ancillary Services are determined as follows:  (a) For Off-Line Non-Spin Resources that are brought On-Line by ERCOT deployment instruction, RUC-committed Resources with a telemetered Resource Status of ONRUC and for RMR Resources that are On-Line:  (i) Set the LSL and LDL to zero;  (ii) Remove all Ancillary Service Offers; and  (iii) For the first step of SCED, administratively set the Energy Offer Curve for the Resource at a value equal to the power balance penalty price for all capacity between 0 MW and the HSL of the Resource.  (b) Notwithstanding item (a) above, for RUC-committed Combined Cycle Generation Resources with a telemetered Resource Status of ONRUC that were instructed by ERCOT to transition to a different configuration to provide additional capacity:  (i) Set the LSL and LDL equal to the minimum of their current value and the COP HSL of the QSE-committed configuration for the RUC hour at the snapshot time of the RUC instruction;  (ii) Set the maximum Ancillary Service capabilities of the Resource equal to the minimum of their current value and COP Ancillary Service capabilities of the QSE-committed configuration for the RUC hour at the snapshot time of the RUC instruction; and  (iii) For the first step of SCED, administratively set the Energy Offer Curve for the Resource at a value equal to the power balance penalty price for the additional capacity of the Resource, defined as the positive difference between the Resource’s current telemetered HSL and the COP HSL of the QSE-committed configuration for the RUC hour at the snapshot time of the RUC instruction.  (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 - (5 minutes \* Normal Ramp Rate down), or LSL; and  (ii) If the Generation Resource SCED Base Point is not at HDL, set HDL to the lesser of Aggregated Resource Output + (5 minutes \* Normal Ramp Rate up), or HSL.  (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 - (5 minutes \* Normal Ramp Rate down), or LSL; and  (ii) If the ESR SCED Base Point is not at HDL, set HDL to the lesser of Aggregated Resource Output + (5 minutes \* Normal Ramp Rate up), or HSL.  (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 - (5 minutes \* Normal Ramp Rate down), or LSL; and  (ii) If the Controllable Load Resource SCED Base Point is not at HDL, set HDL to the lesser of Aggregated Resource Output + (5 minutes \* Normal Ramp Rate up), or HSL.  (f) Add the deployed MW from Load Resources that are not Controllable Load Resources and that are providing RRS or ECRS to GTBD linearly ramped over the ten-minute ramp period and add the deployed MW from Load Resources that are not Controllable Load Resources providing Non-Spin to GTBD linearly ramped over the 30-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 restoration period length and amount of MW added to GTBD during the restoration period will be determined by validated telemetry and the type of Ancillary Service deployed from the Resource. 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) Model the MW from ERCOT-directed 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 the corresponding DC Tie Resource Node(s) as negative LSL(s) of pseudo Energy Storage Resource(s) with HSL(s) at 0 and Energy Bid/Offer Curves at the Real-Time System-Wide Offer Cap. The amount of MW is determined from the Dispatch Instruction and should continue over the duration of time specified by the ERCOT Operator.  (i) Model the MW from ERCOT-directed 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 the corresponding DC Tie Resource Node(s) as negative LSL(s) of pseudo Energy Storage Resource(s) with HSL(s) at 0 and Energy Bid/Offer Curves at the Real-Time System-Wide Offer Cap. 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) Model the MW from ERCOT-directed DC Tie exports to address emergency conditions in the receiving electric grid from the corresponding DC Tie Resource Node(s) as HSL(s) of pseudo Energy Storage Resource(s) with LSL(s) at 0 and Energy Bid/Offer Curves at -$250/MWh. 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) Model the MW from ERCOT-directed DC Tie import curtailments to address local transmission system limitations or emergency conditions in the receiving electric grid from the corresponding DC Tie Resource Node(s) as HSL(s) of pseudo Energy Storage Resource(s) with LSL(s) at 0 and Energy Bid/Offer Curves at -$250/MWh. 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.  (l) 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.  (m) 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.  (n) 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 (CDR), 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 CDR 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.  (o) Perform a SCED with changes to the inputs in items (a) through (m) above, considering only Competitive Constraints and the non-mitigated Energy Offer Curves.  (p) Perform mitigation on the submitted Energy Offer Curves using the LMPs from the previous step as the reference LMP.  (q) Perform a SCED with the changes to the inputs in items (a) through (m) above, considering both Competitive and Non-Competitive Constraints and the mitigated Energy Offer Curves.  (r) The Real-Time Reliability Deployment Price Adder for Energy at each Settlement Point is equal to the difference between that Settlement Point’s LMP from item (q) above and LMP 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.  (s) The Real-Time Reliability Deployment Price Adder for the Energy Metered for each Resource meter is equal to the positive difference between the meter located Electric Bus LMP from item (q) above and the LMP 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.  (t) For each individual Ancillary Service, the Real-Time Reliability Deployment Price Adder for Ancillary Service is equal to the positive difference between the MCPC for that Ancillary Service from item (q) above and the MCPC for that Ancillary Service. |

6.6.1.2 Real-Time Settlement Point Price for a Load Zone

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

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

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

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

For a DC Tie Load Zone:

LZLMP *y* = RTLMP *b, y*

Where:

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

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

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

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| --- |
| [NPRR1010: Replace paragraph (1) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]  (1) The Real-Time Settlement Point Price for a Load Zone Settlement Point is based on the state-estimated Load in MW and the time-weighted average Real-Time LMPs at Electrical Buses that are included in the Load Zone. The Real-Time Settlement Point Price for a Load Zone Settlement Point for a 15-minute Settlement Interval is calculated as follows:  **RTSPP = Max (-$251, ((TLMP *y* \* LZLMP *y*) / TLMP*y*) + LRTRDP)**  For all Load Zones except Direct Current Tie (DC Tie) Load Zones:  LZLMP *y* =  (RTLMP *b, y* \* SEL *b, y*) / SEL*b, y*  For a DC Tie Load Zone:  LZLMP *y* = RTLMP *b, y*  Where:  LRTRDP = (RNWF *y* \* RTRDPA *y*)  RNWF *y*= TLMP *y* / TLMP *y* |

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

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

For all Load Zones except DC Tie Load Zones:

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

For a DC Tie Load Zone:

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

SEL*b, y* = 1

Where:

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

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

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

The above variables are defined as follows:

|  |  |  |
| --- | --- | --- |
| Variable | Unit | Description |
| RTSPP | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Settlement Point, for the 15-minute Settlement Interval. |
| RTSPPEW | $/MWh | *Real-Time Settlement Point Price Energy-Weighted*⎯The Real-Time Settlement Point Price at the Settlement Point *p*, for the 15-minute Settlement Interval that is weighted by the state-estimated Load of the Load Zone of each SCED interval within the 15-minute Settlement Interval. |
| RTLMP *b, y* | $/MWh | *Real-Time Locational Marginal Price at bus per interval*⎯The Real-Time LMP at Electrical Bus *b* in the Load Zone, for the SCED interval *y*. |
| 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 Price Adder for On-Line Reserves 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. |
| LZWF *b, y* | none | *Load Zone Weighting Factor per bus per interval*⎯The weight used in the Load Zone Settlement Point Price calculation for Electrical Bus *b*, for the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| LZLMP *y* | $/MWh | *Load Zone Locational Marginal Price*⎯The Load Zone LMP for the Load Zone for the SCED interval *y*. |
| SEL *b, y* | MW | *State Estimator Load at bus per interval*⎯The Load value from State Estimator, including a calculated net Load value at each Private Use Network and adjustments to account for Distribution Generation Resource (DGR) and Distribution Energy Storage Resource (DESR) injections and withdrawals that are settled at a Resource Node, excluding Wholesale Storage Load (WSL) and Non-WSL Energy Storage Resource (ESR) Charging Load for Electrical Bus *b* in the Load Zone, for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |
| *b* | none | An Electrical Bus in the Load Zone. The summation is over all of the Electrical Buses in the Load Zone. |

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| [NPRR1010: Replace paragraph (2) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]  (2) For all Settlement calculations in which a 15-minute Real-Time Settlement Point Price for a Load Zone is required in order to perform Settlement for a 15-minute quantity that is represented as one value (the integrated value for the 15-minute interval) but varies with each SCED interval within the 15-minute Settlement Interval, an energy-weighted Real-Time Settlement Point Price shall be used and is calculated as follows:  **RTSPPEW = Max [-$251, ((RTLMP*b, y* \* LZWF *b, y*) + LRTRDP)]**  For all Load Zones except DC Tie Load Zones:  LZWF *b, y* = (SEL*b, y* \* TLMP *y*) **/** [(SEL*b, y* \* TLMP*y*)]  For a DC Tie Load Zone:  LZWF *b, y* = (SEL*b, y* \* TLMP *y*) **/** [(SEL*b, y* \* TLMP*y*)]  SEL*b, y* = 1  Where:  LRTRDP = (RNWF *y* \* RTRDPA *y*)  RNWF *y* = TLMP *y* /TLMP *y*  The above variables are defined as follows:   |  |  |  | | --- | --- | --- | | **Variable** | **Unit** | **Description** | | RTSPP | $/MWh | *Real-Time Settlement Point Price*⎯The Real-Time Settlement Point Price at the Settlement Point, for the 15-minute Settlement Interval. | | RTSPPEW | $/MWh | *Real-Time Settlement Point Price Energy-Weighted*⎯The Real-Time Settlement Point Price at the Settlement Point *p*, for the 15-minute Settlement Interval that is weighted by the state-estimated Load of the Load Zone of each SCED interval within the 15-minute Settlement Interval. | | RTLMP *b, y* | $/MWh | *Real-Time Locational Marginal Price at bus per interval*⎯The Real-Time LMP at Electrical Bus *b* in the Load Zone, for the SCED interval *y*. | | LRTRDP | $/MWh | *Locational Real-Time Reliability Deployment Price for Energy*⎯The Real-Time price for the 15-minute Settlement Interval at the Settlement Point, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | RTRDPA*y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy*⎯The Real-Time price adder that captures the impact of reliability deployments on energy prices at the Settlement Point for the SCED interval *y*. | | RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the Settlement Interval. | | LZWF *b, y* | none | *Load Zone Weighting Factor per bus per interval*⎯The weight used in the Load Zone Settlement Point Price calculation for Electrical Bus *b*, for the portion of the SCED interval *y* within the 15-minute Settlement Interval. | | LZLMP *y* | $/MWh | *Load Zone Locational Marginal Price*⎯The Load Zone LMP for the Load Zone for the SCED interval *y*. | | SEL *b, y* | MW | *State Estimator Load at bus per interval*⎯The Load value from State Estimator, including a calculated net Load value at each Private Use Network and adjustments to account for Distribution Generation Resource (DGR) and Distribution Energy Storage Resource (DESR) injections and withdrawals that are settled at a Resource Node, excluding Wholesale Storage Load (WSL) and Non-WSL Energy Storage Resource (ESR) Charging Load, for Electrical Bus *b* in the Load Zone, for the SCED interval *y*. | | TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. | | *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. | | *b* | none | An Electrical Bus in the Load Zone. The summation is over all of the Electrical Buses in the Load Zone. | |

