SCED process. The summary must describe the limiting element (or identified operator-entered constraint with operator's comments describing the reason and the Resource-specific impacts for any manual overrides). ERCOT shall provide the summary to Market Participants on the MIS Secure Area and to the Independent Market Monitor (IMM).

6.5.7.5 Ancillary Services Capacity Monitor

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

(a) ~~Responsive Reserve~~RRS capacity from Generation Resources;

(b) ~~Responsive Reserve~~RRS capacity from Load Resources excluding Controllable Load Resources;

(c) ~~Responsive Reserve~~RRS capacity from Controllable Load Resources;

(d) Non-Spin~~ning Reserve~~ available from On-Line Generation Resources with Energy Offer Curves;

(e) Non-Spin~~ning Reserve~~ available from undeployed Load Resources;

(f) Non-Spin~~ning Reserve~~ available from Off-Line Generation Resources;

(g) Non-Spin~~ning Reserve~~ available from Resources with Output Schedules;

(h) Undeployed Reg-Up and undeployed Reg-Down;

(i) Available capacity with Energy Offer Curves in the ERCOT System that can be used to increase Base Points in SCED;

(j) Available capacity with Energy Offer Curves in the ERCOT System that can be used to decrease Base Points in SCED;

(k) Available capacity without Energy Offer Curves in the ERCOT System that can be used to increase Base Points in SCED;

(l) Available capacity without Energy Offer Curves in the ERCOT System that can be used to decrease Base Points in SCED; and

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

$$PRC_1 = \sum_{i=\text{online generation resource}}^{\text{All online generation resources}} \text{Min}(\text{Max}((RDF*HSL - \text{Actual Net Telemetered Output})_i, 0.0), 0.2*RDF*HSL_i)$$

$$PRC_2 = \sum_{i=\text{online generation resource}}^{\text{All online generation resources}} ((\text{Hydro-synchronous condenser output})_i \text{ as qualified by item (6) of Operating Guide Section 2.5.2.33.1.2, ~~Types of Responsive Reserve~~Additionl Operational Details for Responsive Reserve Providers))}$$

$$PRC = PRC_1 + PRC_2$$

The above variables are defined as follows:

Variable	Unit	Description
PRC_1	MW	Generation On-Line greater than 0 MW
PRC_2	MW	Hydro-synchronous condenser output
PRC	MW	Physical Responsive Capability
RDF		The currently approved Reserve Discount Factor

(2) Each QSE shall operate Resources providing Ancillary Service capacity to meet its obligations. If a QSE experiences temporary conditions where its total obligation for providing Ancillary Service can-not be met on the QSE's Resources, then the QSE may add additional capability from other Resources that it represents. It adds that capability by changing the Resource Status and updating the Ancillary Service Schedules and Ancillary Services Resource Responsibility of the affected Resources and notifying ERCOT under Section 6.4.8.1, Evaluation and Maintenance of Ancillary Service Capacity Sufficiency. If the QSE is unable to meet its total obligations to provide committed Ancillary Services capacity, the QSE shall notify ERCOT immediately of the expected duration of the QSE's inability to meet its obligations. ERCOT shall determine whether replacement Ancillary Services will be procured on behalf of the affected QSE according to Section 6.4.8.1.

6.5.7.6 Load Frequency Control

6.5.7.6.1 LFC Process Description

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

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

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

(4) Based on the ACE MW correction, the LFC issues a set of control signals every four seconds to each QSE providing Regulation and, if required, each QSE providing RRS. Control must be proportional to the QSE's share of each of the services that it is providing, respecting the QSE's Resources' capability to provide regulation control. Control signals are provided to the QSE using the ICCP data link. QSEs shall receive an Updated Desired Base Point updated every four seconds by LFC. ERCOT will provide an Operations Notice of any methodology change to the determination of the Updated Desired Base Point within 60 minutes of the change.

(5) Each QSE shall allocate its Regulation energy deployment among its Resources to meet a deployment signal, and shall provide ERCOT with the participation factor of each Resource via telemetry in accordance with Section 6.5.7.6.2.1, Deployment of Regulation Service, and Section 6.4.8.1, Evaluation and Maintenance of Ancillary Service Capacity Sufficiency. Each QSE's allocation of Regulation Service to its Resources must be consistent with the telemetry provided under Section 6.5.5.2, Operational Data Requirements. Each QSE's allocation of its Regulation energy deployment among its Resources to meet a deployment signal must ensure the participation factors of all its Generation Resources in comparison to all its Controllable Load Resources remains constant.

(6) If all Reg-Up capacity has been deployed, ERCOT shall use the LFC system to deploy Responsive Reserve on Generation Resources and Controllable Load Resources. Such Responsive Reserve deployments by ERCOT must be deployed as specified in Section 6.5.7.6.2.2, Deployment of Responsive Reserve Service.

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

(8) The inputs for LFC include:

(a) Actual system frequency;

(b) Scheduled system frequency;

(c) Capacity available for Regulation by QSE;

(d) Telemetered high and low Regulation availability status indications for each Resource available for Regulation deployments for ERCOT information;

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

(f) Resource Regulation participation factor;

(g) Capacity available for Responsive Reserve by QSE;

(h) ERCOT System frequency bias; and

~~(i) DSR Base Points; and~~

(ij) Telemetered Resource output.

(9) If system frequency deviation is greater than an established threshold, ERCOT may issue Dispatch Instructions to those Resources not providing Reg-Up or Reg-Down that have Base Points directionally opposite ACE, to temporarily suspend ramping to their Base Point until frequency deviation returns to zero.

6.6 Settlement Calculations for the Real-Time Energy Operations

6.6.1 Real-Time Settlement Point Prices

Real-Time energy settlements use Real-Time Settlement Point Prices ~~(SPPs)~~ that are calculated for Resource Nodes, Load Zones, and Hubs.

6.6.1.1 Real-Time Settlement Point Price for a Resource Node

(1) Except for a logical Resource Node for a Combined Cycle Train, t~~T~~he Real-Time Settlement Point Price ~~SPP~~ for a Resource Node Settlement Point is a Base-Point time-

weighted average of the Real-Time Locational Marginal Prices (LMPs). The Real-Time Settlement Point Price ~~SPP~~ for a 15-minute Settlement Interval is calculated as follows:

$$\mathbf{RTSPP} = \sum_{y} (\mathbf{RNWF}_y * \mathbf{RTLMP}_y)$$

Where the Resource Node weighting factor is:

$$\mathbf{RNWF}_y = [\mathbf{Max}\ (0.001, \sum_{r} \mathbf{BP}_{r,y}) * \mathbf{TLMP}_y] / [\sum_{y} (\mathbf{Max}\ (0.001, \sum_{r} \mathbf{BP}_{r,y}) * \mathbf{TLMP}_y)]$$

The above variables are defined as follows:

Variable	Unit	Description
RTSPP	$/MWh	*Real-Time Settlement Point Price*—The Real-Time Settlement Point Price~~SPP~~ at the Settlement Point for the 15-minute Settlement Interval.
$RTLMP_{-y}$	$/MWh	*Real-Time Locational Marginal Price per interval*—The Real-Time LMP at the Settlement Point for the Security-Constrained Economic Dispatch (SCED) interval *y*.
$BP_{-r,y}$	MW	*Base Point per Resource per interval*—The Base Point of Resource *r*, for the whole SCED interval *y*.
$RNWF_{-y}$	none	*Resource Node Weighting Factor per interval*—The weight used in the Resource Node Settlement Point Price~~PP~~ calculation for the portion of the SCED interval y within the Settlement Interval.
$TLMP_{-y}$	second	*Duration of SCED interval per interval*—The duration of the portion of the SCED interval *y* within the Settlement Interval.
y	none	A SCED interval in the 15-minute Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval.
r	none	A Resource at the Resource Node. The summation is taken over all Resources at that node.

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

(a) The Real-Time LMP for the logical Resource Node for each SCED interval shall be the sum of the Real-Time LMP in each SCED interval at each of the Resource Nodes of the generation units registered in the On-Line (as determined by Real-Time telemetry) Combined Cycle Generation Resource times a weight factor determined as set forth in paragraph (b) below.

Where:

$$RTLMP = \sum_{CCGR\_PhyR} RTLMP_{CCGR\_PhyR} * RTCCGRWF_{CCGR\_PhyR}$$

The above variables are defined as follows:

Variable	Unit	Definition
RTLMP	$/MWh	*Real-Time Locational Marginal Price at a logical Resource Node for a*

		Combined Cycle Train—The Real-Time LMP at the Combined Cycle Generation Resource logical Resource Node for a SCED Interval.
$RTLMP_{CCGR\_PhyR}$	$/MWh	*Real-Time Locational Marginal Price at a generation unit Resource Node registered to the Combined Cycle Generation Resource*—The Real-Time LMP at the Resource Node of an On-Line generation unit designated in a Combined Cycle Train registration for the Combine Cycle Generation Resource for each SCED interval.
$RTCCGRWF_{CCGR\_PhyR}$	none	*Real-Time Combined Cycle Generation Resource Weighting Factor*—The Real Time Combined Cycle Generation Resource weighting factor for a generation unit designated in a Combined Cycle Train registration for the Combined Cycle Generation Resource.
CCGR_PhyR	none	A generation unit designated in a Combine Cycle Train registration for a Combined Cycle Generation Resource.

(b) The weight factor for each generation unit registered in a Combined Cycle Generation Resource shall be the Real-Time net power output telemetry in each SCED interval for each generation unit registered in the Combined Cycle Generation Resource divided by the total Real-Time net power output telemetry for all of the generation units registered in the Combined Cycle Generation Resource.

Where:

$$RTCCGRWF_{CCGR\_PhyR} = TG_{CCGR\_PhyR} / \sum_{CCGR\_PhyR} TG_{CCGR\_PhyR}$$

The above variables are defined as follows:

Variable	Unit	Definition
$RTCCGRWF_{CCGR\_PhyR}$	none	*Real-Time Combined Cycle Generation Resource Weighting Factor*—The Real Time Combined Cycle Generation Resource weighting factor for a generation unit designated in a Combined Cycle Train registration for the Combined Cycle Generation Resource.
TG_{CCGR_PhyR}	MW	*Telemetered Generation for a Combined Cycle Generation Resource generation unit*—The telemetered generation of a generation unit designated in a Combined Cycle Train registration for the Combined Cycle Generation Resource at the time of each SCED run.
CCGR_PhyR	none	A generation unit designated in a Combine Cycle Train registration for a Combined Cycle Generation Resource.

6.6.3 Real-Time Energy Charges and Payments

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 ~~SPP~~ Settlement Point Price for the following amounts at a particular Resource Node Settlement Point:

(a) The energy produced by all its Generation Resources 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 Energy Bids cleared in the Day-Ahead Market (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 eEnergy oOffers 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:

If the Generation Resources at the Resource Node Settlement Point *p* are involved with a net metering scheme:

$$\mathbf{RTEIAMT}_{q,p} = \mathbf{(-1)} * \{ \sum_{gsc} (\sum_{r} (\mathbf{GSPLITPER}_{q,r,gsc,p} * \mathbf{NMSAMTTOT}_{gsc})) + \mathbf{RTSPP}_{p} * [(\mathbf{SSSK}_{q,p} * 1/4) + (\mathbf{DAEP}_{q,p} * 1/4) + (\mathbf{RTQQEP}_{q,p} * 1/4) - (\mathbf{SSSR}_{q,p} * 1/4) - (\mathbf{DAES}_{q,p} * 1/4) - (\mathbf{RTQQES}_{q,p} * 1/4)] \}$$

Otherwise

$$\mathbf{RTEIAMT}_{q,p} = \mathbf{(-1)} * \mathbf{RTSPP}_{p} * \{ \sum_{r} \mathbf{RTMG}_{q,p,r} + (\mathbf{SSSK}_{q,p} * 1/4) + (\mathbf{DAEP}_{q,p} * 1/4) + (\mathbf{RTQQEP}_{q,p} * 1/4) - (\mathbf{SSSR}_{q,p} * 1/4) - (\mathbf{DAES}_{q,p} * 1/4) - (\mathbf{RTQQES}_{q,p} * 1/4) \}$$

The above variables are defined as follows:

Variable	Unit	Description
-$RTEIAMT_{q,p}$	$	*Real-Time Energy ImbalanceAmount per QSE per Settlement Point*—The payment or charge to QSE *q* for the 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 SPP at Settlement Point *p*, for the 15-minute Settlement Interval.
$RTMG_{q,r,p}$	MWh	*Real-Time Metered Generation per QSE per Settlement Point per Resource*—The Real-Time energy produced by the Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.

