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NPRR Number	**617**	**NPRR Title**	**Energy Offer Flexibility**	
Timeline	Normal	**Action**		Recommended Approval
Date of Decision		September 25, 2014		
Proposed Effective Date		Upon system implementation.		
Priority and Rank Assigned		Priority – 2014; Rank – 1105		
Nodal Protocol Section(s) Requiring Revision		4.4.9.2.1, Startup Offer and Minimum-Energy Offer Criteria 4.6.2.3, Day-Ahead Make-Whole Settlements 4.6.2.3.1, Day-Ahead Make-Whole Payment 5.1, Introduction 5.7.1.1, RUC Guarantee 5.7.1.4, Revenue Less Cost During QSE Clawback Intervals 5.7.3, Payment When ERCOT Decommits a QSE-Committed Resource		
Other Binding Documents Requiring Revision or Related Revision Requests		None.		
Revision Description		This Nodal Protocol Revision Request (NPRR) seeks to correct inconsistencies regarding the restrictions on energy offers in the Day-Ahead Market (DAM). The current DAM is a voluntary, financial market. Generators are neither required to offer units in the DAM, nor is Load required to purchase energy in the DAM. Moreover, the mitigation of offer curves that occurs in Real-Time does *not* apply to the DAM, which suggests that generators are generally free to construct their offer curves (i.e., one "part" of a Three-Part Supply Offer) in the DAM at whatever level they choose. To the extent that purchasers of energy feel that the prices offered by generators in the DAM are too high, they are free not to purchase the energy in the DAM. The current Protocols nevertheless place significant restrictions on the ability of generators to offer energy at their desired levels. In particular, the caps on Startup Offers and Minimum-Energy Offers (i.e., the "second" and "third" parts of a Three-Part Supply Offer) prevent generators from choosing what to offer to the voluntary market. There may be instances, for example, in which a generator has an acute and/or temporary fuel supply that would change the costs associated with starting or running a unit. There could be significant day-over-day changes in the daily index price of gas, such that the caps are relying on a significantly out-of-date index value; a		

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	generator may be experiencing acute maintenance issues that would necessitate inputting a higher offer to account for increased operational costs; or a generator may only want to commit a unit in the DAM if it can capture a sufficient premium for the risk associated with that commitment. In each of these cases, as well in many other situations, the generator would justifiably want to increase its Startup Offer or Minimum-Energy Offer above the unit-specific verifiable costs. Yet the current Protocols expressly prohibit this. Calpine believes that energy offers in a voluntary, financial, energy-only DAM should not be programmatically restricted to an Entity's assumed true costs. Rather, the market should be allowed to function freely, pairing willing buyers with willing sellers. In such a regime, caps on Startup Offers and Minimum-Energy Offers would be eliminated, thereby allowing Market Participants to purchase and sell energy in the DAM on terms that all parties would agree on. In other words, a Three-Part Supply Offer would represent the voluntary energy offer of a generator as opposed to an offer that is partially (and often incorrectly) tied to a generator's costs. And, of course, these offers in the DAM would only be awarded if there is a Load willing to purchase the energy at the offered price. Importantly, there would still be a need for verifiable Startup and minimum energy costs, as ERCOT's Reliability Unit Commitment (RUC) process and DAM Make-Whole Payments would need to be correlated to a unit's verifiable costs in order to prevent a windfall to generators. As such, this NPRR ensures that generators do not receive Make-Whole Payments in excess of their generic or verifiable costs. In other words, while this proposal would remove caps on Three-Part Supply Offers in the DAM, it would not change the fundamental bargain that allows generators to be made whole to their costs and nothing more.
Reason for Revision	☐ Addresses current operational issues. ☐ Meets Strategic goals (tied to the ERCOT Strategic Plan or directed by the ERCOT Board). ☒ Market efficiencies or enhancements ☐ Administrative ☐ Regulatory requirements ☒ Other: (explain) Removes potentially vague Protocol language with a clear and concise description of the application of the fuel adder into the Mitigated Offer Cap.

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Credit Work Group Review	ERCOT Credit Staff and the Credit Work Group (Credit WG) have reviewed NPRR617 and do not believe that it requires changes to credit monitoring activity or the calculation of liability.
Procedural History	➢ On 4/21/14, NPRR617 was posted. ➢ On 5/15/14, PRS considered NPRR617. ➢ On 6/5/14, ERCOT comments were posted. ➢ On 6/11/14, Luminant Energy comments were posted. ➢ On 6/11/14, PRS again considered NPRR617. ➢ On 7/11/14, WMS comments were posted. ➢ On 8/7/14, a second set of WMS comments were posted. ➢ On 8/14/14, PRS again considered NPRR617. ➢ On 8/26/14, a second set of ERCOT comments were posted. ➢ On 9/3/14, an Impact Analysis was posted. ➢ On 9/11/14, PRS considered the 8/14/14 PRS Report and Impact Analysis for NPRR617. ➢ On 9/25/14, TAC considered NPRR617.
PRS Decision	On 5/15/14, PRS unanimously voted to table NPRR617. All Market Segments were present for the vote. On 6/11/14, PRS voted via roll call vote to table NPRR617 and to refer the issue to WMS. There were eight opposing votes from the Investor Owned Utility (IOU), Independent Power Marketer (IPM) (2), and Independent Generator (5) Market Segments and one abstention from the IPM Market Segment. All Market Segments were present for the vote. On 8/14/14, PRS voted to recommend approval of NPRR617 as amended by the 6/5/14 ERCOT comments. There was one opposing vote from the Consumer Market Segment. All Market Segments were present for the vote. On 9/11/14, PRS unanimously voted to endorse and forward the 8/14/14 PRS Report as amended by the 8/26/14 ERCOT comments and the Impact Analysis for NPRR617 to TAC with a recommended priority of 2014 and rank of 1105. All Market Segments were present for the vote.
Summary of PRS Discussion	On 5/15/14, NPRR617 was tabled pending clarification from ERCOT on Settlement language. On 6/11/14, there was discussion regarding the extent to which NPRR617 addresses gas supply issues and the implications of placing a cap on a Resource's Startup and Minimum-Energy Offers. On 8/14/14, participants discussed the 6/5/14 ERCOT comments; that unnecessary limitations are being placed on the Startup and Minimum Energy Offers; and that Generators would be paid on