6.6.3.1 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, consumed as WSL, or consumed as Non-WSL ESR Charging Load 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*) + (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*)

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*. |
| ESRNWSLTOT *q, p* | MWh | *ESR Non-WSL Total*—The total energy metered by the Settlement Meters which measures Non-WSL ESR Charging Load 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*. |
| MEBR *q, r, b* | MWh | *Metered Energy for Energy Storage Resource Load at Bus*—The energy metered by the Settlement Meter which measures Non-WSL ESR Charging Load 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. |
| 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 Non-WSL ESR Charging Load for each 15-minute Settlement Interval. |
| NMRTETOT *gsc* | MWh | *Net Meter Real-Time Energy Total*—The net sum for all Settlement Meters included in generation site code *gsc*. A positive value indicates an injection of power to the ERCOT System. |
| GSPLITPER *q, r, gsc, p* | none | *Generation Resource SCADA Splitting Percentage*—The generation allocation percentage for Resource *r* that is part of a net metering arrangement. GSPLITPER is calculated by taking the Supervisory Control and Data Acquisition (SCADA) values (GSSPLITSCA) for a particular Generation Resource *r* that is part of a net metering configuration and dividing by the sum of all SCADA values for all Resources that are included in the net metering configuration for each interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| *q* | none | A QSE. |
| *p* | none | A Resource Node Settlement Point. |
| *r* | none | A Generation Resource or a Controllable Load Resource that is part of an ESR that is located at the Facility with net metering. |
| *gsc* | none | A generation site code. |
| *b* | none | An Electrical Bus. |

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| [NPRR1014: Replace paragraph (2) above with the following upon system implementation:]  (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*) + (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*)  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*. | |  | | | | ESRNWSLTOT *q, p* | MWh | *ESR Non-WSL Total*—The total energy metered by the Settlement Meters which measures Non-WSL ESR Charging Load 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*. | |  | | | | MEBR *q, r, b* | MWh | *Metered Energy for Energy Storage Resource Load at Bus -* The energy metered by the Settlement Meter which measures Non-WSL ESR Charging Load 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. | |  | | | | 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 Non-WSL ESR Charging Load 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 ESR that is located at the Facility with net metering. | | *gsc* | none | A generation site code. | | *b* | none | An Electrical Bus. | |

(3) For a facility with Settlement Meters that measure 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 Non-WSL ESR Charging Load 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,** image001**BP *r, y*) \* TLMP *y*] /**

**[image010Max (0.001,** image001 **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 Non-WSL ESR Charging Load 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 Non-WSL ESR Charging Load for each 15-minute Settlement Interval. |
| RNWFL*b, y* | none | *Net meter Weighting Factor per interval for the Energy Metered as Energy Storage Resource Load*The weight factor used in net meter price calculation for meters in Electrical Bus *b*, for the SCED interval *y*, for the ESR Load associated with an ESR. The weighting factor used in the net meter price calculation shall not be recalculated after the fact due to revisions in the association of Resources to Settlement Meters. |
| RTRMPRESR*b* | $/MWh | *Real-Time Price for the Energy Metered as Energy Storage Resource Load at bus*⎯The Real-Time price for the Settlement Meter which measures ESR Load at Electrical Bus *b*, for the 15-minute Settlement Interval. |
| BP *r, y* | MW | *Base Point per Resource per interval* - The Base Point of Resource *r*, for the SCED interval *y*. |
| *q* | none | A QSE. |
| *gsc* | none | A generation site code. |
| *r* | none | The Controllable Load Resource that is part of an ESR. |
| *p* | none | A Resource Node Settlement Point. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |
| *b* | none | An Electrical Bus. |

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| [NPRR1010 and NPRR1014: Replace applicable portions of paragraph (3) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010; or upon system implementation for NPRR1014:]  (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 Non-WSL ESR Charging Load 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*) + (image010(RNWFL *b, y* \* RTRDMPA *b, y*) )]**  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*]**  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*. | |  |  |  | | RTRDMPA ***b, y*** | $/MWh | *Real-Time Reliability Deployment Price Adder for the Energy Metered* ⎯The Real-Time price adder that captures the impact of reliability deployments for the Settlement Meter at Electrical Bus *b*, for the SCED interval *y*. | |  |  |  | |  |  |  | | 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 Non-WSL ESR Charging Load 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 Non-WSL ESR Charging Load 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.

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,** **BP *r, y*) \* TLMP *y*] /**

**[image010Max (0.001,** **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 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 ESR Load. A positive value represents energy produced, and a negative value represents energy withdrawn. |
| *gsc* | none | A generation site code. |
| *r* | none | A Generation Resource that is located at the Facility with net metering. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |
| *b* | none | An Electrical Bus. |

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| [NPRR1010 and NPRR1014: Replace applicable portions of paragraph (4) above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010; or upon system implementation for NPRR1014:]  (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.  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*) + (image010(RNWF *b, y* \* RTRDMPA *b, y*) )]**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*]**  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* | $/MWh | *Real-Time Price for the Energy Metered for each Resource meter at bus*⎯The Real-Time price for the Settlement Meter at Electrical Bus *b*, for the 15-minute Settlement Interval. | | MEB *gsc, b* | MWh | *Metered Energy at bus*⎯The metered energy by the Settlement Meter which is not upstream from another Settlement Meter which measures ESR Load for the 15-minute Settlement Interval. A positive value represents energy produced, and a negative value represents energy withdrawn. | | ~~RTRDSPP~~*~~p~~* | ~~$/MWh~~ | *~~Real-Time Reliability Deployment Settlement Point Price for Energy~~*~~⎯The Real-Time price for the 15-minute Settlement Interval at Settlement Point~~ *~~p~~*~~, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time Reliability Deployment Price Adder for Energy.~~ | | RTRDMPA *b, y* | $/MWh | *Real-Time Reliability Deployment Price Adder for the Energy Metered* ⎯The Real-Time price adder that captures the impact of reliability deployments for the Settlement Meter at Electrical Bus b, for the SCED interval y. | |  |  |  | |  |  |  | | 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 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 SCADA Splitting Percentage for each Resource within a net metering arrangement for the 15-minute Settlement Interval is calculated as follows:

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

The above variables are defined as follows:

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

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| [NPRR1014: Replace paragraph (5) above with the following upon system implementation:]  (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. |

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

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

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

(b) Have either received a SCED Base Point equal to the Resource’s HDL override value or received a SCED Base Point less than the Resource’s output level at the time of the instruction but greater than or equal to the instructed operating level specified in the VDI, during the 15-minute Settlement Interval;

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

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

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

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

(iii) An explanation of the nature of the loss and how it was attributable to the HDL override or equivalent VDI issued by ERCOT; and

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

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

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

The payment shall be calculated as follows:

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

Where:

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

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

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| HDLOAL ***q, r, p, i*** | $ | *High Dispatch Limit override attested losses*—The financial loss to the QSE due to the HDL override as attested by the QSE in accordance with paragraph (1)(d) above. |
| HDLOEAMT ***q, r, p, i*** | $ | *High Dispatch Limit override energy amount per QSE per Generation Resource*—The payment to QSE *q* for an ERCOT-issued HDL override or equivalent VDI for Generation Resource *r* at Settlement Point *p* for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. |
| HDLOBRKP ***q, r, p, i*** | MW | *High Dispatch Limit override break point per QSE per Resource*—The point on the Energy Offer Curve corresponding to the lesser of the AVGHASL or the interception between the RTSPP of the Generation Resource *r* represented by QSE *q* minus the Real-Time Reserve Price for On-Line Reserves and the Real-Time On-Line Reliability Deployment Price and the Energy Offer Curve of Generation Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. |
| AVGHDL ***q, r, p, i*** | MW | *Average High Dispatch Limit per QSE per Settlement Point per Resource*—The time-weighted average of all 4-second HDL values calculated by the Resource Limit Calculator, subject to the maximum of the manual HDL override or equivalent VDI and the telemetered output or consumption, for the Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* within the 15-minute Settlement Interval *i*.  For a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. |
| AVGHASL ***q, r, p, i*** | MW | *Average High Ancillary Service Limit per QSE per Settlement Point per Resource*—The time-weighted average High Ancillary Service Limit (HASL) calculated every four seconds by the Resource Limit Calculator for the Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* within the 15-minute Settlement Interval *i*.  For a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. In the case of a VDI that is equivalent to an HDL override, this value is set equal to the HASL of Generation Resource or Controllable Load Resource *r* at the time that the VDI is issued to the QSE. |
| HDLOBRKPCP*q, r, p, i* | MW | *High Dispatch Limit override break point at clearing price per QSE per Resource*—The MW value on the Energy Offer Curve corresponding to the Real-Time Settlement Point Price of Generation Resource *r* represented by QSE *q* at Settlement Point *p* minus the Real-Time Reserve Price for On-Line Reserves and the Real-Time On-Line Reliability Deployment Price. For a combined cycle Resource, *r* is a Combined Cycle Train. |
| RTEOCOST *q, r, i* | $/MWh | Real-Time Energy Offer Curve Cost Cap—The Energy Offer Curve Cost Cap for Resource *r* represented by QSE *q*, for the Resource’s generation above the LSL for the Settlement Interval *i*. See Section 4.4.9.3.3, Energy Offer Curve Cost Caps. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| HDLOQTY *q, r, p, i* | MWh | *High Dispatch Limit override quantity per QSE per Generation Resource—*The difference between the HDLOBRKP and the AVGHDL due to an ERCOT-issued HDL override or equivalent VDI for Generation Resource *r* represented by QSE *q* at Settlement Point *p* for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. |
| RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. |
| RTRSVPOR *i* | $/MWh | *Real-Time Reserve Price for On-Line Reserves*⎯The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval *i*. |
| RTRDP *i* | $/MWh | *Real-Time On-Line Reliability Deployment Price*⎯The Real-Time price for the 15-minute Settlement Interval *i*, reflecting the impact of reliability deployments on energy prices that is calculated from the Real-Time On-Line Reliability Deployment Price Adder. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |
| *p* | none | A Resource Node Settlement Point. |
| *i* | none | A 15-minute Settlement Interval. |

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

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

The above variables are defined as follows:

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

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| [NPRR1010: Replace Section 6.6.3.6 above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]  **6.6.3.6 Real-Time High Dispatch Limit Override Energy Payment**  (1) If ERCOT directs a reduction in a Generation Resource’s real power output by employing a manual High Dispatch Limit (HDL) override, or issues a Verbal Dispatch Instruction (VDI) to a Generation Resource to adjust its operation to produce the same effect, and the reduction causes the QSE to suffer a demonstrable financial loss, the QSE may be eligible for a Real-Time High Dispatch Limit Override Energy Payment, as calculated below, upon providing documented proof of that loss. In order to qualify for this payment the QSE must:  (a) Have complied with ERCOT Dispatch Instructions to reduce real power output;  (b) Have either received a SCED Base Point equal to the Resource’s HDL override value or received a SCED Base Point less than the Resource’s output level at the time of the instruction but greater than or equal to the instructed operating level specified in the VDI, during the 15-minute Settlement Interval;  (c) Have incurred a demonstrable financial loss associated with variable cost components of DAM obligations or energy purchase or sale provisions of bilateral contracts (as opposed to lost opportunity costs), in consequence of the HDL override or VDI that had an equivalent effect; and  (d) File a timely Settlement and billing dispute, including the following items:  (i) An attestation signed by an officer or executive with authority to bind the QSE;  (ii) The dollar amount and calculation of the financial loss by Settlement Interval;  (iii) An explanation of the nature of the loss and how it was attributable to the HDL override or equivalent VDI issued by ERCOT; and  (iv) Sufficient documentation to support the QSE’s calculation of the amount of the financial loss.  (2) ERCOT may request additional supporting documentation or explanation with respect to the submitted materials within 15 Business Days of receipt. Additional information requested by ERCOT must be provided by the QSE within 15 Business Days of ERCOT’s request. ERCOT will provide Notice of its acceptance or rejection of the claim for the High Dispatch Limit Override Energy Payment within 15 Business Days of the updated submission.  (3) The Energy Offer Curve used to calculate the Real-Time High Dispatch Limit Override Energy Payment will be the most recent valid Energy Offer Curve received by ERCOT that was effective for the disputed interval(s) when the HDL override or equivalent VDI was issued. If no curve exists for the interval being disputed, ERCOT will use the most recent valid Energy Offer Curve received before the HDL override or equivalent VDI was issued for an interval prior to the disputed interval(s).  (4) The amount recoverable under this section shall be offset by any Ancillary Service Imbalance revenues received by the QSE that the QSE would not have earned had ERCOT not issued an HDL override.  The payment shall be calculated as follows:  **HDLOEAMT *q, r, p, i* = (-1) \* Min {HDLOAL *q, r, p, i,* Max(0, ((RTSPP *p, i* – LRTRDP *p, i* – RTEOCOST *q, r, i*) \* HDLOQTY *q, r, p, i*))}**  Where:  HDLOQTY *q, r, p, i* = Max(0, (¼ (HDLOBRKP *q, r, p, i* – AVGHDL *q, r, p, i*)))  HDLOBRKP *q, r, p, i* = Min(AVGHSL *q, r, p, i*, HDLOBRKPCP *q, r, p, i*)  The above variables are defined as follows:   | **Variable** | **Unit** | **Definition** | | --- | --- | --- | | HDLOAL ***q, r, p, i*** | $ | *High Dispatch Limit override attested losses*—The financial loss to the QSE due to the HDL override as attested by the QSE in accordance with paragraph (1)(d) above. | | HDLOEAMT ***q, r, p, i*** | $ | *High Dispatch Limit override energy amount per QSE per Generation Resource*—The payment to QSE *q* for an ERCOT-issued HDL override or equivalent VDI for Generation Resource *r* at Settlement Point *p* for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. | | HDLOBRKP ***q, r, p, i*** | MW | *High Dispatch Limit override break point per QSE per Resource*—The point on the Energy Offer Curve corresponding to the lesser of the AVGHSL or the interception between the RTSPP of the Generation Resource *r* represented by QSE *q* minus the Real-Time Reliability Deployment Price for Energy and the Energy Offer Curve of Generation Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. | | AVGHDL ***q, r, p, i*** | MW | *Average High Dispatch Limit per QSE per Settlement Point per Resource*—The time-weighted average of all 4-second HDL values calculated by the Resource Limit Calculator, subject to the maximum of the manual HDL override or equivalent VDI and the telemetered output or consumption, for the Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* within the 15-minute Settlement Interval *i*.  For a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. | | AVGHSL ***q, r, p, i*** | MW | *Average High Sustained Limit per QSE per Settlement Point per Resource*—The time-weighted average High Sustained Limit (HSL) for the Generation Resource or Controllable Load Resource *r* represented by QSE *q* at Settlement Point *p* within the 15-minute Settlement Interval *i*.  For a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train. In the case of a VDI that is equivalent to an HDL override, this value is set equal to the HSL of Generation Resource or Controllable Load Resource *r* at the time that the VDI is issued to the QSE. | | HDLOBRKPCP*q, r, p, i* | MW | *High Dispatch Limit override break point at clearing price per QSE per Resource*—The MW value on the Energy Offer Curve corresponding to the Real-Time Settlement Point Price of Generation Resource *r* represented by QSE *q* at Settlement Point *p* minus the Real-Time Reliability Deployment Price for Energy. For a combined cycle Resource, *r* is a Combined Cycle Train. | | RTEOCOST *q, r, i* | $/MWh | *Real-Time Energy Offer Curve Cost Cap—*The Energy Offer Curve Cost Cap for Resource *r* represented by QSE *q*, for the Resource’s generation above the Low Sustained Limit (LSL) for the Settlement Interval *i*. See Section 4.4.9.3.3, Energy Offer Curve Cost Caps. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. | | HDLOQTY *q, r, p, i* | MWh | *High Dispatch Limit override quantity per QSE per Generation Resource—*The difference between the HDLOBRKP and the AVGHDL due to an ERCOT-issued HDL override or equivalent VDI for Generation Resource *r* represented by QSE *q* at Settlement Point *p* for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. | | RTSPP *p, i* | $/MWh | *Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price at Settlement Point *p*, for the 15-minute Settlement Interval *i*. | | LRTRDP *p, i* | $/MWh | *Locational Real-Time Reliability Deployment Price* *for Energy*⎯The Real-Time price for the 15-minute Settlement Interval *i* at Settlement Point *p*, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time Reliability Deployment Price Adder for Energy. | | *q* | none | A QSE. | | *r* | none | A Generation Resource. | | *p* | none | A Resource Node Settlement Point. | | *i* | none | A 15-minute Settlement Interval. |   (5) The total compensation to each QSE for an HDL override for the 15-minute Settlement Interval is calculated as follows:  **HDLOEAMTQSETOT *q, i*  = HDLOEAMT *q, r, p, i***  The above variables are defined as follows:   | **Variable** | **Unit** | **Definition** | | --- | --- | --- | | HDLOEAMT *q, r, p, i* | $ | *High Dispatch Limit override energy amount per QSE per Generation Resource*—The payment to QSE *q* for an ERCOT-issued HDL override or equivalent VDI for Generation Resource *r* at Settlement Point *p* for the 15-minute Settlement Interval *i*. For a combined cycle Resource, *r* is a Combined Cycle Train. | | HDLOEAMTQSETOT *q, i* | $ | *High Dispatch Limit override energy amount QSE total per QSE*—The total of the energy payments to QSE *q* as compensation for HDL overrides for this QSE for the 15-minute Settlement Interval *i*. | | *q* | none | A QSE. | | *r* | none | A Generation Resource. | | *p* | none | A Resource Node Settlement Point. | | *i* | none | A 15-minute Settlement Interval. | |

**6.6.3.8 Real-Time Payment or Charge for Energy from a Settlement Only Distribution Generator (SODG) or a Settlement Only Transmission Generator (SOTG)**

(1) The payment or charge to each QSE for energy from an SODG or an SOTG shall be based on an identified nodal energy price, RTESOGPR, as described in this subsection, with the following exceptions:

(a) An SODG or SOTG that has opted out of nodal pricing as described in paragraph (5) below; or

(b) Any site with one or more ESS SODGs or SOTGs where the ESS capacity constitutes more than 50% of the site’s total SOG nameplate capacity.