Variable	Unit	Description
$SSSK_{q, p}$	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 ~~e~~Energy ~~o~~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.
$NMSAMTTOT_{gsc}$	$	*Net Metering Settlement Payment*—The total payment to the entire facility with a net metering arrangement.
$GSPLITPER_{q, r, gsc, p}$	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.
gsc	none	A generation site code.

(3) The total payments to a facility with a net metering arrangement, for each 15-minute Settlement Interval, shall be calculated as follows:

$$\mathbf{NMRTETOT}_{gsc} = \sum_{me} \mathbf{MEB}_{gsc, b}$$

If $NMRTETOT_{gsc} = 0$

The Load is included in the Real-Time ~~Adjusted Metered Load~~AML per QSE and is included in the Real-Time energy imbalance payment or charge at a Load Zone.

Otherwise

$$\mathbf{NMSAMTTOT}_{gsc} = \sum_{b} (\mathbf{RTRMPR}_{b} * \mathbf{MEB}_{gsc, b})$$

Where the price for Settlement Meter is determined as follows:

For $EBNRT_b <= 0$

$$\mathbf{RTRMPR}_b = \sum_y (\mathbf{RTLMP}_{b,y} * \mathbf{TLMP}_y) / \sum_y \mathbf{TLMP}_y$$

Otherwise $RTRMPR_b$ is determined as follows:

$$\mathbf{RTRMPR}_b = \sum_y (\mathbf{RNWF}_{b,y} * \mathbf{RTLMP}_{b,y})$$

Where the weighting factor for the bus associated with the meter is:

$$\mathbf{RNWF}_{b,y} = [\mathbf{Max}(0.001, \sum_r \mathbf{BP}_y) * \mathbf{TLMP}_y] / [\sum_y \mathbf{Max}(0.001, \sum_r \mathbf{BP}_{r,y}) * \mathbf{TLMP}_y]$$

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 *me* included in generation site code *gsc*. A positive value indicates an injection of power to the ERCOT System.
$NMSAMTTOT_{gsc}$	$	*Net Metering Settlement Payment*—The total payment to the entire facility 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.
$EBNRT_{me}$	MWh	*Energy at bus Near Real-Time*—The energy at the bus associated with the Settlement Meter gathered by the ERCOT Real-Time process for the 15-minute Settlement Interval. A positive value represents energy produced, and a negative value represents energy consumed. This is the integrated value for the 15 minute interval that is available shortly after the end of the 15 minute interval.
$MEB_{gsc, b}$	MWh	*Metered Energy at bus*—The metered energy by the Settlement Meter *me* for the 15-minute Settlement Interval. A positive value represents energy produced, and a negative value represents energy consumed.
$RTLMP_{b, y}$	$/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*.

Variable	Unit	Description
$RNWF_{b, y}$	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 ~~*IrD id,*~~ 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.
gsc	none	A generation site code.
r	none	A Generation Resource that is located at the facility with net metering. The summation is over all the Generation Resources at the facility.
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 Generation Resource SCADA Splitting Percentage for each Rresource within a net metering arrangement for the 15-minute Settlement Interval is calculated as follows:

$$\mathbf{GSPLITPER}_{q, r, gsc, p} = \mathbf{GSSPLITSCA}_{r} / \sum_{r} \mathbf{GSSPLITSCA}_{r}$$

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. The summation is over all the Generation Resources at the facility.
q	none	A QSE.
p	none	A Resource Node Settlement Point.

(5) 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:

$$\mathbf{RTEIAMTQSETOT}_{q} = \sum_{p} \mathbf{RTEIAMT}_{q,p}$$

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 ~~the~~ Real-Time Energy Imbalance Service at Settlement Point *p*, for the 15-minute Settlement Interval.
q	none	A QSE.
p	none	A Resource Node Settlement Point.

6.6.5 *Generation Resource Base-Point Deviation Charge*

A QSE for a Generation Resource shall pay a Base-Point ~~deviation~~ Deviation Ceharge if the Resource did not follow Dispatch Instructions and Ancillary Services deployments within defined tolerances, except when the Dispatch Instructions and Ancillary Services deployments violate the Resource Parameters. The Base-Point Ddeviation Ceharge does not apply to Generation Resources between breaker close and the time at which the telemetered High Sustained Limit (HSL) becomes greater than Low Sustained Limit (LSL). The desired output from a Generation Resource during a 15-minute Settlement Interval is calculated as follows:

$$\mathbf{AABP} = \sum_{y} ((\mathbf{BP}_{y} + \mathbf{BP}_{y-1})/2 * \mathbf{TLMP}_{y}) / (\sum_{y} \mathbf{TLMP}_{y}) + \mathbf{TWAR}$$

Where:

$$\mathbf{TWAR} = \sum_{y} ((\mathbf{ARI}_{y} * \mathbf{TLMP}_{y}) / (\sum_{y} \mathbf{TLMP}_{y})$$

The above variables are defined as follows:

Variable	Unit	Definition
AABP	MW	*Adjusted Aggregated Base Point*—The Generation Resource's aggregated Base Point adjusted for Ancillary Service deployments, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, AABP is calculated for the Combined Cycle Train considering all SCED Dispatch Instructions to any Combined Cycle Generation Resources within the Combined Cycle Train.
BP_y	MW	*Base Point by interval*—The Base Point for the Generation Resource at the Resource Node, 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.

Variable	Unit	Definition
TWAR	MW	*Time-Weighted Average Regulation*—The amount of regulation that the Generation Resource should have produced based on the deployment signals as calculated by the Load Frequency Control (LFC) within the 15-minute Settlement Interval.
ARI_y	MW	*Average Regulation Instruction*—The amount of regulation that the Generation Resource should have produced based on the deployment signals as calculated by the LFC within the SCED interval.
y	none	A SCED interval in the Settlement Interval. The summation is over the total number of SCED runs that cover the 15-minute Settlement Interval.

6.6.5.1 General Generation Resource Base_-Point Deviation Charge

(1) Unless one of the exceptions specified in paragraphs (2) and (3) below applies, ERCOT shall charge a Generation Resource Base_-Point Ddeviation Ceharge for a Generation Resource other than those described in Section 6.6.5.2, IRR Generation Resource Base_-Point Deviation Charge, and Section 6.6.5.3, Generators Exempt from Deviation Charges, when:

(a) The ~~SPP~~ Settlement Point Price for the Resource Node is positive; and

(b) The telemetered generation of the Generation Resource over the 15-minute Settlement Interval is outside the tolerances defined later in this S~~Sub~~section 6.6.5.1.

(2) ERCOT may not charge a QSE a -Generation Resource Base_-Point Ddeviation Ceharge under paragraph (1) above when both ~~(a) and (b)~~ of the following apply:

(a) The generation deviation of the Generation Resource over the 15-minute Settlement Interval is in a direction that contributes to frequency corrections that resolve an ERCOT System frequency deviation; and

(b) The ERCOT System frequency deviation is greater than +/-0.05 Hz at any time during the 15-minute Settlement Interval.

(3) ERCOT may not charge a QSE a Generation Resource Base_-Point Ddeviation Ceharge under paragraph (1) above for any 15-minute Settlement Interval during which Responsive Reserve is deployed.

6.6.5.1.1 Base Point Deviation Charge for Over Generation

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

(a) Five percent of the average of the Base Points in the Settlement Interval adjusted for any Ancillary Services deployments; or

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

(2) The charge to each QSE for over-generation of each Generation Resource at each Resource Node Settlement Point, if the Real-Time metered generation is greater than the upper tolerance during a given 15-minute Settlement Interval, is calculated as follows:

$$\mathbf{BPDAMT}_{q,r,p} = \mathbf{Max}(0, \mathbf{RTSPP}_{p}) * \mathbf{Max}[0, (\mathbf{TWTG}_{q,r,p} - \tfrac{1}{4} * \mathbf{Max}(((1 + K1) * \mathbf{AABP}_{q,r,p}), (\mathbf{AABP}_{q,r,p} + Q1)))]$$

Where:

$$\mathbf{TWTG}_{q,r,p} = \sum_{y} (\mathbf{ATG}_{q,r,p,y} * \mathbf{TLMP}_{y} / 3600)$$

The above variables are defined as follows:

Variable	Unit	Definition
$BPDAMT_{q,r,p}$	$	*Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval. The Base Point Deviation Charge is charged to the Combined Cycle Train for all Combined Cycle Generation Resources.
$RTSPP_{p}$	$/MWh	*Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price ~~SPP~~ at Settlement Point *p*, for the 15-minute Settlement Interval.
$TWTG_{q,r,p}$	MWh	*Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$AABP_{q,r,p}$	MW	*Adjusted Aggregated Base Point per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Ancillary Service deployments, of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, AABP is calculated for the Combined Cycle Train considering all SCED Dispatch Instructions to any Combined Cycle Generation Resources within the Combined Cycle Train.
$ATG_{q,r,p,y}$	MW	*Average Telemetered Generation*—The average telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the SCED 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.
K1	none	The percentage tolerance for over-generation, 5%.
Q1	MW	The MW tolerance for over-generation, five~~5~~ MW.
q	none	A QSE.
3600	none	The number of seconds in one hour.
p	none	A Resource Node Settlement Point.
r	none	A non-exempt, non–Intermittent Renewable Resources (IRR) Generation Resource.
y	none	An Emergency Base Point interval or SCED interval that overlaps the 15-minute Settlement Interval.

6.6.5.1.2 Base Point Deviation Charge for Under Generation

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

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

(b) The average of the Base Points in the Settlement Interval adjusted for any Ancillary Service deployments minus five~~5~~ MW.

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

$$\mathbf{BPDAMT}_{q,r,p} = \mathbf{Max}(0, \mathbf{RTSPP}_{p}) * \mathbf{Min}(1, KP) * \mathbf{Max}\{0, \{\mathbf{Min}[((1 - K2) * \tfrac{1}{4}(\mathbf{AABP}_{q,r,p})), \tfrac{1}{4}(\mathbf{AABP}_{q,r,p} - Q2)] - \mathbf{TWTG}_{q,r,p}\}\}$$

Where:

$$\mathbf{TWTG}_{q,r,p} = \sum_{y} (\mathbf{ATG}_{q,r,p,y} * \mathbf{TLMP}_{y} / 3600)$$

The above variables are defined as follows:

Variable	Unit	Definition
$BPDAMT_{q,r,p}$	$	*Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval. A Base Point Deviation Charge is charged to the Combined Cycle Train for all Combined Cycle Generation Resources.
$RTSPP_{p}$	$/MWh	*Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point Price~~SPP~~ at Settlement Point *p*, for the 15-minute Settlement Interval.
$TWTG_{q,r,p}$	MWh	*Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$AABP_{q,r,p}$	MW	*Adjusted Aggregated Base Point*—The aggregated Base Point adjusted for Ancillary Service deployments of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, AABP is calculated for the Combined Cycle Train considering all SCED Dispatch Instructions to any Combined Cycle Generation Resources within the Combined Cycle Train.
$ATG_{q,r,p,y}$	MW	*Average Telemetered Generation*—The average telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the SCED 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.
KP	None	The coefficient applied to the Settlement Point Price~~PP~~ for under-generation charge, 1.0.
K2	None	The percentage tolerance for under-generation, 5%.
Q2	MW	The MW tolerance for under-generation, five~~5~~ MW.
q	none	A QSE.

p	none	A Resource Node Settlement Point.
r	none	A non-exempt, non-IRR Generation Resource.
y	none	An Emergency Base Point interval or SCED interval that overlaps the 15-minute Settlement Interval.