(2) For an SODG, the price used as the basis for the 15-minute Real-Time price calculation is the time-weighted price at the Electrical Bus associated with this mapped Load in the Network Operations Model. For an SOTG, the price used as the basis for the 15-minute Real-Time price calculation is the time-weighted price at the Electrical Bus as determined by ERCOT in review of the meter location of the SOTG in the Network Operations Model. SODG and SOTG sites will be represented as a single unit in the ERCOT Settlement system.

(3) For an SODG or an SOTG, the total payment or charge for each 15-minute Settlement Interval shall be calculated as follows:

MEBSOGNET *q,* *gsc* = Max(0, MEBSOG *q, gsc, b*)

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

The Load 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.

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

**RTESOGSAMT *q,* *gsc* = (-1) \* [( RTESOGPR *b* \* MEBSOG *q, gsc, b*)]**

Where the price for the SOTG or SODG is determined as follows:

**RTESOGPR *b* = Max [-$251, ((SDWF *y* \* RTLMP *b, y*) + RTRSVPOR + RTRDP)]**

Where:

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

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

SDWF *y* = TLMP *y* / TLMP *y*

The above variables are defined as follows:

| **Variable** | **Unit** | **Description** |
| --- | --- | --- |
| RTESOGSAMT*q,**gsc* | $ | *Real-Time Energy for SODG and SOTG Site Amount* —The total payment or charge to QSE *q* for SODG or SOTG site *gsc* for the 15-minute Settlement Interval. |
| RTESOGPR *b* | $/MWh | *Real-Time Price for the Energy Metered for each SODG or SOTG Site* ⎯The Real-Time price at Electrical Bus *b* for the Settlement Meter for the SODG or SOTG site for the 15-minute Settlement Interval. |
| MEBSOGNET *q, gsc* | MWh | *Net Metered energy at gsc for an SODG or SOTG Site* ⎯The net sum for all Settlement Meters for SODG or SOTG site *gsc* represented by QSE *q*. A positive value indicates an injection of power to the ERCOT System. |
| MEBSOG *q,* *gsc, b* | MWh | *Metered energy at bus for an SODG or SOTG Site* ⎯The metered energy by the Settlement Meter(s) at Electrical Bus *b* for SODG or SOTG site *gsc* represented by QSE *q*. A positive value represents energy produced, and a negative value represents energy consumed. |
| 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*. |
| SDWF *y* | None | *SCED Duration Weighting Factor per interval*⎯The weight used in the SODG or SOTG price calculation for the portion of the SCED interval *y* within the Settlement Interval. |
| RTLMP *b, y* | $/MWh | *Real-Time Locational Marginal Price at bus per interval*⎯The Real-Time LMP at Electrical Bus *b*, for the SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the SCED interval *y* within the Settlement Interval. |
| *gsc* | none | A generation site code. |
| *b* | none | An Electrical Bus. |
| *y* | None | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |

(4) The total net payments and charges to each QSE for energy from SODGs and SOTGs for the 15-minute Settlement Interval is calculated as follows:

**RTESOGAMTQSETOT *q* = RTESOGSAMT *q, gsc***

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| RTESOGAMTQSETOT *q* | $ | *Real-Time Energy Payment or Charge per QSE for Energy from SODGs and SOTGs* —The payment or charge to QSE *q* for Real-Time energy from SODGs and SOTGs, for the 15-minute Settlement Interval. |
| RTESOGSAMT *q, gsc* | $ | *Real-Time Energy for SODG and SOTG Site Amount* —The total payment or charge to QSE *q* for an SODG or SOTG site *gsc* for the 15-minute Settlement Interval. |
| *q* | none | A QSE. |
| *gsc* | none | A generation site code. |

(5) Notwithstanding anything else in this Section except paragraphs (6) and (7) below, a Resource Entity may opt out of nodal pricing and continue Load Zone Settlement for any SODG or SOTG if, by January 1, 2019, the SODG or SOTG was operational or was subject to a Power Purchase or Tolling Agreement (PPA) or Transmission and/or Distribution Service Provider (TDSP) interconnection agreement, or had an executed agreement with a developer. By December 31, 2019, the Resource Entity must submit a properly completed Section 23, Form N, Pricing Election for Settlement Only Distribution Generators and Settlement Only Transmission Generators. Any SODG or SOTG relying on a PPA or TDSP interconnection agreement or agreement with a developer must also have achieved Initial Synchronization for the full Resource capacity before June 1, 2020 to be eligible to opt out of nodal pricing. A Resource Entity must provide ERCOT documented proof of any PPA, TDSP interconnection agreement, or developer agreement that it relies on as a basis for any election under this paragraph. This election is valid through the earlier of December 31, 2029 or the date on which the election is revoked pursuant to paragraph (8) of this Section. On January 1, 2030, all SODGs and SOTGs will be subject to nodal pricing.

(6) For any SODG or SOTG for which the applicable Resource Entity has elected to opt out of nodal pricing, ERCOT shall settle the output of the SODG or SOTG using the Load Zone Settlement Point Price for the duration of the opt-out period so long as the SODG or SOTG is not physically modified for any purpose, including to increase the capacity of the unit or change the fuel type of the unit, except as necessary for routine maintenance or repairs to address normal wear and tear.

(7) If at any time ERCOT determines that the SODG or SOTG fails to meet the opt-out conditions in paragraph (6) above, ERCOT shall settle the output of the SODG or SOTG at the applicable nodal price as soon as practicable after providing written notice to the affected Resource Entity.

(8) A Resource Entity that has opted out of nodal pricing for one or more SODGs or SOTGs pursuant to paragraph (5) of this Section may withdraw that election and begin receiving applicable nodal pricing for one or more such generators by submitting a properly completed election form (Section 23, Form N). An election of nodal pricing is irrevocable. ERCOT will effectuate the transition of an SODG or SOTG to nodal pricing in ERCOT Settlement systems as soon as practicable.

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| [NPRR995 and NPRR1010: Replace applicable portions of Section 6.6.3.8 above with the following upon system implementation for NPRR995; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010:]  6.6.3.8 Real-Time Payment or Charge for Energy from a Settlement Only Distribution Generator (SODG), Settlement Only Transmission Generator (SOTG), Settlement Only Distribution Energy Storage System (SODESS), or Settlement Only Transmission Energy Storage System (SOTESS)  (1) The payment or charge to each QSE for energy from an SODG, SOTG, SODESS, or SOTESS shall be based on an identified nodal energy price, RTESOPR, as described in this subsection, with the exception of an SODG or SOTG that has opted out of nodal pricing as described in paragraph (7) below.  (2) For an SODG or an SODESS, the price used as the basis for the 15-minute Real-Time price calculation is the time-weighted price at the Electrical Bus associated with this mapped Load in the Network Operations Model. For an SOTG or an SOTESS, the price used as the basis for the 15-minute Real-Time price calculation is the time-weighted price at the Electrical Bus as determined by ERCOT in review of the meter location of the SOTG or SOTESS in the Network Operations Model. Load that is not WSL will be included in the Real-Time AML per QSE. Each SODG, SOTG, SODESS, and SOTESS site will be represented as a single unit in the ERCOT Settlement system.  (3) For an SODG, SOTG, SODESS, or SOTESS, the total payment or charge for each 15-minute Settlement Interval shall be calculated as follows:  MEBSOGNET *q,* *gsc* = Max(0, MEBSOG *q, gsc, b*)  If MEBSOGNET *q, gsc* = 0 for a 15-minute Settlement Interval, then  The Load is included in the Real-Time AML per QSE, excluding WSL.  Otherwise, when MEBSOGNET *q, gsc* > 0 for a 15-minute Settlement Interval, then  RTGSOAMT *q,* *gsc* = (-1) \* [(RTESOPR *b* \* MEBSOG *q, gsc, b*)]  (4) For an SODESS or SOTESS, the total payment or charge for each 15-minute Settlement Interval shall be calculated as follows:  **RTWSLSOAMT *q, gsc* = (-1) \* [(RTESOPR *b* \* WSOL *q, gsc, b*)]**  **RTNWSLSOAMT *q, gsc*= (-1) \* [(RTESOPR *b* \* NWSOL *q, gsc, b*)]**  (5) The price for the SOTG, SODG, SODESS, or SOTESS is determined as follows:  RTESOPR *b* = Max [-$251, ((SDWF *y* \* RTLMP *b, y*) + (SDWF *y* \* RTRDMPA *b, y*))]  The above variables are defined as follows:   | Variable | Unit | Description | | --- | --- | --- | | RTGSOAMT*q,**gsc* | $ | *Real-Time Generation for SODG, SOTG, SODESS, or SOTESS Site Amount* —The total payment or charge for generation to QSE *q* for SODG, SOTG, SODESS, or SOTESS site *gsc* for the 15-minute Settlement Interval. | | RTWSLSOAMT*q,**gsc* | $ | *Real-Time WSL for SODESS or SOTESS Site Amount* —The total payment or charge for WSL to QSE *q* for the SODESS or SOTESS site *gsc* for the 15-minute Settlement Interval. | | RTNWSLSOAMT*q,**gsc* | $ | *Real-Time Non-WSL for SODESS or SOTESS Site Amount* —The total payment or charge for Non-WSL Settlement Only Charging Load to QSE *q* for the SODESS or SOTESS site *gsc* for the 15-minute Settlement Interval. | | RTESOPR *b* | $/MWh | *Real-Time Price for the Energy Metered for each SODG, SOTG, SODESS, or SOTESS Site* ⎯The Real-Time price at Electrical Bus *b* for the Settlement Meter for the SODG, SOTG, SODESS*,* or SOTESS site for the 15-minute Settlement Interval. | | MEBSOGNET *q, gsc* | MWh | *Net Metered energy at gsc for an SODG, SOTG, SODESS or SOTESS Site* ⎯The net sum for all Settlement Meters for SODG, SOTG, SODESS, or SOTESS site *gsc* represented by QSE *q*. A positive value indicates an injection of power to the ERCOT System. | | MEBSOG *q,* *gsc, b* | MWh | *Metered energy at bus for an SODG, SOTG, SODESS, or SOTESS Site* ⎯The metered energy by the Settlement Meter(s) at Electrical Bus *b* for SODG, SOTG, SODESS*,* orSOTESS site *gsc* represented by QSE *q* for the 15-minute Settlement Interval. A positive value represents energy produced, and a negative value represents energy consumed. | | WSOL *q, gsc, b* | MWh | *WSL for an SODESS or SOTESS Site*⎯The WSL as measured for an SODESS or SOTESS site *gsc* at Electrical Bus *b*, represented by QSE *q,* represented as a negative value, for the 15-minute Settlement Interval. | | NWSOL *q, gsc, b* | MWh | *Non-WSL Settlement Only Charging Load for an SODESS or SOTESS Site*⎯The Non-WSL Settlement Only Charging Load as measured for an SODESS or SOTESS site *gsc* at Electrical Bus *b*, represented by QSE *q,* represented as a negative value, for the 15-minute Settlement Interval. | |  |  |  | | RTRDMPA ***b, y*** | $/MWh | *Real-Time Reliability Deployment Price Adder for the Energy Metered* ⎯The Real-Time price adder that captures the impact of reliability deployments for the Settlement Meter at Electrical Bus *b*, for the SCED interval *y*. | |  |  |  | | SDWF *y* | None | *SCED Duration Weighting Factor per interval* ⎯The weight used in the SODG, SOTG, SODESS, or SOTESS price calculation for the portion of the SCED interval *y* within the Settlement Interval. | | RTLMP *b, y* | $/MWh | *Real-Time Locational Marginal Price at bus per interval* ⎯The Real-Time LMP at Electrical Bus *b*, for the SCED interval *y*. | | TLMP *y* | second | *Duration of SCED interval per interval* ⎯The duration of the SCED interval *y* within the Settlement Interval. | | *gsc* | none | A generation site code. | | *b* | none | An Electrical Bus. | | *y* | None | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |   (6) The total net payments and charges to each QSE for energy from SODGs, SOTGs, SODESSs, or SOTESSs for the 15-minute Settlement Interval is calculated as follows:  RTESOAMTQSETOT *q* = (RTGSOAMT *q, gsc* + RTWSLSOAMT *q, gsc*+ RTNWSLSOAMT *q, gsc*)  The above variables are defined as follows:   | Variable | Unit | Definition | | --- | --- | --- | | RTESOAMTQSETOT *q* | $ | *Real-Time Energy Payment or Charge per QSE for SODGs, SOTGs, SODESSs, or SOTESSs* —The payment or charge to QSE *q* for Real-Time energy from SODGs, SOTGs, SODESSs, or SOTESSs, for the 15-minute Settlement Interval. | | RTGSOAMT *q, gsc* | $ | *Real-Time Generation for SODG, SOTG, SODESS, or SOTESS Site Amount* —The total payment or charge for generation to QSE *q* for SODG, SOTG, SODESS, or SOTESS site *gsc* for the 15-minute Settlement Interval. | | RTWSLSOAMT*q,**gsc* | $ | *Real-Time WSL for SODESS or SOTESS Site Amount* —The total payment or charge for WSL to QSE *q* for the SODESS or SOTESS site *gsc* for the 15-minute Settlement Interval. | | RTNWSLSOAMT*q,**gsc* | $ | *Real-Time Non-WSL for SODESS or SOTESS Site Amount* —The total payment or charge for Non-WSL Settlement Only Charging Load to QSE *q* for the SODESS or SOTESS site *gsc* for the 15-minute Settlement Interval. | | *q* | none | A QSE. | | *gsc* | none | A generation site code. |   (7) Notwithstanding anything else in this Section except paragraphs (8) and (9) below, a Resource Entity may opt out of nodal pricing and continue Load Zone Settlement for any SODG or SOTG if, by January 1, 2019, the SODG or SOTG was operational or was subject to a Power Purchase or Tolling Agreement (PPA) or Transmission and/or Distribution Service Provider (TDSP) interconnection agreement, or had an executed agreement with a developer. By December 31, 2019, the Resource Entity must submit a properly completed Section 23, Form N, Pricing Election for Settlement Only Distribution Generators and Settlement Only Transmission Generators. Any SODG or SOTG relying on a PPA or TDSP interconnection agreement or agreement with a developer must also have achieved Initial Synchronization for the full Resource capacity before June 1, 2020 to be eligible to opt out of nodal pricing. A Resource Entity must provide ERCOT documented proof of any PPA, TDSP interconnection agreement, or developer agreement that it relies on as a basis for any election under this paragraph. This election is valid through the earlier of December 31, 2029 or the date on which the election is revoked pursuant to paragraph (10) of this Section. On January 1, 2030, all SODGs and SOTGs will be subject to nodal pricing.  (8) For any SODG or SOTG for which the applicable Resource Entity has elected to opt out of nodal pricing, ERCOT shall settle the output of the SODG or SOTG using the Load Zone Settlement Point Price for the duration of the opt-out period so long as the SODG or SOTG is not physically modified for any purpose, including to increase the capacity of the unit or change the fuel type of the unit, except as necessary for routine maintenance or repairs to address normal wear and tear.  (9) If at any time ERCOT determines that the SODG or SOTG fails to meet the opt-out conditions in paragraph (8) above, ERCOT shall settle the output of the SODG or SOTG at the applicable nodal price as soon as practicable after providing written notice to the affected Resource Entity.  (10) A Resource Entity that has opted out of nodal pricing for one or more SODGs or SOTGs pursuant to paragraph (7) of this Section may withdraw that election and begin receiving applicable nodal pricing for one or more such generators by submitting a properly completed election form (Section 23, Form N). An election of nodal pricing is irrevocable. ERCOT will effectuate the transition of an SODG or SOTG to nodal pricing in ERCOT Settlement systems as soon as practicable. |

***6.7.5 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 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, represented by the QSE for the 15-minute Settlement Interval;

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| ***[NPRR987: Replace paragraph (a) above with the following upon system implementation:]***  (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, the telemetered consumption from Load Resources with a validated Ancillary Service Schedule for ECRS or RRS controlled by high-set under-frequency relay or Non-Spin, and the capacity from Controllable Load Resources available to SCED;

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| ***[NPRR987: 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 or Non-Spin, 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, ECRS, RRS and Non-Spin for 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, ONHOLD, 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 Resources telemetering both STARTUP Resource Status and greater than zero Non-Spin Ancillary Service Responsibility.

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| ***[NPRR987: Replace paragraph (c) above with the following upon system implementation:]***  (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) ESRs. |

(4) Reliability Must-Run (RMR) Units and Reliability Unit Commitment (RUC) Resources On-Line during the hour due to an ERCOT instruction will be excluded from the amounts calculated for the 15-minute Settlement Interval pursuant to paragraphs (2)(a), (b), and (c) above, except for:

(a) Those RUC Resources that had a Three-Part Supply Offer cleared in the DAM for the hour;

(b) 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;

(c) 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, Reliability Unit Commitment (RUC) Process; or

(d) Any RUC Resource committed by a RUC Dispatch Instruction where that Resource’s QSE subsequently opted out of RUC Settlement pursuant to paragraph (14) of Section 5.5.2.