6.6.5.2 IRR Generation Resource Base-Point Deviation Charge

(1) ERCOT shall charge a QSE for an IRR a Base-Point Ddeviation Ceharge if the IRR metered generation is more than 10% above its Adjusted Aggregated Base Point and if the Adjusted Aggregated Base Point is two MW or more below the IRR's HSL. The deviation charge may be refunded if the IRR shows, to ERCOT's satisfaction, that the IRR was taking the necessary control actions to produce at levels equal to or less than the Base Point but was unable to comply solely due to increasing renewable energy input. The IRR must always take the necessary control actions, in its capability, to comply with Base Point Dispatch Instructions if the Base Point is two MW or more below the IRR's HSL as soon as practicable.

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

If $AABP_{q,r,p} > (HSL_{q,r,p} - QIRR)$

$$\mathbf{BPDAMT_{q,r,p} = 0}$$

Otherwise

$$\mathbf{BPDAMT_{q,r,p} = Max\ (0, RTSPP_{p})\ *}$$

$$\mathbf{Max\ (0, TWTG_{q,r,p} - \tfrac{1}{4} * AABP_{q,r,p} * (1 + KIRR))}$$

Where:

$$TWTG_{q,r,p} = \sum_{y} (ATG_{q,r,p,y} * TLMP_{y} / 3600)$$

The above variables are defined as follows:

Variable	Unit	Definition
$BPDAMT_{q,r,p}$	$	*Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval.
$RTSPP_{p}$	$/MWh	*Real-Time Settlement Point Price per Settlement Point*—The Real-Time ~~SPP~~ Settlement Point Price at Resource Node *p*, for the 15-minute Settlement Interval.
$TWTG_{q,r,p}$	MWh	*Time-Weighted Telemetered Generation per QSE per Settlement Point per Resource*—The telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval.

$AABP_{q, r, p}$	MW	*Adjusted Aggregated Base Point Generation per QSE per Settlement Point per Resource*—The aggregated Base Point adjusted for Ancillary Service deployments, of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement Interval.
$HSL_{q, r, p}$	MW	*High ~~Sustainable~~ Sustained Limit Generation per QSE per Settlement Point per Resource*—The HSL of Generation Resource *r* represented by QSE *q* at Resource Node *p* for the hour that includes the 15-minute Settlement Interval.
$ATG_{q, r, p, y}$	MW	*Average Telemetered Generation*—The average telemetered generation of Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the SCED 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.
KIRR		The percentage tolerance for over-generation of an IRR, 10%.
QIRR	MW	The threshold to test the adjusted aggregated Base Point against the HSL for an IRR, two~~2~~ MW.
q	none	A QSE.
p	none	A Resource Node Settlement Point.
r	none	An IRR Generation Resource.
y	none	An Emergency Base Point interval or SCED interval that overlaps the 15-minute Settlement Interval.

6.6.5.3 Generators Exempt from Deviation Charges

Generation Resource Base Point Ddeviation Ceharges do not apply to Reliability Must-Run (RMR) Units, Dynamically Scheduled Resources (DSRs) (except as described in Section 6.4.2.2, Output Schedules for Dynamically Scheduled Resources), or Qualifying Facilities (QFs) that do not submit an Energy Offer Curve for the Settlement Interval.

6.6.5.4 Base Point Deviation Payment

ERCOT shall pay the Base-Point Ddeviation Ceharges collected from the QSEs representing Generation Resources to the QSEs representing Load based on LRS. The payment to each QSE for a given 15-minute Settlement Interval is calculated as follows:

$$\mathbf{LABPDAMT}_q = \mathbf{(-1) * BPDAMTTOT * LRS}_q$$

Where:

$$BPDAMTTOT = \sum_q BPDAMTQSETOT_q$$

$$BPDAMTQSETOT_q = \sum_p \sum_r BPDAMT_{q, r, p}$$

The above variables are defined as follows:

Variable	Unit	Definition

Variable	Unit	Definition
LABPDAMT $_q$	$	*Load-Allocated Base-Point Deviation Amount per QSE*—QSE *q*'s share of the total charge for all ~~the~~ Generation Resource~~'~~s' Base Point deviations, based on LRS for the 15-minute Settlement Interval.
BPDAMTTOT	$	*Base-Point Deviation Amount Total*—The total of Base-Point Deviation Charges to all QSEs for all Generation Resources, for the 15-minute Settlement Interval.
BPDAMTQSETOT $_q$	$	*Base-Point Deviation Amount QSE Total per QSE*—The total of Base-Point Deviation Charges to QSE *q* for all Generation Resources represented by this QSE, for the 15-minute Settlement Interval.
BPDAMT $_{q, r, p}$	$	*Base Point Deviation Charge per QSE per Settlement Point per Resource*—The charge to QSE *q* for Generation Resource *r* at Resource Node *p*, for its deviation from Base Point, for the 15-minute Settlement Interval. A Base Point Deviation Charge is charged to the Combined Cycle Train for all Combined Cycle Generation Resources.
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.
p	none	A Resource Node Settlement Point.
r	none	A Generation Resource.

6.6.6 *Reliability Must-Run Settlement*

6.6.6.1 RMR Standby Payment

(1) The Standby Payment for ~~Reliability Must-Run (~~RMR~~)~~ Service is paid to each QSE representing an RMR Unit for each RMR Unit for each contracted hour under performance requirements set forth in Section 22, Attachment B, Standard Form Reliability Must-Run Agreement, and other performance requirements in these Protocols. For Initial Settlement, the Standby Payment is the "Estimated Standby Cost" stated in the RMR Agreement. For Final and True-Up Settlements, the Standby Payment is based on the RMR Unit's actual Eligible Cost.

(2) The Standby Payment to each QSE for each RMR Unit for each hour is calculated as follows:

$$\mathbf{RMRSBAMT}_{q,r} = \mathbf{(-1) * RMRSBPR}_{q,r}$$

The above variables are defined as follows:

Variable	Unit	Definition
RMRSBAMT $_{q, r}$	$	*Reliability Must Run Standby Payment per QSE per Resource by hour*—The Standby Payment to QSE *q* for RMR Unit *r*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
RMRSBPR $_{q, r}$	$ per hour	*Reliability Must Run Standby Price per QSE per Resource by hour*—The hourly standby cost for RMR Unit *r* represented by QSE *q*, for the hour. See item (3) below. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
q	none	A QSE.

Variable	Unit	Definition
r	none	An RMR Unit.

(3) For the Initial Settlement and resettlements executed before true-up and before actual cost data is submitted, the standby price of an RMR Unit is the "Estimated Standby Cost" stated in the RMR Agreement. For other resettlements, the standby price of an RMR Unit for each hour is calculated as follows:

$$\mathbf{RMRSBPR}_{q,r} = \mathbf{RMRMNFC}_{q,r} / \mathbf{MH}_{q,r} * (1 + \mathbf{RMRIF} * \mathbf{RMRCRF}_{q,r} * \mathbf{RMRARF}_{q,r})$$

Where:

RMR Capacity Reduction Factor

If $(RMRTCAPA_{q,r} + RMRTCAP_{q,r} \geq RMRCCAP_{q,r})$, then, $RMRCRF_{q,r} = 1$

Otherwise

$$RMRCRF_{q,r} = \text{Max}(0, 1 - 2 * (RMRCCAP_{q,r} - RMRTCAP_{q,r}) / RMRCCAP_{q,r})$$

RMR Availability Reduction Factor

If $(RMRHREAF_{q,r} \geq RMRTA_{q,r})$, then, $RMRARF_{q,r} = 1$

Otherwise

$$RMRARF_{q,r} = \text{Max}(0, 1 - (RMRTA_{q,r} - RMRHREAF_{q,r}) * 2)$$

RMR Hourly Rolling Equivalent Availability Factor

If $(RMREH_{q,r} < 4380)$

$$RMRHREAF_{q,r} = 1$$

Otherwise

$$RMRHREAF_{q,r} = \left(\sum_{hr=h-4379}^{h} RMRAFLAG_{q,r,hr}\right) / 4380$$

Availability for a Combined Cycle Train will be determined pursuant to contractual terms but no more than once per hour.

The above variables are defined as follows:

Variable	Unit	Definition
$RMRSBPR_{q,r}$	$ per hour	*Reliability Must-Run Standby Price per QSE per Resource by hour*—The hourly standby cost for RMR Unit *r* respresnted by QSE *q*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. ~~Standby Price for RMR Unit *r* represented by QSE *q* for the hour.~~

Variable	Unit	Definition
$RMRARF_{q, r}$	none	*Reliability Must-Run Availability Reduction Factor per QSE per Resource by hour*—The availability reduction factor of RMR Unit *r* represented by QSE *q*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRCRF_{q, r}$	none	*Reliability Must-Run Capacity Reduction Factor per QSE per Resource by hour*—The capacity reduction factor of the RMR Unit, for the hour. See paragraph (2) of Section 3.14.1.13, Incentive Factor. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRCCAP_{q, r}$	MW	*Reliability Must-Run Contractual Capacity per QSE per Resource*—The capacity of RMR Unit *r* represented by QSE *q* as specified in the RMR Agreement. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRTCAP_{q, r}$	MW	*Reliability Must-Run Testing Capacity by hour*—The testing capacity of RMR Unit *r* represented by QSE *q*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRTA_{q, r}$	none	*Reliability Must-Run Target Availability per QSE per Resource*—The Target Availability of RMR Unit *r* represented by QSE *q*, as specified in the RMR Agreement and divided by 100 to convert a percentage to a fraction. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRHREAF_{q, r}$	none	*Reliability Must-Run Hourly Rolling Equivalent Availability Factor per QSE per Resource by hour*—The equivalent availability factor of RMR Unit *r* represented by QSE *q* over 4380 hours, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMREH_{q, r}$	none	*Reliability Must-Run Elapsed number of Hours per QSE per Resource by hour*—The number of the elapsed hours of the term of the RMR Agreement for RMR Unit *r* represented by QSE *q*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRMNFC_{q, r}$	$	*Reliability Must-Run Monthly Non-Fuel Cost per QSE per Resource*—The actual non-fuel ~~e~~Eligible ~~c~~Cost of RMR Unit *r* represented by QSE *q*, for the month. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$MH_{q, r}$	hour	*Number of Hours in the Month per QSE per Resource*—The total number of hours of the month, when RMR Unit *r* represented by QSE *q* is under an RMR Agreement. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
RMRIF	none	*Reliability Must Run Incentive Factor*—The Incentive Factor of RMR Units under RMR Agreement.
$RMRARF_{q, r}$	none	*Reliability Must-Run Availability Reduction Factor per QSE per Resource by hour*—The availability reduction factor of RMR Unit *r* represented by QSE *q*, as calculated for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRAFLAG_{q, r, hr}$	none	*RMR Availability Flag per QSE per Resource by hour*—The flag of the availability of RMR Resource *r* represented by QSE *q*, 1 for available and 0 for unavailable, for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$RMRTCAPA_{q, r}$	MW	*Reliability Must-Run Testing Capacity Adjustment by hour*—The testing capacity adjustment factor, in the event an ERCOT Operator has deemed that a RMR Unit's Tested Capacity did not materially affect the reliability of the ERCOT System, of an RMR Unit *r* represented by QSE *q*, for the hour. See paragraph (2) of Section 3.14.1.13. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
q	none	A QSE.
r	none	An RMR Unit.

Variable	Unit	Definition
hr	none	The index for a given hour and all the previous 4379 hours.
4380	none	The number of hours in a six-month period.

(4) The total of the Standby Payments to each QSE for all RMR Units represented by this QSE for a given hour is calculated as follows:

$$\mathbf{RMRSBAMTQSETOT}_{q} = \sum_{r} \mathbf{RMRSBAMT}_{q,r}$$

The above variables are defined as follows:

Variable	Unit	Definition
$RMRSBAMTQSETOT_q$	$	*Reliability Must-Run Standby Amount QSE Total per QSE*—The total of the Standby Payments to QSE *q* for all RMR Units represented by this QSE for the hour.
$RMRSBAMT_{q,r}$	$	*Reliability Must-Run Standby Payment per QSE per Resource*—The Standby Payment to QSE *q* for RMR Unit *r*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
q	none	A QSE.
r	none	An RMR Unit.