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| ***[NPRR885: Replace 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 will be excluded from the amounts calculated for the 15-minute Settlement Interval pursuant to paragraphs (2)(a), (b), and (c) above except for:  (a) Those RUC Resources that had a Three-Part Supply Offer cleared in the DAM for the hour;  (b) 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;  (c) 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, Reliability Unit Commitment (RUC) Process; or  (d) Any RUC Resource committed by a RUC Dispatch Instruction where that Resource’s QSE subsequently opted out of RUC Settlement pursuant to paragraph (14) of Section 5.5.2. |

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

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| ***[NPRR987: Replace paragraph (6) above with the following upon system implementation:]***  (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* – RTNCLRNSRESP *q* – RTRMRRESP *q*]

Where:

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

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

RTNCLRNSRESP *q* =  SYS\_GEN\_DISCFACTOR \* RTNCLRNSRESPR *q, r, p*

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*)) + RTCLRCAP *q* + RTNCLRCAP *q*

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| ***[NPRR987: Replace the formula “RTOLCAP q” above with the following upon system implementation:]***  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), (RTNCLRECRS *q +* RTNCLRRRS *q*)\* 1.5)

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

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*

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| ***[NPRR987: Insert the language below upon system implementation:]***  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* + RTCLRREG *q*

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

RTCLRLPC *q* = SYS\_GEN\_DISCFACTOR \* RTCLRLPCR ***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* + RTNCLRNSRESP *q*)

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

RTNCLRNSCAP *q* = Min(Max(RTNCLRNPC *q* – RTNCLRLPC *q*, 0.0), RTNCLRNS *q* \* 1.5)

RTNCLRNS *q* = SYS\_GEN\_DISCFACTOR \* RTNCLRNSR *q, r, p*

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

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

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

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| ***[NPRR987: Insert the language below upon system implementation:]***  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. |
| 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*. |
| RNWF *y* | none | *Resource Node Weighting Factor per interval*⎯The weight used in the Resource Node Settlement Point Price calculation for the portion of the SCED interval *y* within the 15-minute Settlement Interval. |
| RTRSVPOR | $/MWh | *Real-Time Reserve Price for On-Line Reserves*⎯The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval. |
| RTRSVPOFF | $/MWh | *Real-Time Reserve Price for Off-Line Reserves*⎯The Real-Time Reserve Price for Off-Line Reserves for the 15-minute Settlement Interval. |
| RTOLCAP *q* | MWh | *Real-Time On-Line Reserve Capacity for the QSE*⎯The Real-Time reserve capacity of On-Line Resources available for the QSE *q*, for the 15-minute Settlement Interval. |
| RTOLHSLRA *q, r, p* | MWh | *Real-Time Adjusted On-Line High Sustained Limit for the Resource*⎯The Real-Time telemetered HSL for the Resource *r* represented by QSE *q* at Resource Node *p* that is available to SCED, integrated over the 15-minute Settlement Interval, and adjusted pursuant to paragraphs (3) and (4) above. |
| RTOLHSL *q* | MWh | *Real-Time On-Line High Sustained Limit for the QSE*⎯The Real-Time telemetered HSL for all Generation Resources available to SCED, pursuant to paragraphs (3) and (4) above, integrated over the 15-minute Settlement Interval for the QSE *q*, discounted by the system-wide discount factor.   |  | | --- | | ***[NPRR987: Replace the description above with the following upon system implementation:]***  *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, ECRS, RRS and Non-Spin pursuant to Section 4.4.7.4, Ancillary Service Supply Responsibility, for the QSE *q*, for the 15-minute Settlement Interval. |
| RTCLRCAP *q* | MWh | *Real-Time Capacity from Controllable Load Resources for the QSE*—The Real-Time capacity and Reg-Up minus Non-Spin available from all Controllable Load Resources available to SCED for the QSE *q*, integrated over the 15-minute Settlement Interval.   |  | | --- | | ***[NPRR987: Replace the description above with the following upon system implementation:]***  *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 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. |
| 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 ECRS, RRS, or Non-Spin 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 ECRS, RRS, or Non-Spin 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 ECRS, RRS, or Non-Spin 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 ECRS, RRS, or Non-Spin Ancillary Service Schedule integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. |
| RTNCLRNSCAP ***q*** | MWh | *Real-Time Capacity from Non-Controllable Load Resources carrying Non-Spin for the QSE*—The Real-Time capacity for all Load Resources that are not Controllable Load Resources and that have a validated Real-Time Non-Spin Ancillary Service Schedule for the QSE *q*, integrated over the 15-minute Settlement Interval. |
| RTNCLRNSR *q, r, p* | MWh | *Real-Time Non-Spin Schedule for the Non-Controllable Load Resource ⎯*The validated Real-Time telemetered Non-Spin Ancillary Service Schedule for the Load Resource *r* that is not a Controllable Load Resources represented by QSE *q* at Resource Node *p*, integrated over the 15-minute Settlement Interval. |
| RTNCLRNS *q* | MWh | *Real-Time Non-Spin Schedule for Non-Controllable Load Resources for the QSE*⎯The Real-Time telemetered Non-Spin Ancillary Service Schedule for all Load Resources that are not Controllable Load Resources for the QSE *q*, integrated over the 15-minute Settlement Interval discounted by the system-wide discount factor. |
| RTNCLRNSRESP *q* | MWh | *Real-Time Non-Controllable Load Resource Non-Spin Responsibility for the QSE*⎯The Real Time telemetered Non-Spin Ancillary Service Supply Responsibility for all Load Resources that are not Controllable Load Resources discounted by the system-wide discount factor for the QSE *q*, integrated over the 15-minute Settlement Interval. |
| RTNCLRNSRESPR *q, r, p* | MWh | *Real-Time Non-Controllable Load Resource Non-Spin Responsibility for the Resource*⎯The Real-Time telemetered Non-Spin Ancillary Service Resource Responsibility for the Load Resource *r* that is not a Controllable Load Resource represented by QSE *q* at Resource Node *p* integrated over the 15-minute Settlement Interval. |
| RTCLRNPCR *q, r, p* | MWh | *Real-Time Net Power Consumption from the Controllable Load Resource—*The Real-Time net real power consumption from the Controllable Load Resource *r* represented by QSE *q* at Resource Node *p* available to SCED integrated over the 15-minute Settlement Interval.   |  | | --- | | ***[NPRR987: Replace the description above with the following upon system implementation:]***  *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 available to SCED integrated over the 15-minute Settlement Interval for the QSE *q* discounted by the system-wide discount factor.   |  | | --- | | ***[NPRR987: Replace the description above with the following upon system implementation:]***  *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 *r* represented by QSE *q* at Resource Node *p* available to SCED integrated over the 15-minute Settlement Interval.   |  | | --- | | ***[NPRR987: Replace the description above with the following upon system implementation:]***  *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 available to SCED integrated over the 15-minute Settlement Interval for the QSE *q* discounted by the system-wide discount factor.   |  | | --- | | ***[NPRR987: Replace the description above with the following upon system implementation:]***  *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 available to SCED 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 not available to SCED *r* represented by QSE *q* at Resource Node *p* with Primary Frequency Response, integrated over the 15-minute Settlement Interval. |
| RTMGA *q, r, p* | MWh | *Real-Time Adjusted Metered Generation per QSE per Settlement Point per Resource*—The adjusted metered generation, pursuant to paragraphs (3) and (4) above, of Generation Resource *r* represented by QSE *q* at Resource Node *p* in Real-Time for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| RTMGQ *q* | MWh | *Real-Time Metered Generation per QSE*—The metered generation, discounted by the system-wide discount factor, of all generation Resources represented by QSE *q* in Real-Time for the 15-minute Settlement Interval, pursuant to paragraphs (3) and (4) above.   |  | | --- | | ***[NPRR987: Replace the description above with the following upon system implementation:]***  *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. | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | ***[NPRR987: Insert the variables “RTESRCAPR q, g, p”, “RTESRCAP q”, “SOCT q, r”, and “SOCOM q, r” below upon system implementation:]***   |  |  |  | | --- | --- | --- | | 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.   |  | | --- | | ***[NPRR1069: Replace the description above with the following upon system implementation of NPRR987:]***  *Real-Time Off-Line Reserve Capacity for the QSE*⎯The Real-Time reserve capacity of Off-Line Resources, not including modeled Generation Resources associated with ESRs, 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.   |  | | --- | | ***[NPRR1069: Replace the description above with the following upon system implementation of NPRR987:]***  *Real-Time Generation Resources with Cold Start Available in 30 Minutes*⎯The Real-Time telemetered HSLs of Generation Resources, excluding Intermittent Renewable Resources (IRRs) and modeled Generation Resources associated with ESRs, 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 Off-Line Generation Resources that have telemetered an OFFNS Resource Status for the QSE *q*, time-weighted over the 15-minute Settlement Interval.   |  | | --- | | ***[NPRR1069: Replace the description above with the following upon system implementation of NPRR987:]***  *Real-Time Generation Resources with Off-Line Non-Spin Schedule*⎯The Real-Time telemetered HSLs of Off-Line Generation Resources, not including modeled Generation Resources associated with ESRs, 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.   |  | | --- | | ***[NPRR1069: Replace the description above with the following upon system implementation of NPRR987:]***  *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, not including modeled Generation Resources associated with ESRs, 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. |
| 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 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, 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, 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.* |
| 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, 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. |
| 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. |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | ***[NPRR987: Insert the variables “UPESR q, r, p” and “UPESRA q, r, p” below upon system implementation:]***   |  |  |  | | --- | --- | --- | | 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. |
| |  |  |  |  | | --- | --- | --- | --- | | ***[NPRR987: Insert the variable “g” below upon system implementation:]***   |  |  |  | | --- | --- | --- | | *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 (14) 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. |
| 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, ECRS, RRS, and Non-Spin for all RUC Resources that have opted out per paragraph (14) 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, 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. |
| *q* | none | A QSE. |
| *r* | none | A Generation Resource. |

|  |
| --- |
| ***[NPRR1010: Replace Section 6.7.5 above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]***  ***6.7.5 Real-Time Ancillary Service Charges and Payments*** |

***6.7.6 Real-Time Ancillary Service Imbalance Revenue Neutrality Allocation***

(1) The total cost for Ancillary Service Imbalance payments and charges associated with ORDC and reliability deployments is allocated to the QSEs representing Load based on Load Ratio Share (LRS). The Real-Time Ancillary Service imbalance revenue neutrality allocations to each QSE for a given 15-minute Settlement Interval are calculated as follows:

**LAASIRNAMT *q*= (-1) \* [(RTASIAMTTOT + RTRUCRSVAMTTOT) \* LRS *q*]**

**LARDASIRNAMT *q*= (-1) \* [(RTRDASIAMTTOT + RTRDRUCRSVAMTTOT) \* LRS *q*]**

Where:

RTASIAMTTOT = RTASIAMT *q*

RTRUCRSVAMTTOT =  RTRUCRSVAMT *q*

RTRDASIAMTTOT = RTRDASIAMT *q*

RTRDRUCRSVAMTTOT=  RTRDRUCRSVAMT *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| LAASIRNAMT *q* | $ | *Load-Allocated Ancillary Service Imbalance Revenue Neutrality Amount per QSE*—The QSE *q*’s share of the total Real-Time Ancillary Service imbalance revenue neutrality amount associated with ORDC for the 15-minute Settlement Interval. |
| RTASIAMTTOT | $ | *Real-Time Ancillary Service Imbalance Market Total Amount*—The total payment or charge to all QSEs for the Real-Time Ancillary Service imbalance associated with ORDC for each 15-minute Settlement Interval. |
| 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 ORDC for each 15-minute Settlement Interval. |
| RTRUCRSVAMTTOT | $ | *Real-Time RUC Ancillary Service Reserve Market Total Amount*—The total payment to all QSEs for the Real-Time RUC Ancillary Service reserve payments associated with ORDC for each 15-minute Settlement Interval. |
| 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. |
| LRS *q* | none | The LRS calculated for QSE *q* for the 15-minute Settlement Interval. See Section 6.6.2.2, QSE Load Ratio Share for a 15-Minute Settlement Interval. |
| *q* | none | A QSE. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***[NPRR1010: Replace Section 6.7.6 above with the following upon system implementation of the Real-Time Co-Optimization (RTC) project:]***  ***6.7.6 Real-Time Ancillary Service Revenue Neutrality Allocation***  (1) The total cost for Real-Time Ancillary Service payments and charges is allocated to the QSEs representing Load based on Load Ratio Share (LRS). The Real-Time Ancillary Service allocations to each QSE for a given 15-minute Settlement Interval are calculated as follows:  (a) For Reg-Up:  LARTRUAMT *q* = (-1) \* (RTRUIMBAMTTOT + RTRUOAMTTOT +  RTRUTOAMTTOT) \* LRS *q*  Where:  RTRUIMBAMTTOT =  (RTRUIMBAMT *q*)  RTRUOAMTTOT =  (RTRUOAMT *q*)  RTRUTOAMTTOT =  (RTRUTOAMT *q*)  The above variables are defined as follows:   | Variable | **Unit** | **Description** | | --- | --- | --- | | LARTRUAMT *q* | $ | *Load-Allocated Real-Time Reg-Up Amount for the QSE*— The QSE *q*­’s share of the total Real-Time Reg-Up amount for the 15-minute Settlement Interval. | | RTRUIMBAMT *q* | $ | *Real-Time Reg-Up Imbalance Amount for the QSE -* The total payment or charge to QSE *q* for the Real-Time Reg-Up imbalance for each 15-minute Settlement Interval. | | RTRUOAMT *q* | $ | *Real-Time Reg-Up Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Up only awards for each 15-minute Settlement Interval. | | RTRUIMBAMTTOT | $ | *Real-Time Reg-Up Imbalance Market Total Amount -* The total payment or charge to all QSEs for the Real-Time Reg-Up imbalance for each 15-minute Settlement Interval. | | RTRUOAMTTOT | $ | *Real-Time Reg-Up Only Market Total Amount -* The total charge to all QSEs in Real-Time for Reg-Up only awards for each 15-minute Settlement Interval. | | RTRUTOAMT *q* | $ | *Real-Time Reg-Up Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Up trade overages for each 15-minute Settlement Interval. | | RTRUTOAMTTOT | $ | *Real-Time Reg-Up Trade Overage Total Amount* — The total charge to all QSEs for Real-Time Reg-Up trade overages for each 15-minute Settlement Interval. | | LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2, QSE Load Ratio Share for a 15-Minute Settlement Interval, for QSE *q* for the 15-minute Settlement Interval. | | *q* | none | A QSE. |   (b) For Reg-Down:  LARTRDAMT *q* = (-1) **\* (**RTRDIMBAMTTOT + RTRDOAMTTOT +  RTRDTOAMTTOT) \* LRS *q*  Where:  RTRDIMBAMTTOT = (RTRDIMBAMT *q*)  RTRDOAMTTOT = (RTRDOAMT *q*)  RTRDTOAMTTOT = (RTRDTOAMT *q*)  The above variables are defined as follows:   | Variable | **Unit** | **Description** | | --- | --- | --- | | LARTRDAMT *q* | $ | *Load-Allocated Real-Time Reg-Down Amount for the QSE* ⎯ The QSE *q*’s share of the total Real-Time Reg-Down amount for the 15-minute Settlement Interval. | | RTRDIMBAMT *q* | $ | *Real-Time Reg-Down Imbalance Amount for the QSE -* The total payment or charge to QSE *q* for the Real-Time Reg-Down imbalance for each 15-minute Settlement Interval. | | RTRDOAMT *q* | $ | *Real-Time Reg-Down Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Down only awards for each 15-minute Settlement Interval. | | RTRDIMBAMTTOT | $ | *Real-Time Reg-Down Imbalance Market Total Amount -* The total payment or charge to all QSEs for the Real-Time Reg-Down imbalance for each 15-minute Settlement Interval. | | RTRDOAMTTOT | $ | *Real-Time Reg-Down Only Market Total Amount -* The total charge to all QSEs in Real-Time for Reg-Down only awards for each 15-minute Settlement Interval. | | RTRDTOAMT *q* | $ | *Real-Time Reg-Down Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for Reg-Down trade overages for each 15-minute Settlement Interval. | | RTRDOAMTTOT | $ | *Real-Time Reg-Down Trade Overage Total Amount* — The total charge to all QSEs for Real-Time Reg-Down trade overages for each 15-minute Settlement Interval. | | LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2 for QSE *q* for the 15-minute Settlement Interval. | | *q* | none | A QSE. |   (c) For Responsive Reserve (RRS):  LARTRRAMT *q* = (-1) **\* (**RTRRIMBAMTTOT + RTRROAMTTOT +  RTRRTOAMTTOT) \* LRS *q*  Where:  RTRRIMBAMTTOT =  (RTRRIMBAMT *q*)  RTRROAMTTOT =  (RTRROAMT *q*)  RTRRTOAMTTOT =  (RTRRTOAMT *q*)  The above variables are defined as follows:   | Variable | **Unit** | **Description** | | --- | --- | --- | | LARTRRAMT *q* | $ | *Load-Allocated Real-Time Responsive Reserve Amount for the QSE* ⎯ The QSE’s share of the total Real-Time RRS amount for the 15-minute Settlement Interval. | | RTRRIMBAMT *q* | $ | *Real-Time Responsive Reserve Imbalance Amount for the QSE -* The total payment or charge to QSE *q* for the Real-Time RRS imbalance for each 15-minute Settlement Interval. | | RTRROAMT *q* | $ | *Real-Time Responsive Reserve Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for RRS only awards for each 15-minute Settlement Interval. | | RTRRIMBAMTTOT | $ | *Real-Time Responsive Reserve Imbalance Market Total Amount -* The total payment or charge to all QSEs for the Real-Time RRS imbalance for each 15-minute Settlement Interval. | | RTRROAMTTOT | $ | *Real-Time Responsive Reserve Only Market Total Amount -* The total charge to all QSEs in Real-Time for RRS only awards for each 15-minute Settlement Interval. | | RTRRTOAMT *q* | $ | *Real-Time Responsive Reserve Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for RRS trade overages for each 15-minute Settlement Interval. | | RTRROAMTTOT | $ | *Real-Time Responsive Reserve Trade Overage Total Amount* — The total charge to all QSEs for Real-Time RRS trade overages for each 15-minute Settlement Interval. | | LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2 for QSE *q* for the 15-minute Settlement Interval. | | *q* | none | A QSE. |   (d) For Non-Spin:  LARTNSAMT *q* = (-1) \* (RTNSIMBAMTTOT + RTNSOAMTTOT +  RTNSTOAMTTOT) \* LRS *q*  Where:  RTNSIMBAMTTOT =  (RTNSIMBAMT *q*)  RTNSOAMTTOT =  (RTNSOAMT *q*)  RTNSTOAMTTOT =  (RTNSTOAMT *q*)  The above variables are defined as follows:   | Variable | **Unit** | **Description** | | --- | --- | --- | | LARTNSAMT *q* | $ | *Load-Allocated Real-Time Non-Spin Amount for the QSE* ⎯ The QSE’s share of the total Real-Time Non-Spin amount for the 15-minute Settlement Interval. | | RTNSIMBAMT *q* | $ | *Real-Time Non-Spin Imbalance Amount for the QSE -* The total payment or charge to QSE *q* for the Real-Time Non-Spin imbalance for each 15-minute Settlement Interval. | | RTNSOAMT *q* | $ | *Real-Time Non-Spin Only Amount for the QSE*— The total charge to QSE *q* in Real-Time for Non-Spin only awards for each 15-minute Settlement Interval. | | RTNSIMBAMTTOT | $ | *Real-Time Non-Spin Imbalance Market Total Amount -* The total payment or charge to all QSEs for the Real-Time Non-Spin imbalance for each 15-minute Settlement Interval. | | RTNSOAMTTOT | $ | *Real-Time Non-Spin Only Market Total Amount -* The total charge to all QSEs in Real-Time for Non-Spin only awards for each 15-minute Settlement Interval. | | RTNSTOAMT *q* | $ | *Real-Time Non-Spin Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for Non-Spin trade overages for each 15-minute Settlement Interval. | | RTNSOAMTTOT | $ | *Real-Time Non-Spin Trade Overage Total Amount* — The total charge to all QSEs for Real-Time Non-Spin trade overages for each 15-minute Settlement Interval. | | LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2 for QSE *q* for the 15-minute Settlement Interval. | | *q* | none | A QSE. |   (e) For ERCOT Contingency Reserve Service (ECRS):  LARTECRAMT *q* = (-1) \* (RTECRIMBAMTTOT + RTECROAMTTOT +  RTECRTOAMTTOT) \* LRS *q*  Where:  RTECRIMBAMTTOT =  (RTECRIMBAMT *q*)  RTECROAMTTOT = (RTECROAMT *q*)  RTECRTOAMTTOT = (RTECRTOAMT *q*)  The above variables are defined as follows:   | Variable | **Unit** | **Description** | | --- | --- | --- | | LARTECRAMT *q* | $ | *Load-Allocated Real-Time ERCOT Contingency Reserve Service Amount for the QSE -* The QSE *q*’s share of the total Real-Time ECRS amount for the 15-minute Settlement Interval. | | RTECRIMBAMT *q* | $ | *Real-Time ERCOT Contingency Reserve Service Imbalance Amount for the QSE -* The total payment or charge to QSE *q* for the Real-Time ECRS imbalance for each 15-minute Settlement Interval. | | RTECROAMT *q* | $ | *Real-Time ERCOT Contingency Reserve Service Only Amount for the QSE—* The total charge to QSE *q* in Real-Time for ECRS only awards for each 15-minute Settlement Interval. | | RTECRIMBAMTTOT | $ | *Real-Time ERCOT Contingency Reserve Service Imbalance Market Total Amount -* The total payment or charge to all QSEs for the Real-Time ECRS imbalance for each 15-minute Settlement Interval. | | RTECROAMTTOT | $ | *Real-Time ERCOT Contingency Reserve Service Only Market Total Amount -* The total charge to all QSEs in Real-Time for ECRS only awards for each 15-minute Settlement Interval. | | RTECRTOAMT *q* | $ | *Real-Time ERCOT Contingency Reserve Service Trade Overage Amount for the QSE*— The total charge to QSE *q* in Real-Time for ECRS trade overages for each 15-minute Settlement Interval. | | RTECROAMTTOT | $ | *Real-Time ERCOT Contingency Reserve Service Trade Overage Total Amount* — The total charge to all QSEs for Real-Time ECRS trade overages for each 15-minute Settlement Interval. | | LRS*q* | none | *Load Ratio Share per QSE*—The LRS as defined in Section 6.6.2.2 for QSE *q* for the 15-minute Settlement Interval. | | *q* | none | A QSE. | |