6.6.6.2 RMR Payment for Energy

(1) Payment for energy on the Initial Settlement and settlements executed before true-up and before actual cost data is submitted must be calculated using the estimated input/output curve and startup fuel as specified in the RMR Agreement, the actual energy produced and the ~~Fuel Index Price~~ (FIP). The payment for energy for all other settlements must be based on actual fuel costs for the RMR Unit. The payment for energy for each hour is calculated as follows:

$$\mathbf{RMREAMT}_{q,r} = (-1) * ((\mathbf{FIP} + \mathbf{RMRCEFA}_{q,r}) * \mathbf{RMRSUFQ}_{q,r} / \mathbf{RMRH}_{q,r}) * \mathbf{RMRALLOCFLAG}_{q,r} + \sum_{i=1}^{4} (((\mathbf{FIP} + \mathbf{RMRCEFA}_{q,r}) * \mathbf{RMRHR}_{q,r,i} + \mathbf{RMRVCC}_{q,r}) * \mathbf{RTMG}_{q,r,i})$$

The above variables are defined as follows:

Variable	Unit	Definition
$RMREAMT_{q,r}$	$	*Reliability Must-Run Energy Amount per QSE per Resource by hour*—The energy payment to QSE *q* for RMR Unit *r*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
FIP	$/MMBtu	*Fuel Index Price*—The FIP for the Operating Day.
$RMRSUFQ_{q,r}$	MMBtu	*Reliability Must-Run Startup Fuel Quantity per QSE per Resource*—The Estimated Start Uup Fuel specified in the RMR Agreement for RMR Unit *r* represented by QSE *q*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.

Variable	Unit	Definition
$RMRH_{q, r,h}$	hour	*Reliability Must-Run Hours*—The number of hours during which RMR Unit *r* represented by QSE *q* is instructed On-Line for the Operating Day. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRALLOCFLAG_{q, r}$	none	*Reliability Must-Run Startup Flag per QSE per Resource by hour*—The number that indicates whether or not the startup fuel cost of RMR Unit *r* represented by QSE *q* is allocated to the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train. The startup fuel cost will be allocated equally to all contiguous intervals for which there is an eligible start. The $RMRALLOCFLAG_{q, r}$ value is 1 if the startup fuel cost is allocated; otherwise, its value is 0. The $RMRALLOCFLAG_{q, r}$ for eligibility is determined in ~~Protocol~~ Sections 5.6.2, RUC Startup Cost Eligibility, and 5.6.3, Forced Outage of a RUC-Committed Resource, for start-up payments and commitments in either the Reliability Unit Commitment (RUC) or DAM ~~markets~~.
$RMRHR_{q, r, i}$	MMBtu /MWh	*Reliability Must-Run Heat Rate per QSE per Resource by Settlement Interval by hour*—The multiplier determined based on the input/output curve and the Real-Time generation of RMR Unit *r* represented by QSE *q*, for the 15-minute Settlement Interval *i* in the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRVCC_{q, r}$	$/MWh	*Reliability Must-Run Variable Cost Component per QSE per Resource*—The monthly cost component that is used to adjust the energy cost calculation to reflect the actual fuel costs of RMR Unit *r* represented by QSE *q*. The value is initially set to zero. For resettlements, see item (2) below. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RTMG_{q, r, i,}$	MWh	*Real-Time Metered Generation per QSE per Resource by Settlement Interval by hour*—The Real-Time energy from RMR Unit *r* represented by QSE *q*, for the 15-minute Settlement Interval *i* in the hour *h*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRCEFA_{q, r}$	$/MMBtu	*Reliability Must-Run Contractual Estimated Fuel Adder*—The Estimated Fuel Adder that is contractually agreed upon in Section 22, Attachment B, Standard Form Reliability Must-Run Agreement. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
q	none	A QSE.
r	none	An RMR Unit.
i	none	A 15-minute Settlement Interval.

(2) If the RMR actual fuel cost is filed in accordance with the timeline in these Protocols, the monthly RMR variable cost component is calculated for the subsequent resettlements as follows:

$$\mathbf{RMRVCC}_{q,r} = (\mathbf{RMRMFCOST}_{q,r} + \sum_{h} \mathbf{RMREAMT}_{q,r,f,h}) / (\sum_{i} \mathbf{RTMG}_{q,r,i})$$

The above variables are defined as follows:

Variable	Unit	Definition

Variable	Unit	Definition
$RMRVCC_{q, r}$	$/MWh	*Reliability Must-Run Variable Cost Component per QSE per Resource*—The monthly cost component that is used to adjust the energy cost calculation to reflect the actual fuel costs of RMR Unit *r* represented by QSE *q*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRMFCOST_{q, r}$	$	*Reliability Must-Run Monthly actual Fuel Cost per QSE per Resource*—The monthly actual fuel cost of RMR Unit *r* represented by QSE *q*, for the month. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RTMG_{q, r, i}$	MWh	*Real-Time Metered Generation per QSE per Resource by Settlement Interval*—The Real-Time energy from RMR Unit *r* represented by QSE *q* for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMREAMT_{q, r, f, h}$	$	*Reliability Must-Run Energy Amount per QSE per Resource by hour*—The energy payment to QSE *q* for RMR Unit *r*, for the hour *h*, from the former Settlement Statement *f*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
q	none	A QSE.
r	none	An RMR Unit.
h	none	An hour in the month.
i	none	A 15-minute Settlement Interval in the month.
~~*RMREAMT*~~ $_{q, r, f, h}$	$	~~*Reliability Must Run Energy Amount per QSE per Resource by hour*—The energy payment to QSE *q* for RMR Unit *r*, for the hour *h* from the former Settlement Statement *f*.~~
f	none	Amount from former settlement run.

(3) The total of the payments for energy to each QSE for all RMR Units represented by this QSE for a given hour is calculated as follows:

$$\mathbf{RMREAMTQSETOT}_{q} = \sum_{r} \mathbf{RMREAMT}_{q, r}$$

The above variables are defined as follows:

Variable	Unit	Definition
$RMREAMTQSETOT_{q}$	$	*Reliability Must-Run Energy Amount QSE Total per QSE*—The total of the energy payments to QSE *q* for all RMR Units represented by this QSE for the hour.
$RMREAMT_{q, r}$	$	*Reliability Must-Run Energy Amount per QSE per Resource by hour*—The energy payment to QSE *q* for RMR Unit *r*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
q	none	A QSE.
r	none	An RMR Unit.

6.6.6.3 RMR Adjustment Charge

(1) Each QSE that represents an RMR Unit shall pay a charge designed to recover the net total revenues from RUC settlements, and from Real-Time settlements received by that QSE for all RMR Units that it represents, except that the charge does not include net revenues received by the QSE for the RMR Sstandby Ppayments calculated under

Section 6.6.6.1, RMR Standby Payment, and the RMR energy payments calculated under Section 6.6.6.2, RMR Payment for Energy.

(2) The charge for each QSE representing an RMR Unit for a given Operating Hour is calculated as follows:

$$\mathbf{RMRAAMT}_{q} = (-1) * [\sum_{p} \sum_{r} (((-1) * \sum_{i=1}^{4} (\mathbf{RTMG}_{q,r,p,i} * \mathbf{RTSPP}_{p,i})) + \sum_{i=1}^{4} \mathbf{EMREAMT}_{q,r,p,i} + \mathbf{RUCMWAMT}_{q,r,p} + \mathbf{RUCCBAMT}_{q,r,p} + \mathbf{RUCDCAMT}_{q,r,p} + \sum_{i=1}^{4} \mathbf{VSSEAMT}_{q,r,p,i} + \sum_{i=1}^{4} \mathbf{VSSVARAMT}_{q,r,i})]$$

The above variables are defined as follows:

Variable	Unit	Definition
$RMRAAMT_q$	$	*RMR Adjustment Charge per QSE*—The adjustment from QSE *q* Sstandby Ppayments and energy payments for all RMR Units represented by this QSE, for the revenues received for the same RMR Units from RUC and Real-Time oOperations, for the hour..
$RTEIAMT_{q, p, i}$	$	*Real-Time Energy Imbalance Amount per QSE per Settlement Point*—The payment or charge to QSE *q* for the Real-Time Energy Imbalance Service at Settlement Point *p*, for the 15-minute Settlement Interval.
$EMREAMT_{q, r, p, i}$	$	*Emergency Energy Amount per QSE per Settlement Point per unit per interval*—The payment to QSE *q* for the additional energy produced by RMR Unit *r* at Resource Node *p* in Real-Time during the Emergency Condition, for the 15-minute Settlement Interval *i*. Payment for emergency energy is made to the Combined Cycle Train.
$RUCMWAMT_{q, r, p}$	$	*RUC Make-Whole Amount per QSE per Settlement Point per unit*—The amount calculated for RMR Unit *r* committed in RUC at Resource Node *p* to make whole the Sstartup Cost and minimum energy cost of this unit, for the hour. See Section 5.7.1, RUC Make-Whole Payment. When one or more Combined Cycle Generation Resources are committed by RUC, payment is made to the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources.
$RUCCBAMT_{q, r}$	$	*RUC Clawback Charge per QSE per unit*—The RUC Clawback Charge to QSE *q* for RMR Unit *r*, for the hour. See Section 5.7.2, RUC Clawback Charge. When one or more Combined Cycle Generation Resources are committed by RUC, a charge is made to the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources.
$RUCDCAMT_{q, r, p}$	$	*RUC Decommitment Amount per QSE per Settlement Point per unit*—The amount calculated for RMR Unit *r* at Resource Node *p* represented by QSE *q* due to ERCOT de-commitment, for the hour. When one or more Combined Cycle Generation Resources are decommitted by RUC, payment is made to the Combined Cycle Train for all RUC-decommitted Combined Cycle Generation Resources.
$VSSEAMT_{q, r, p, i}$	$	*Voltage Support Service Energy Amount per QSE per Settlement Point per unit per interval* —The compensation to QSE *q* for ERCOT-directed power reduction from RMR Unit *r* at Resource Node *p* to provide Voltage Support Service (VSS), for the 15-minute Settlement Interval *i*. Payment for VSS is made to the Combined Cycle Train.
$VSSVARAMT_{q, r, i}$	$	*Voltage Support Service VAvar Amount per QSE per Unit*—The payment to QSE *q* for the Voltage Support Service (VSS) provided by RMR Unit *r*, for the 15-minute Settlement Interval *i*. Payment for VSS is made to the Combined Cycle Train.
$RTSPP_p$	$/MWh	*Real-Time Settlement Point Price per Settlement Point*—The Real-Time Settlement Point PriceSPP at Settlement Point *p*, for the 15-minute Settlement Interval.
$RTMG_{q, r, p}$	MWh	*Real-Time Metered Generation per QSE per Settlement Point per Resource*—The Real-Time energy produced by the Generation Resource *r* represented by QSE *q* at Resource Node *p*, for the 15-minute Settlement 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.

Variable	Unit	Definition
r	none	An RMR Unit.
i	none	A 15-minute Settlement Interval in the hour.

6.6.6.4 RMR Charge for Unexcused Misconduct

(1) If a Misconduct Event, as defined in the RMR Agreement, is not excused as provided in the RMR Agreement, then ERCOT shall charge the QSE that represents the RMR Unit an unexcused misconduct amount of $10,000 for each unexcused Misconduct Event as follows:

$$\mathbf{RMRNPAMT}_{q,r} = \mathbf{\$10{,}000 * RMRNPFLAG}_{q,r}$$

The above variable is defined as follows:

Variable	Unit	Definition
$RMRNPAMT_{q,r}$	$	*Reliability Must-Run Unexcused Misconduct Charge per QSE per Resource*—The charge to QSE *q* for the unexcused Misconduct Event of RMR Unit *r* for an Operating Day. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$RMRNPFLAG_{q,r}$	$	*Reliability Must-Run Non-Performance Flag per QSE per Resource*—A flag for the QSE *q* for the unexcused Misconduct Event of RMR Unit *r* for an Operating Day. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
q	none	A QSE.
r	none	An RMR Unit.

(2) The total of the charges to each QSE for unexcused Misconduct Events of all RMR Units represented by this QSE for a given Operating Day is calculated as follows:

$$\mathbf{RMRNPAMTQSETOT}_{q} = \sum_{r} \mathbf{RMRNPAMT}_{q,r}$$

The above variables are defined as follows:

Variable	Unit	Definition
$RMRNPAMTQSETOT_{q}$	$	*Reliability Must-Run Unexcused Misconduct Amount QSE Total per QSE*—The total of the charges to QSE *q* for unexcused Misconduct Events of the RMR Units represented by this QSE for the Operating Day.
$RMRNPAMT_{q,r}$	$	*Reliability Must-Run Unexcused Misconduct Charge per QSE per Resource*—The charge to QSE *q* for the unexcused Misconduct Event of RMR Unit *r* for the Operating Day. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
q	none	A QSE.
r	none	An RMR Unit.

6.6.6.5 RMR Service Charge

The total RMR cost for all RMR Units less the amount received from DAM, RUC processes and Real-Time operations for all RMR Units is allocated to the QSEs representing Lloads based on LRS. The RMR Service charge to each QSE for a given hour is calculated as follows:

$$\mathbf{LARMRAMT}_q = \mathbf{(-1) * (RMRSBAMTTOT + RMREAMTTOT + RMRAAMTTOT - \sum_{i=1}^{4} RMRDAESRTVTOT}_i \mathbf{- (RMRDAEREVTOT + RMRDAMWREVTOT) + RMRNPAMTTOT / H) * HLRS}_q$$

Where:

RMR Standby Amount Total

$$\text{RMRSBAMTTOT} = \sum_q \text{RMRSBAMTQSETOT}_q$$

RMR Energy Amount Total

$$\text{RMREAMTTOT} = \sum_q \text{RMREAMTQSETOT}_q$$

RMR Adjustment Charge Total

$$\text{RMRAAMTTOT} = \sum_q \text{RMRAAMT}_q$$

RMR Non-Performance Amount Total

$$\text{RMRNPAMTTOT} = \sum_q \text{RMRNPAMTQSETOT}_q$$

Total Day-Ahead energy revenue for all RMR Units

$$\text{RMRDAEREVTOT} = \sum_q \sum_r \sum_p \text{DAEREV}_{q,r,p}$$

$$\text{DAEREV}_{q,r,p} = (-1) * \text{DASPP}_p * \text{DAESR}_{q,r,p}$$

Total Real-Time value of Day-Ahead energy for all RMR Units by interval

$$\text{RMRDAESRTVTOT}_i = \sum_q \sum_r \sum_p \text{DAESRTV}_{q,r,p,i}$$

$$\text{DAESRTV}_{q,r,p,i} = \text{RTSPP}_{p,i} * (\text{DAESR}_{q,r,p} * 1/4)$$

Total Real-Time value of Day-Ahead Make-Whole Revenue for all RMR units by interval

$$\text{RMRDAMWREVTOT}_i = \text{DAMWRMRREVQSETOT}$$

The above variables are defined as follows:

Variable	Unit	Definition

Variable	Unit	Definition
LARMRAMT $_q$	$	*Load-Allocated Reliability Must-Run Amount per QSE*—The amount charged to QSE *q* based on its LRS of the difference between the amount paid to all QSEs for RMR Service under ~~this~~ Section 6.6.6, Reliability Must-Run Settlement, and the amount that would have been paid to the QSEs for the same RMR Units if they were not providing RMR Service under the other parts of this Section 6, Adjustment Period and Real-Time Operations, Section 5, Transmission Security Analysis and Reliability Unit Commitment, and Section 4, Day-Ahead Operations, for the hour.
RMRSBAMTTOT	$	*RMR Standby Amount Total*—The total of the Sstandby Ppayments to all QSEs for all RMR Units, for the hour.
RMREAMTTOT	$	*RMR Energy Amount Total*—The total of the energy cost payments to all QSEs for all RMR Units, for the hour.
RMRAAMTTOT	$	*RMR Adjusted Amount Total*—The total of the adjusted amounts from all QSEs representing RMR Units for the revenues received for these units from RUC, Real-Time o~~O~~perations and Ancillary Service m~~M~~arkets, for the hour.
RMRNPAMTTOT	$	*RMR Non-Performance Amount Total*—The total of the charges to all QSEs for unexcused M~~m~~isconduct Eevents of all RMR Units, for the Operating Day.
RMRDAEREVTOT	$	*RMR Day-Ahead Energy Revenue Total*—The total of the revenues for the offers cleared in the DAM for all RMR Units, for the hour.
RMRDAESRTVTOT	$	*RMR Day-Ahead Energy Sale Real-Time Value Total*—The total of the Real-Time value of the offers cleared in the DAM for all RMR Units, for the hour.
RMRDAMWREVTOT	$	*RMR Day-Ahead Make-Whole Revenue Total*—The total of the RMR Day-Ahead Make-Whole Revenue for all DAM-committed RMR Units for the hour.
HLRS $_q$	none	The hourly LRS calculated for QSE *q* for the hour. See Section 6.6.2.3, QSE Load Ratio Share for an Operating Hour.
RMRSBAMTQSETOT $_q$	$	*Reliability Must-Run Standby Amount QSE Total per QSE*—The total of the Standby Payments to QSE *q* for the RMR Units represented by the same QSE for the hour.
RMREAMTQSETOT $_q$	$	*Reliability Must-Run Energy Amount QSE Total per QSE*—The total of the energy payments to QSE *q* for the RMR Units represented by the same QSE for the hour.
RMRAAMT $_q$	$	*RMR Adjusted Amount per QSE*—The adjustment from QSE *q* Sstandby Ppayments and energy payments for all RMR Units represented by this QSE, for the revenues received for the same RMR Units from RUC and Real-Time o~~O~~perations, for the hour.
RMRNPAMTQSETOT $_q$	$	*Reliability Must-Run Unexcused Misconduct Amount QSE Total per QSE*—The total of the charges to QSE *q* for unexcused Misconduct Events of the RMR Units represented by the same QSE for the Operating Day.
DAEREV $_{q,r,p}$	$	*Day-Ahead Energy Revenue per QSE by Settlement Point per unit*—The revenue that ERCOT collects for the offer cleared in the DAM submitted for RMR Unit *r* at Resource Node *p* represented by QSE *q*, based on the DAM Settlement Point Price~~PP~~, for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.

Variable	Unit	Definition
$DAESRTV_{q, r, p, i}$	$	*Day-Ahead Energy Sale Real-Time Value per QSE per Settlement Point per unit per interval*—The Real-Time value of the energy sold in the DAM from RMR Unit *r* at Resource Node *p* represented by QSE *q*, for the 15-minute Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$DASPP_{p}$	$/MWh	*Day-Ahead Settlement Point Price by Settlement Point*—The DAM Settlement Point Price~~PP~~ at Resource Node *p* for the hour.
$RTSPP_{p, i}$	$/MWh	*Real-Time Settlement Point Price per Settlement Point per interval*—The Real-Time Settlement Point Price~~PP~~ at Resource Node *p*, for the 15-minute Settlement Interval *i*.
$DAESR_{q, r, p}$	MW	*Day-Ahead Energy Sale from Resource per QSE by Settlement Point per unit*—The amount of energy cleared through Three-Part Supply Offers in the DAM and/or DAM Energy-Only Offer Curves for RMR Unit *r* at Resource Node *p* represented by QSE *q* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$DAESR_{q, r, p, i}$	MW	*Day-Ahead Energy Sale from Resource per QSE by Settlement Point per unit per interval*—The amount of energy cleared through Three-Part Supply Offers in the DAM and/or DAM Energy-Only Offer Curves for Resource *r* at Resource Node *p* represented by QSE *q* for the hour that includes the 15-minute Settlement Interval *i*.
DAMWRMRREVQSETOT	$	*Day-Ahead Make-Whole RMR Revenue QSE Total per QSE*—The total of the Day-Ahead Make-Whole Revenue calculated for QSE *q* for DAM-committed RMR Units represented by this QSE for the hour.
q	none	A QSE.
p	none	A Resource Node Settlement Point.
r	none	An RMR Unit.
i	none	A 15-minute Settlement Interval in the hour.
H	none	The number of hours of the Operating Day.

6.6.7 Voltage Support Settlement

6.6.7.1 Voltage Support Service Payments

(1) All other Generation Resources shall be eligible for compensation for Reactive Power production in accordance with Section 6.5.7.7, Voltage Support Service, only if ERCOT issues a Dispatch Instruction that results in the following unit operation:

(a) When ERCOT instructs the Generation Resource to exceed its Unit Reactive Limit (URL) and the Generation Resource provides additional Reactive Power, then ERCOT shall pay for the additional Reactive Power provided at a price that recognizes the avoided cost of reactive support Resources on the transmission network.

(b) Any real power reduction directed by ERCOT through ~~(~~VDIs~~)~~ to provide for additional reactive capability for voltage support must be compensated as a lost opportunity payment

(2) The payment for a given 15-minute Settlement Interval to each QSE representing a Generation Resource that operates in accordance with an ERCOT Dispatch Instruction is calculated as follows:

Depending on the Dispatch Instruction, payment for Volt-Amperes ~~R~~reactive (~~va~~VAr):

If $VSSVARLAG_{q,r} > 0$

$$\mathbf{VSSVARAMT_{q,r} = (-1) * VSSVARPR * VSSVARLAG_{q,r}}$$

If $VSSVARLEAD_{q,r} > 0$

$$\mathbf{VSSVARAMT_{q,r} = (-1) * VSSVARPR * VSSVARLEAD_{q,r}}$$

Where:

$$VSSVARLAG_{q,r} = \text{Max}\,[0, \text{Min}\,(¼ * VSSVARIOL_{q,r}, RTVAR_{q,r}) - (¼ * URLLAG_{q,r})]$$

$$VSSVARLEAD_{q,r} = \text{Max}\,\{0, [(¼ * URLLEAD_{q,r}) - \text{Max}\,((¼ * VSSVARIOL_{q,r}), RTVAR_{q,r})]\}$$

$$URLLAG_{q,r} = 0.32868 * HSL_{q,r}$$

$$URLLEAD_{q,r} = (-1) * 0.32868 * HSL_{q,r}$$

The above variables are defined as follows:

Variable	Unit	Definition
$VSSVARAMT_{q,r}$	$	*Voltage Support Service VA~~v~~ar Amount per QSE per Generation Resource* - The payment to QSE *q* for the VSS provided by Generation Resource *r*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train.
VSSVARPR	$/M~~v~~aVArh	*Voltage Support Service ~~v~~VAar Price* - The price for instructed M~~v~~aVAr beyond a Generation Resource's URL currently is $2.65/M~~v~~aVArh (based on $50.00/installed kV~~v~~Aar).
$VSSVARLAG_{q,r}$	M~~v~~aVArh	*Voltage Support Service VA~~v~~ar Lagging per QSE per Generation Resource* - The instructed portion of the Reactive Power above the Generation Resource's lagging URL for Generation Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train.
$VSSVARLEAD_{q,r}$	M~~v~~aVArh	*Voltage Support Service VA~~v~~ar Leading per QSE per Generation Resource* - The instructed portion of the Reactive Power below the Generation Resource's leading URL for Generation Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train.

Variable	Unit	Definition
VSSVARIOL $_{q, r}$	M~~va~~VAr	*Voltage Support Service VA~~var~~ Instructed Output Level per QSE per Generation Resource*—The instructed Reactive Power output level of Generation Resource *r* represented by QSE *q*, lagging Reactive Power if positive and leading Reactive Power if negative, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train.
RTVAR $_{q, r}$	MVAR~~r~~h	*Real-Time VA~~var~~ per QSE per Resource*—The netted Reactive Energy measured for Generation Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train.
URLLAG $_{q, r}$	M~~va~~VAr	*Unit Reactive Limit Lagging per QSE per Resource*—The URL for lagging Reactive Power of the Generation Resource *r* represented by QSE *q* as determined in accordance with these Protocols. Its value is positive. Where for a combined cycle resource, *r* is a Combined Cycle Train.
URLLEAD $_{q, r}$	M~~va~~VAr	*Unit Reactive Limit Leading per QSE per Resource*—The URL for leading Reactive Power of the Generation Resource *r* represented by QSE *q* as determined in accordance with these Protocols. Its value is negative. Where for a combined cycle resource, *r* is a Combined Cycle Train.
HSL $_{q,r}$	MW	*High Sustained Limit*—The ~~(~~HSL~~)~~ of a Generation Resource as defined in Section 2, Definitions, for the hour that includes the Settlement Interval *i*. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource.
q	none	A QSE.
r	none	A Generation Resource.