**6.9 Reliability Deployment Indifference Payment and Allocation**

***6.9.1 Reliability Deployment Indifference Payment***

(1) ERCOT shall calculate Reliability Deployment Indifference Payment, which will make Resources indifferent to any difference between their dispatch levels from the Security-Constrained Economic Dispatch (SCED) dispatch run and the SCED pricing run.

(2) The payment to each Qualified Scheduling Entity (QSE) for Reliability Deployment Indifference Payment for each Settlement Interval is calculated based on the Settlement Point Price at each Settlement Point of the QSE’s Generation Resources, Energy Storage Resources and Controllable Load Resources and the following amounts for each QSE:

(a) The time weighted telemetered generation from all Generation Resources, represented by the QSE for the 15-minute Settlement Interval;

(b) The time weighted telemetered generation or consumption from all Energy Storage Resources, represented by the QSE for the 15-minute Settlement Interval;

(c) The average telemetered power consumption from all Controllable Load Resources, represented by the QSE for the 15-minute Settlement Interval; and

(d) The dispatch level from the SCED pricing run in 6.7.7.3.1, Determination of Real-Time On-Line Reliability Deployment, for all Resources represented by the QSE for the 15-minute Settlement Interval.

(3) The Reliability Deployment Indifference Payment for a Generation Resource or Energy Storage Resource that is dispatched higher or lower in the SCED pricing run than its Base Point for the 15-minute Settlement Interval is equal to the greater of (i) 0 or (ii) the product of (a) Real-Time Reliability Deployment Price for Energy and (b) the difference of its SCED pricing run dispatch level and its time weighted telemetered generation or consumption.

(4) The Reliability Deployment Indifference Payment for a Controllable Load Resource that is dispatched higher or lower in the SCED pricing run than its Base Point for the 15-minute Settlement Interval is equal to the greater of (i) 0 or (ii) the product of (a) Real-Time Reliability Deployment Price for Energy and (b) the difference of its average telemetered power consumption and its SCED pricing run dispatch level.

(5) The total Reliability Deployment Indifference Payment to a QSE *q* for a given 15-minute Settlement Interval is calculated as follows:

RDIAMT *q* =  [RDIGA *q,r,p* + RDILA *q,r,p*]

Where:

For a Generation Resource or an Energy Storage Resource:

RDIGA *q,r,p* = (-1) \* Max (0, LRTRDP*p*\*(SPRDL *q, r,p* / 4 – TWTG*q,r, p*))

For a Controllable Load Resource:

RDILA *q,r,p* = (-1) \* Max (0, LRTRDP*p*\*(ATPC*q,r, p* – SPRDL*q,r, p* / 4))

Where:

SPRDL*q,r,p* =  (( TLMP *y* /TLMP *y*) \* SPRDLS*q,p,r,y*)

LRTRDP*p* =  (( TLMP *y* /TLMP *y*) \* RTRDPA*p, y*)

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| RDIAMT *q* | $ | *Reliability Deployment Indifference Total Amount per QSE*—The total Reliability Deployment Indifference Payment to QSE *q* for the 15-minute Settlement Interval. |
| RDIGA *q,r,p* | $ | *Reliability Deployment Indifference Amount per QSE per Generation or Energy Storage Resource*—The Reliability Deployment Indifference Payment to QSE *q* for Generation Resource or Energy Storage Resource *r* for the 15-minute Settlement Interval. |
| RDILA *q,r,p* | $ | *Reliability Deployment Indifference Amount per QSE per Controllable Load Resource*—The Reliability Deployment Indifference Payment to QSE *q* for Controllable Load Resource *r* for the 15-minute Settlement Interval. |
| LRTRDP*p* | $/MWh | *Locational Real-Time Reliability Deployment Price for Energy⎯*The Real-Time price for the 15-minute Settlement Interval at Settlement Point *p*, reflecting the impact of reliability deployments on energy prices that are calculated from the Real-Time On-Line Reliability Deployment Price Adder*.* |
| TWTG *q, r, p* | MWh | *Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation (negative generation when consuming) of Generation Resource or Energy Storage Resource *r* represented by QSE *q* at Settlement Point *p,* for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. |
| ATPC *q, r, p* | 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*.* |
| SPRDL *q r,p* | MW | *SCED Pricing Run Dispatch Level—*The SCED pricing run dispatch level of Resource *r* at Settlement Point *p* represented by QSE *q* for the 15-minute Settlement Interval*.* |
| SPRDLS *q,p,r,y* | MW | *SCED Pricing Run Dispatch Level per SCED Interval—*The SCED pricing run dispatch level of Resource *r* at Settlement Point *p* represented by QSE *q* for SCED interval *y*. |
| RTRDPA*p, y* | $/MWh | *Real-Time Reliability Deployment Price Adder for Energy*⎯The Real-Time price adder that captures the impact of reliability deployments on energy prices at Settlement Point *p,* for SCED interval *y*. |
| TLMP *y* | second | *Duration of SCED interval per interval*⎯The duration of the portion of the SCED interval *y* within the Settlement Interval. |
| *y* | none | A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval. |
| *q* | none | A QSE. |
| *p* | none | A Settlement Point. |
| *r* | none | A Generation Resource, Energy Storage Resource, or Controllable Load Resource. |

***6.9.2 Reliability Deployment Indifference Allocation***

(1) The total cost for Reliability Deployment Indifference Payments is allocated to the QSEs representing Load based on Load Ratio Share (LRS). The Reliability Deployment Indifference Allocations to each QSE for a given 15-minute Settlement Interval are calculated as follows:

**LARDIAMT *q* = (-1) \* [(RDIAMTTOT) \* LRS *q*]**

Where:

RDIAMTTOT =  RDIAMT *q*

The above variables are defined as follows:

| **Variable** | **Unit** | **Definition** |
| --- | --- | --- |
| LARDIAMT *q* | $ | *Load-Allocated Reliability Deployment Indifference Amount per QSE*—The QSE *q*’s share of the total Real-Time Reliability Deployment Indifference amount for the 15-minute Settlement Interval. |
| RDIAMTTOT | $ | *Reliability Deployment Indifference Total Amount*—The total payment to all QSEs for the Reliability Deployment Indifference Payments for the 15-minute Settlement Interval. |
| RDIAMT *q* | $ | *Reliability Deployment Indifference Total Amount per QSE*—The total payment to QSE *q* for the Reliability Deployment Indifference Payments for the 15-minute Settlement Interval. |
|  |  |  |
| LRS *q* | none | The LRS calculated for QSE *q* for the 15-minute Settlement Interval. See Section 6.6.2.2, QSE Load Ratio Share for a 15-Minute Settlement Interval. |
| *q* | none | A QSE. |