(3) The total additional compensation to each QSE for voltage support service for the 15-minute Settlement Interval is calculated as follows:

$$\mathbf{VSSVARAMTQSETOT_q} = \sum_r \mathbf{VSSVARAMT_{q,r}}$$

Variable	Unit	Definition
VSSVARAMT $_{q, r}$	$	*Voltage Support Service VA~~var~~ Amount per QSE per Generation Resource*—The payment to QSE *q* for the VSS provided by Generation Resource *r*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train.
VSSVARAMTQSETOT $_{q}$	$	*Voltage Support VA~~var~~ Amount QSE total per QSE*—The total of the payments to QSE *q* as compensation for VSS by this QSE for the 15-minute settlement interval.
q	none	A QSE.
r	none	A Generation Resource.

(4) The lost opportunity payment, if applicable:

$$\mathbf{VSSEAMT_{q,r}} = \mathbf{(-1) * Max\ (0, RTSPP_p * Max\ (0, (HSL_{q,r} * ¼ - RTMG_{q,r})) - (RTICHSL_{q,r} - RTVSSAIEC_{q,r} * (RTMG_{q,r} - LSL_{q,r} * ¼)))}$$

Where:

$$RTICHSL_{q,r} = RTHSLAIEC_{q,r} * (¼ * HSL_{q,r} - ¼ * LSL_{q,r})$$

The above variables are defined as follows:

Variable	Unit	Definition
$VSSEAMT_{q,r}$	$	*Voltage Support Service Energy Amount per QSE per Generation Resource*—The lost opportunity payment to QSE *q* for ERCOT-directed VSS from Generation Resource r for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train.
$RTMG_{q,r}$	MWh	*Real-Time Metered Generation per QSE per Resource*—The Real-Time metered generation of Generation Resource *r* represented by QSE *q*, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train.
$RTSPP_p$	$	*Real-Time Settlement Point Price*—The Real-Time SPP at the Resource Node for the 15-minute Settlement Interval. -
$RTVSSAIEC_{q,r}$	$/MWh	*Real-Time Average Incremental Energy Cost per QSE per Resource*—The average incremental cost to operate (not subject to cost cap) the Generation Resource *r* represented by QSE *q* from its LSL to its metered MW output, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource.
$RTICHSL_{q,r}$	$	*Real-Time Incremental Cost Corresponding with HSL per QSE per Resource*—The incremental cost to operate (not subject to cost cap) Generation Resource *r* represented by QSE *q* from its LSL to its HSL, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource.
$RTHSLAIEC_{q,r}$	$/MWh	*Real-Time Average Incremental Energy Cost for the entire Energy Offer Curve through the HSL per QSE per Resource*—The average incremental cost to operate (not subject to cost cap) the Generation Resource *r* represented by QSE *q* from its LSL to its HSL, for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource.
$HSL_{q,r}$	MW	*High Sustained ~~able~~ Limit Generation per QSE per Settlement Point per Resource*—The ~~High Sustainable Limit~~HSL of Generation Resource *r* represented by QSE *q* at Resource Node p for the hour that includes the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource.
$LSL_{q,r}$	MW	*Low Sustained~~able~~ Limit Generation per QSE per Settlement Point per Resource*—The ~~Low Sustainable Limit~~LSL of Generation Resource *r* represented by QSE *q* at Resource Node p for the hour that includes the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Generation Resource.
q	none	A QSE.
r	none	A Generation Resource.
p	none	A Resource Node Settlement Point.

(5) The total of the payments to each QSE for ERCOT-directed power reduction to provide VSS for a given 15-minute Settlement Interval is calculated as follows:

$$\mathbf{VSSEAMTQSETOT}_q = \sum_r \mathbf{VSSEAMT}_{q,r}$$

The above variables are defined as follows:

Variable	Unit	Definition

Variable	Unit	Definition
$VSSEAMTQSETOT_q$	$	*Voltage Support Service Lost Opportunity Amount QSE Total per QSE*—The total of the lost opportunity payments to QSE *q* for providing VSS for providing ERCOT-directed VSS for the 15-minute Settlement Interval.
$VSSEAMT_{q,r}$	$	*Voltage Support Service Energy Amount per QSE per Settlement Point per Generation Resource*—The lost opportunity payment to QSE *q* for ERCOT-directed VSS from Generation Resource *r* for the 15-minute Settlement Interval for the 15-minute Settlement Interval. Where for a combined cycle resource, *r* is a Combined Cycle Train.
q	none	A QSE.
r	none	A Generation Resource.

6.6.8 Black Start Capacity

6.6.8.1 Black Start Capacity Payment

(1) ERCOT shall pay an hourly standby fee to QSEs representing Black Start Resources. This standby fee is determined through a competitive annual bidding process, with an adjustment for reliability based on a six-month rolling availability equal to 85% in accordance with Section 22, Attachment D, Standard Form Black Start Agreement.

(2) ERCOT shall pay a Black Start standby payment to each QSE for each Black Start Resource. The payment for each hour is calculated as follows:

$$\mathbf{BSSAMT}_{q,r} = \mathbf{(-1) * BSSPR}_{q,r} \mathbf{* BSSARF}_{q,r}$$

Where:

Black Start Service Availability Reduction Factor

If ($BSSHREAF_{q,r} \geq 0.85$)

$BSSARF_{q,r} = 1$

Otherwise

$BSSARF_{q,r} = \text{Max}(0, 1 - (0.85 - BSSHREAF_{q,r}) * 2)$

Black Start Service Hourly Rolling Equivalent Availability Factor

If ($BSSEH_{q,r} < 4380$)

$BSSHREAF_{q,r} = 1$

Otherwise

$$BSSHREAF_{q,r} = \left(\sum_{hr=h-4379}^{h} BSSAFLAG_{q,r,hr}\right) / 4380$$

Availability for a Combined Cycle Train will be determined pursuant to contractual terms but no more than once per hour.

The above variables are defined as follows:

Variable	Unit	Definition
$BSSAMT_{q,r}$	$	*Black Start Service Amount per QSE per Resource by hour*—The standby payment to QSE *q* for the Black Start Service (BSS) provided by Resource *r*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$BSSPR_{q,r}$	$ per hour	*Black Start Service Price per QSE per Resource*—The standby price of BSS Resource *r* represented by QSE *q*, as specified in the Black Start~~SS~~ Agreement. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$BSSARF_{q,r}$	none	*Black Start Service Availability Reduction Factor per QSE per Resource by hour*—The availability reduction factor of Resource *r* represented by QSE *q* under the Black Start~~SS~~ Agreement, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$BSSHREAF_{q,r}$	none	*Black Start Service Hourly Rolling Equivalent Availability Factor per QSE per Resource by hour*—The equivalent availability factor of the BSS Resource *r* represented by QSE *q* over 4,380 hours, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$BSSEH_{q,r}$	none	*Black Start Service Elapsed number of Hours per QSE per Resource by hour*—The number of the elapsed hours of BSS Resource *r* represented by QSE *q* since the beginning of the BSS Agreement, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$BSSAFLAG_{q,r,hr}$	none	*Black Start Service Availability Flag per QSE per Resource by hour*—The flag of the availability of BSS Resource *r* represented by QSE *q*, 1 for available and 0 for unavailable, for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
q	none	A QSE.
r	none	A BSS Resource.
hr	none	The index of a given hour and the previous 4379 hours.
4380	none	The number of hours in a six-month period.

(3) The total of the payments to each QSE for all BSS Resources represented by this QSE for a given hour is calculated as follows:

$$\mathbf{BSSAMTQSETOT}_{q} = \sum_{r} \mathbf{BSSAMT}_{q,r}$$

The above variables are defined as follows:

Variable	Unit	Definition
$BSSAMTQSETOT_{q}$	$	*Black Start Service Amount QSE Total per QSE*—The total of the payments to QSE *q* for BSS provided by all the BSS Resources represented by this QSE for the hour *h*.
$BSSAMT_{q,r}$	$	*Black Start Service Amount per QSE per Resource*—The standby payment to QSE *q* for BSS provided by Resource *r*, for the hour. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
q	none	A QSE.
r	none	A BSS Resource.

6.6.9 *Emergency Operations Settlement*

6.6.9.1 Payment for Emergency Power Increase Directed by ERCOT

(1) If the Emergency Base Point issued to a Generation Resource is higher than the SCED Base Point immediately before the Emergency Condition, then ERCOT shall pay the QSE an additional compensation for the Resource at its Resource Node Settlement Point. The payment for a given 15-minute Settlement Interval is calculated as follows:

$$\mathbf{EMREAMT}_{q,r,p} = \mathbf{(-1) * EMREPR}_{q,r,p} \mathbf{* EMRE}_{q,r,p}$$

Where:

$$\text{EMREPR}_{q,r,p} = \text{Max}(0, \text{EBPWAPR}_{q,r,p} - \text{RTSPP}_{p})$$

$$\text{EBPWAPR}_{q,r,p} = \sum_{y}(\text{EBPPR}_{q,r,p,y} * \text{EBP}_{q,r,p,y} * \text{TLMP}_{y}) / \sum_{y}(\text{EBP}_{q,r,p,y} * \text{TLMP}_{y})$$

$$\text{EMRE}_{q,r,p} = \text{Max}(0, \text{Min}(\text{AEBP}_{q,r,p}, \text{RTMG}_{q,r,p}) - \tfrac{1}{4} * \text{BP}_{q,r,p})$$

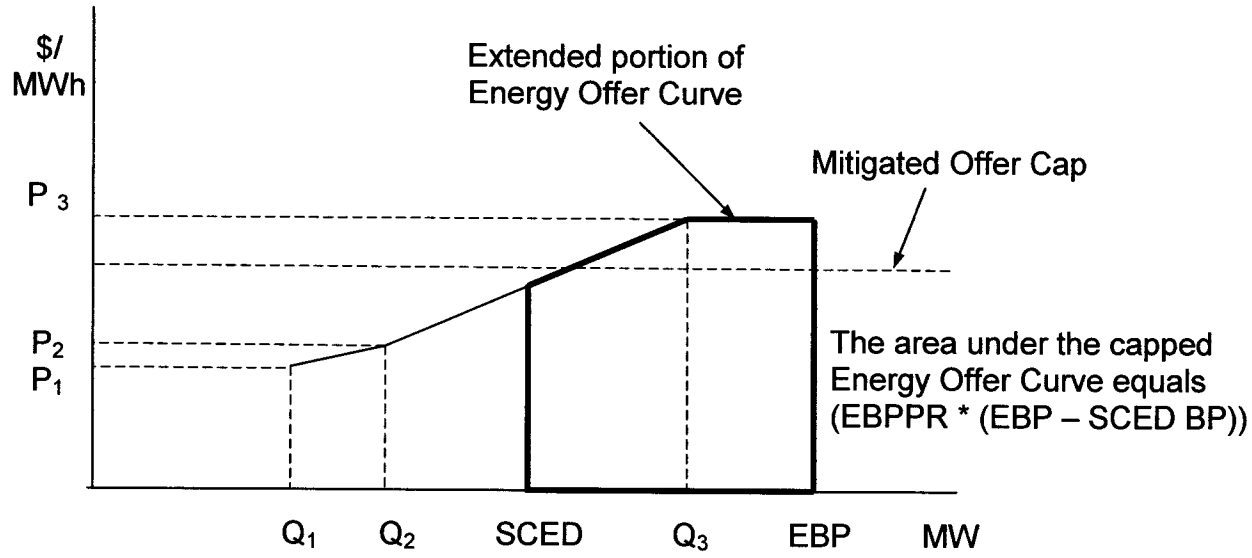
$$\text{AEBP}_{q,r,p} = \frac{\sum_{y}(\text{EBP}_{q,r,p,y} * \text{TLMP}_{y} / 3600)}{\sum_{y}}$$

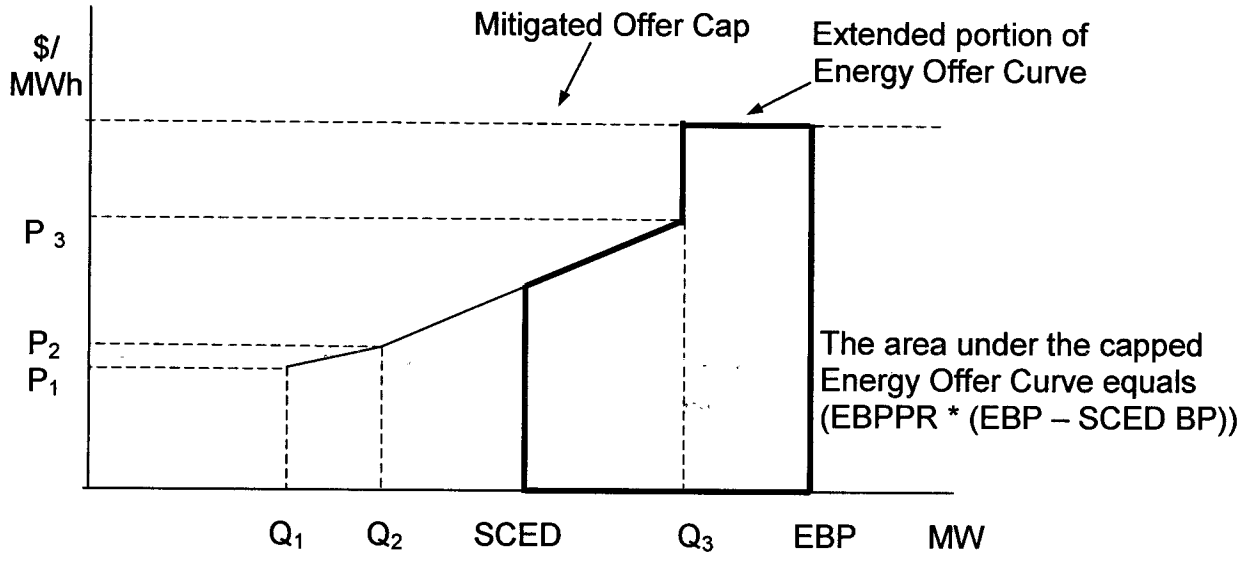
The above variables are defined as follows:

Variable	Unit	Definition
$\text{EMREAMT}_{q,r,p}$	$	*Emergency Energy Amount per QSE per Settlement Point per Resource*—The payment to QSE *q* as additional compensation for the additional energy produced by Generation Resource *r* at Resource Node *p* in Real-Time during the Emergency Condition, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$\text{EMREPR}_{q,r,p}$	$/MWh	*Emergency Energy Price per QSE per Settlement Point per Resource*—The compensation rate for the additional energy produced by Generation Resource *r* at Resource Node *p* represented by QSE *q* in Real-Time during the Emergency Condition, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$\text{EMRE}_{q,r,p}$	MWh	*Emergency Energy per QSE per Settlement Point per Resource*—The additional energy produced by Generation Resource *r* at Resource Node *p* represented by QSE *q* in Real-Time during the Emergency Condition, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$\text{EBPWAPR}_{q,r,p}$	$/MWh	*Emergency Base Point Weighted Average Price per QSE per Settlement Point per Resource*—The weighted average of the energy prices corresponding with the Emergency Base Points on the Energy Offer Curve for Resource *r* at Resource Node *p* represented by QSE *q*, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.

Variable	Unit	Definition
$BP_{q, r, p}$	MW	*Base Point per QSE per Settlement Point per Resource*—The Base Point of Resource *r* at Resource Node *p* represented by QSE *q* from the SCED prior to the Emergency Condition. For a Combined Cycle Train, the Resource *r* must be one of the registered Combined Cycle Generation Resources within the Combined Cycle Train.
$AEBP_{q, r, p}$	MWh	*Aggregated Emergency Base Point*—The Generation Resource's aggregated Emergency Base Point, for the 15-minute Settlement Interval. Where for a Combined Cycle Train, AEBP is calculated for the Combined Cycle Train considering all emergency Dispatch Instructions to any Combined Cycle Generation Resources within the Combined Cycle Train.
$EBP_{q, r, p, y}$	MW	*Emergency Base Point per QSE per Settlement Point per Resource by interval*—The Emergency Base Point of Resource *r* at Resource Node *p* represented by QSE *q* for the Emergency Base Point interval or SCED interval *y*. If a Base Point instead of an Emergency Base Point is effective during the interval *y*, its value equals the Base Point. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$EBPPR_{q, r, p, y}$	$/MWh	*Emergency Base Point Price per QSE per Settlement Point per Resource by interval*—The average incremental energy cost calculated per the Energy Offer Curve for the output levels between the SCED Base Point immediately before the Emergency Condition and the Emergency Base Point of Resource *r* at Resource Node *p* represented by QSE *q* for the Emergency Base Point interval or SCED interval *y*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$RTSPP_{p}$	$/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.
$RTMG_{q, r, p}$	MWh	*Real-Time Metered Generation per QSE per Settlement Point per Resource*—The metered generation of Resource *r* at Resource Node *p* represented by QSE *q* in Real-Time for the 15-minute Settlement Interval. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$TLMP_{y}$	second	*Duration of Emergency Base Point interval or SCED interval per interval*—The duration of the portion of the Emergency Base Point interval or SCED interval *y* within the 15-minute Settlement Interval.
q	none	A QSE.
p	none	A Resource Node Settlement Point.
r	none	A Generation Resource.
y	none	An Emergency Base Point interval or SCED interval that overlaps the 15-minute Settlement Interval.
3600	none	The number of seconds in one hour.

(2) The extension of the Energy Offer Curve is used to calculate the Emergency Base Point Price. If the Emergency Base Point MW value is greater than the largest MW value on the Energy Offer Curve submitted by the QSE for the Resource, then the Energy Offer Curve is extended to the Emergency Base Point MW value with a $/MWh value that is the Mitigated Offer Cap (pursuant to Section 4.4.9.4.1, Mitigated Offer Cap) for the highest MW output on the Energy Offer Curve submitted by the QSE for the Resource.





(3) The total additional compensation to each QSE for emergency power increases of Generation Resources for the 15-minute Settlement Interval is calculated as follows:

$$\mathbf{EMREAMTQSETOT}_{q} = \sum_{r}\sum_{p}\mathbf{EMREAMT}_{q,r,p}$$

The above variables are defined as follows:

Variable	Unit	Definition
EMREAMTQSETOT $_q$	$	*Emergency Energy Amount QSE Total per QSE*—The total of the payments to QSE *q* as additional compensation for emergency power increases of the Generation Resources represented by this QSE for the 15-minute Settlement Interval.

Variable	Unit	Definition
$EMREAMT_{q, r, p}$	$	*Emergency Energy Amount per QSE per Settlement Point per Resource*—The payment to QSE *q* as additional compensation for the additional energy produced by Generation Resource *r* at Resource Node *p* in Real-Time during the Emergency Condition, for the 15-minute Settlement Interval. 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.

6.7 Real-Time Settlement Calculations for the Ancillary Services

6.7.1 *Payments for Ancillary Service Capacity Sold in a Supplemental Ancillary Service Market*

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

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

$$\mathbf{RTPCRUAMT}_{q, m} = \mathbf{(-1) * MCPCRU}_{m} \mathbf{* RTPCRU}_{q, m}$$

Where:

$$RTPCRU_{q, m} = \sum_{r} PCRUR_{q, r, m}$$

The above variables are defined as follows:

Variable	Unit	Description
$RTPCRUAMT_{q, m}$	$	*Procured Capacity for Reg-Up Amount by QSE by market*—The payment to QSE *q* for the Ancillary Service Offers cleared in the market *m* to provide Reg-Up, for the hour.
$MCPCRU_{m}$	$/MW per hour	*Market Clearing Price for Capacity for Reg-Up by market*—The MCPC for Reg-Up from the market *m*, for the hour.
$RTPCRU_{q, m}$	MW	*Procured Capacity for Reg-Up by QSE by market*—The portion of QSE *q*'s Ancillary Service Offers cleared in the market *m* to provide Reg-Up, for the hour.
~~RT~~$PCRUR_{q, r, m}$	MW	*Procured Capacity for Reg-Up from Resource per Resource per QSE by market*—The Reg-Up capacity quantity awarded to QSE *q* in the market *m* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
m~~M~~	none	A SASM.
Q	none	A QSE.
R	none	A Generation Resource.

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

$$\mathbf{RTPCRDAMT}_{q,m} = \mathbf{(-1) * MCPCRD}_{q,m} \mathbf{* RTPCRD}_{q,m}$$

Where:

$$\text{RTPCRD}_{q,m} = \sum_{r} \text{PCRDR}_{r,q,m}$$

The above variables are defined as follows:

Variable	Unit	Description
$\text{RTPCRDAMT}_{q,m}$	$	*Procured Capacity for Reg-Down Amount by QSE by market*—The payment to QSE *q* for the Ancillary Service Offers cleared in the market *m* to provide Reg-Down, for the hour.
MCPCRD_{m}	$/MW per hour	*Market Clearing Price for Capacity for Reg-Down by market*—The MCPC for Reg-Down from the market *m*, for the hour.
$\text{RTPCRD}_{q,m}$	MW	*Procured Capacity for Reg-Down by QSE by market*—The portion of QSE *q*'s Ancillary Service Offers cleared in the market *m* to provide Reg-Down, for the hour.
$\text{PCRDR}_{r,q,m}$	MW	*Procured Capacity for Reg-Down from Resource per Resource per QSE by market*—The Reg-Down capacity quantity awarded to QSE *q* in the market *m* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
M	none	A SASM.
q	none	A QSE.
r	none	A Generation Resource.

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

$$\mathbf{RTPCRRAMT}_{q,m} = \mathbf{(-1) * MCPCRR}_{m} \mathbf{* RTPCRR}_{q,m}$$

Where:

$$\text{RTPCRR}_{q,m} = \sum_{r} \text{PCRRR}_{q,r,m}$$

The above variables are defined as follows:

Variable	Unit	Description
$\text{RTPCRRAMT}_{q,m}$	$	*Procured Capacity for Responsive Reserve Amount by QSE by market*—The payment to QSE *q* for the Ancillary Service Offer cleared in the market *m* to provide ~~Responsive Reserve~~RRS, for the hour.
MCPCRR_{m}	$/MW per hour	*Market Clearing Price for Capacity for Responsive Reserve by market*—The MCPC for ~~Responsive Reserve~~RRS from the market *m*, for the hour.

Variable	Unit	Description
$RTPCRR_{q, m}$	MW	*Procured Capacity for Responsive Reserve by QSE by market*—The portion of QSE *q* Ancillary Service Offers cleared in the market *m* to provide ~~Responsive Reserve~~RRS, for the hour.
$PCRRR_{q,r, m}$	MW	*Procured Capacity for Responsive Reserve from Resource per Resource per QSE by market*—The ~~Responsive Reserve~~RRS capacity quantity awarded to QSE *q* in the market *m* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
m	none	A SASM.
q	none	A QSE.
r	none	A Generation Resource.

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

$$\mathbf{RTPCNSAMT}_{q, m} = \mathbf{(-1) * MCPCNS}_{m} \mathbf{* RTPCNS}_{q, m}$$

Where:

$$RTPCNS_{q, m} = \sum_{r} PCNSR_{q, r, m}$$

The above variables are defined as follows:

Variable	Unit	Description
$RTPCNSAMT_{q, m}$	$	*Procured Capacity for Non-Spin Amount by QSE by market*—The payment to QSE *q* for Ancillary Service Offer cleared in the market *m* to provide Non-Spin, for the hour.
$MCPCNS_{m}$	$/MW per hour	*Market Clearing Price for Capacity for Non-Spin by market*—The MCPC for Non-Spin from the market *m*, for the hour.
$RTPCNS_{q, m}$	MW	*Procured Capacity for Non-Spin by QSE by market*—The portion of QSE *q*'s Ancillary Service Offer cleared in the market *m* to provide Non-Spin, for the hour.
$PCNSR_{q,r, m}$	MW	*Procured Capacity for Non-Spin from Resource per Resource per QSE by market*—The Non-Spin capacity quantity awarded to QSE *q* in the market *m* for Resource *r* for the hour. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
m	none	A SASM.
q	none	A QSE.
r	none	A Generation Resource.

ERCOT Nodal Protocols

Section 2: Definitions and Acronyms

Updated: ~~August 1, 2010~~September 1, 2010

(Effective upon the Nodal Protocol Transition Plan's Texas Nodal Market Implementation Date as prescribed by zonal Protocol Section 21.12, Process for Transition to Nodal Market Protocol Sections)

2 DEFINITIONS AND ACRONYMS

2.1 DEFINITIONS

C

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~~**Combined Cycle Configuration**~~

~~Any combination in which a combined-cycle power block can be operated as a separate Resource. Each possible configuration operated as a separate Resource has a distinct set of operating parameters, physical constraints, and Energy Offer Curve.~~

R

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Resource

The term is used to refer to both a Generation Resource and a Load Resource. The term "Resource" used by itself in these Protocols does not include a Non-Modeled Generator.

All-Inclusive Generation Resource

A term used to refer to both a Generation Resource and a Non-Modeled Generator.

All-Inclusive Resource

A term used to refer to a Generation Resource, Load Resource and a Non-Modeled Generator.

Dynamically Scheduled Resource (DSR)

A Resource that has been designated by the QSE, and approved by ERCOT, as a DSR status-type and that follows a DSR Load.

Generation Resource

A generator capable of providing energy or Ancillary Service to the ERCOT System and is registered with ERCOT as a Generation Resource. The term "Generation Resource" used by itself in these Protocols does not include a Non-Modeled Generator.

Black Start Resource

A Generation Resource under contract with ERCOT to provide BSS.

Combined Cycle Train

The combinations of gas turbines and steam turbines in an electric generation plant that employs more than one thermodynamic cycle. For example, a Combined [ASB1] Cycle Train refers to the combination of gas turbine generators (operating on the Brayton Cycle) with turbine exhaust waste heat boilers and steam turbine generators (operating on the Rankin Cycle) for the production of electric power. In the ERCOT market, Combined Cycle Trains are each registered as a plant that can operate as a Generation Resource in one or more Combined Cycle Generation Resource configurations.

Combined Cycle Generation Resource

A specified configuration of physical Generation Resources (gas and steam turbines), with a distinct set of operating parameters and physical constraints, in a Combined Cycle Train registered with ERCOT.

Intermittent Renewable Resource (IRR)

A Generation Resource that can only produce energy from variable, uncontrollable Resources, such as wind, solar, or run-of-the-river hydroelectricity.

Mothballed Generation Resource

A Generation Resource for which a Generation Entity has submitted a Notification of Suspension of Operations, for which ERCOT has declined to execute an RMR Agreement, and for which the Generation Entity has not announced retirement of the Generation Resource.

Split Generation Resource

A Generation Resource that has been split to function as two or more independent Generation Resources in accordance with Section 10.3.2.1, Generation Meter Splitting, and Section 3.10.7.2, Modeling of Resources and Transmission Loads.

Switchable Generation Resource

A Generation Resource that can be connected to either the ERCOT Transmission Grid or a non-ERCOT Control Area.

Wind-powered Generation Resource (WGR)

A Generation Resource that is powered by wind.

Load Resource

A Load capable of providing Ancillary Service to the ERCOT System and registered with ERCOT as a Load Resource.

Controllable Load Resource

A Load Resource capable of controllably reducing or increasing consumption under dispatch control (similar to Automatic Generation Control (AGC)) and that immediately responds proportionally to frequency changes (similar to generator governor action).

Non-Modeled Generator

A generator that is:

(a) Capable of providing net output of energy to the ERCOT System;

(b) Ten MW or less in size; or greater than ten MW and registered with the PUCT according to P.U.C. SUBST. R. 25.109, Registration of Power Generation Companies and Self-Generators, as a self-generator; and

(c) Registered with ERCOT as a Non-Modeled Generator, which means that the generator may not participate in the Ancillary Service or energy markets, RUC, or SCED.

2.2 ACRONYMS AND ABBREVIATIONS

4-CP	4-Coincident Peak
AAA	American Aribtration Association
ACE	Area Control Error
ACH	Automated Clearing House
ACL	Available Credit Limit
ADR	Alternative Dispute Resolution
AEIC	Association of Edison Illuminating Companies
AGC	Automatic Generation Control
AIL	Aggregate Incremental Liability
ALA	Applicable Legal Authority
AML	Adjusted Metered Load
AMS	Advanced Metering System
ANSI ASC X12	American National Standards Institute Accredited Standards Committee X12
AREP	Affiliated Retail Electric Provider
ARR	Adjusted RPS Requirement
AVR	Automatic Voltage Regulator
BLT	Block Load Transfer
BSS	Black Start Service

CAO	Control Area Operator
CARD	CRR Auction Revenue Distribution
CCD+	Cash Concentration and Disbursement Plus
CCF	Capacity Conversion Factor
CCN	Certificate of Convenience and Necessity
CEII	Critical Energy Infrastructure Information
CEO	Chief Executive Officer
CFE	Comision Federal de Electricidad
CIM	Common Information Model
CMLTD	Current Maturities of Long-Term Debt
CMZ	Congestion Management Zone
COP	Current Operating Plan
COPS	Commercial Operations Subcommittee
CPS	Control Performance Standard
CPT	Central Prevailing Time
CR	Competitive Retailer
CRR	Congestion Revenue Right
CSA	Continuous Service Agreement
CSV	Comma Separated Value
CTX	Corporate Trade Exchange
DAM	Day-Ahead Market
DAS	Data Aggregation System
DASPP	Day-Ahead Settlement Point Price
DC	Direct Current
DC Tie	Direct Current Tie
DG	Distributed Generation
DLC	Direct Load Control
DLF	Distribution Loss Factor
DRG	Distributed Renewable Generation
DRUC	Day-Ahead Reliability Unit Commitment
DSC	Debt Service Coverage
DSP	Distribution Service Provider
DSR	Dynamically Scheduled Resource
DUNS	Data Universal Numbering System
DUNS #	DUNS Number
e-Tag	Electronic Tag
EAF	Equivalent Availability Factor
EAL	Estimated Aggregate Liability
EC	Electric Cooperative
ECI	Element Competitiveness Index
EDI	Electronic Data Interchange
EEA	Energy Emergency Alert
EFT	Electronic Funds Transfer

EILS	Emergency Interruptible Load Service
EMMS	Energy and Market Management System
EMS	Energy Management System
EPRI	Electric Power Research Institute
EPS	ERCOT-Polled Settlement
ERCOT	Electric Reliability Council of Texas, Inc.
ERCOT Board	The Board of Directors of the Electric Reliability Council of Texas, Inc.
ESI ID	Electric Service Identifier
F&A	Finance and Audit
FASD	First Available Switch Date
FCE	Future Credit Exposure
Fed	Federal
FERC	Federal Energy Regulatory Commission
FGR	Flowgate Right
FIP	Fuel Index Price
FOP	Fuel Oil Price
FPA	Federal Power Act
FRR	Final RPS Requirement
GTL	Generic Transmission Limit
HASL	High Ancillary Service Limit
HDL	High Dispatch Limit
HE	Hour Ending
HEL	High Emergency Limit
HRL	High Reasonability Limit
HRUC	Hourly Reliability Unit Commitment
HSL	High Sustained Limit
HWR	High Winter Ratio
Hz	Hertz
ICCP	Inter-Control Center Communications Protocol
IDR	Interval Data Recorder
IEL	Initial Estimated Liability
IMM	Independent Market Monitor
IOU	Investor Owned Utility
IPM	Independent Power Marketer
IRR	Intermittent Renewable Resources
kV	Kilovolt
kVA	Kilovolt-Ampere
kVAr	Kilovolt-Ampere reactive
kVArh	Kilovolt-Ampere reactive hour
kW	Kilowatt
kWh	Kilowatt-Hour

LASL	Low Ancillary Service Limit
LDL	Low Dispatch Limit
LEL	Low Emergency Limit
LFC	Load Frequency Control
LMP	Locational Marginal Price
LPC	Low Power Consumption
LRL	Low Reasonability Limit
LRS	Load Ratio Share
LSE	Load Serving Entity
LSL	Low Sustained Limit
MAP	Mitigation Action Plan
MCPC	Market Clearing Price for Capacity
MDAS	Meter Data Acquisition System
MIS	Market Information System
MMBtu	Million British Thermal Units
MOU	Municipally Owned Utility
MPC	Maximum Power Consumption
MRA	Must-Run Alternative
MRE	Meter Reading Entity
MTLF	Mid-Term Load Forecast
MVA	Megavolt Ampere
MVAr	Mega Volt-Amperes reactive
MW	Megawatt
MWh	Megawatt Hour
NCI	Notice of Change of Information
NERC	North American Electric Reliability Corporation
NIS	Nodal Implementation Surcharge
NIST	National Institute of Standards and Technology
NOIE	Non-Opt-In Entity
NOMCR	Network Operations Model Change Request
Non-Spin	Non-Spinning Reserve
NSA	Network Security Analysis
NWSIDR	Non-Weather Sensitive IDR
O&M	Operations and Maintenance
OCN	Operating Condition Notice
PCRR	Pre-Assigned Congestion Revenue Right
PNM	Peaker Net Margin
POLR	Provider of Last Resort
POC	Peaking Operating Cost
POS	Power Operating System
PRC	Physical Responsive Capability

PRR	Protocol Revision Request
PRS	Protocol Revision Subcommittee
PSS	Power System Stabilizer
PTB	Price-to-Beat
PTP	Point-to-Point
PUCT	Public Utility Commission of Texas
PURA	Public Utility Regulatory Act, Title II, Texas Utility Code
PURPA	Public Utility Regulatory Policy Act
PV	PhotoVoltaic
PWG	Profiling Working Group
QF	Qualifying Facility
QSE	Qualified Scheduling Entity
RAP	Remedial Action Plan
RDF	Reserve Discount Factor
REC	Renewable Energy Credit
Reg-Down	Regulation Down
Reg-Up	Regulation Up
REP	Retail Electric Provider
RID	Resource ID
RIDR	Representative IDR
RMR	Reliability Must-Run
RMS	Retail Market Subcommittee
ROS	Reliability and Operations Subcommittee
RPG	Regional Planning Group
RPP	Renewable Production Potential
RPS	Renewable Portfolio Standard
RRS	Responsive Reserve
RTEP	Real-Time Energy Price
RTM	Real-Time Market
RUC	Reliability Unit Commitment
SASM	Supplemental Ancillary Services Market
SCADA	Supervisory Control and Data Acquisition
SCED	Security-Constrained Economic Dispatch
SCUC	Security-Constrained Unit Commitment
SDRAMP	SCED Down Ramp Rate
SE	State Estimator
SFT	Simultaneous Feasibility Test
SMOG	Settlement Metering Operating Guides
SPS	Special Protection Systems
SRR	Statewide RPS Requirement
STEC	South Texas Electric Cooperative
STLF	Short-Term Load Forecast
STWPF	Short-Term Wind Power Forecast

SURAMP	SCED Up Ramp Rate
SWCAP	System-Wide Offer Cap
T&D	Transmission and Distribution
TAC	Technical Advisory Committee
TDSP	Transmission and/or Distribution Service Provider
TDTWG	Texas Data Transport Working Group
TEWPF	Total ERCOT Wind Power Forecast
TIER	Times/Interest Earning Ratio
TLF	Transmission Loss Factor
TMTP	Texas Market Test Plan
TOU	Time Of Use
TOUS	Time Of Use Schedule
TPE	Total Potential Exposure
TSP	Transmission Service Provider
TTPT	Texas Test Plan Team
TUO	Total Usable Offset
TWC	Texas Water Code
TX SET	Texas Standard Electronic Transaction
UFE	Unaccounted For Energy
URL	Unit Reactive Limit
USA	User Security Administrator
USD	United States Dollar or U.S. Dollar
VAr	Volt-Ampere reactive
VDI	Verbal Dispatch Instruction
VEE	Validation, Editing and Estimating
VSS	Voltage Support Service
WAN	Wide Area Network
WGR	Wind-powered Generation Resource
WGRPP	Wind-powered Generation Resource Production Potential
WMS	Wholesale Market Subcommittee
WSIDR	Weather Sensitive IDR
XML	Extensible Markup Language

ERCOT Nodal Protocols

Section 2: Definitions and Acronyms

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2 DEFINITIONS AND ACRONYMS

2.1 DEFINITIONS

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