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	verifiable costs. Concerns were expressed regarding the potential of Generators being paid on offers instead of verifiable costs in the future and that this should not be allowed. On 9/11/14, there was no discussion.
TAC Decision	On 9/25/14, TAC voted to recommend approval of NPRR617 as recommended by PRS in the 9/11/14 PRS Report. There was one abstention from the Consumer Market Segment. All Market Segments were present for the vote.
Summary of TAC Discussion	On 9/25/14, there was no discussion.
ERCOT Opinion	ERCOT supports Market Participants decision on the NPRR617 as it allows Resources to submit in the DAM, Startup Offers and Minimum-Energy Offers, that are consistent with actual operational conditions of the generating unit, while keeping Make-Whole Payments and offers in RUC correlated to the generator's generic or verifiable costs.

Business Case	
Qualitative Benefits	• Creates a true "voluntary" DAM while still preserving appropriate Make-Whole Payments. • Is expected to increase energy offers in the DAM
Quantitative Benefits	
Impact to Market Segments	
Credit Implications	
Other	

Sponsor	
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Market Segment	Independent Generator

Market Rules Staff Contact	
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Comments Received	
Comment Author	**Comment Summary**
ERCOT 060514	Proposed revisions to the equations calculating Day-Ahead Market Guarantee Amount (DAMGCOST) for Aggregate Generation Resources (AGRs) to accurately reflect the intent of the NPRR and placed a high cap on the Startup and Minimum Energy Offers in order to protect ERCOT systems from possible overflow issues.
Luminant Energy 061114	Supported the 6/5/14 ERCOT comment's proposed revisions for clarifying AGRs, however recommended that the cap on Startup and Minimum Energy Offers should be greater than 200% so that it does not exceed ERCOT system capabilities.
WMS 071114	Requested that PRS continue to table NPRR617.
WMS 080714	Endorsed the 6/5/14 ERCOT comments.
ERCOT 082614	Provided additional revisions that are necessary to align the calculation of Minimum Energy Price (MEPR) during Qualified Scheduling Entities (QSEs) Clawback Intervals with how the MEPR is determined during RUC Committed Intervals.

Comments

Please note that NPRR636, Cleanup to Remove Software Documentation Posting Requirement and Align Three-Part Supply Offer Language, also proposes revisions to Section 4.4.9.2.1.

Proposed Protocol Language Revision

Comment [MB1]: Please note that NPRR636 also proposes revisions to this section.

4.4.9.2.1 ***Startup Offer and Minimum-Energy Offer Criteria***

(1) Each Startup Offer and Minimum-Energy Offer must be reported by a QSE and must include the following information:

(a) The selling QSE;

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

(c) The Resource's hot, intermediate, and cold Startup Offer in dollars;

(d) The Resource's Minimum-Energy Offer in dollars per MWh;

(e) The first and last hour of the Startup and Minimum-Energy Offers

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

(g) Percentage of the FIP to the extent that the startup and minimum energy will be supplied by gas to determine the offer cap; and

(h) Percentage of the FOP to the extent that the startup and minimum energy will be supplied by oil to determine the offer cap.

(2) Valid Startup Offers and Minimum-Energy Offers (which must be part of a Three-Part Supply Offer) must be received before 1000 for the effective DAM and DRUC.

(3) A QSE may update and submit a Three-Part Supply Offer for a Resource during the Adjustment Period for any hours in which the Resource is not RUC-committed before the offer is updated or submitted.

~~(4) The Resource's Startup Offer must be equal to or less than the Resource Category Generic Startup Cost for that type of Resource listed in Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, unless ERCOT has approved verifiable Resource-specific startup costs for that Resource, under Section 4.4.9.2.4, Verifiable Startup Offer and Minimum-Energy Offer Caps, in which case the Resource's Startup Offer must be equal to or less than those approved verifiable Resource-specific startup costs.~~

(4) The Resource's Startup Offer must not be greater than 200% of the Resource Category Generic Startup Cost for that type of Resource listed in Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, unless ERCOT has approved verifiable Resource-specific startup costs for that Resource, under Section 4.4.9.2.4, Verifiable Startup Offer and Minimum-Energy Offer Caps, in which case the Resource's Startup Offer must be must not be greater than 200% of those approved verifiable Resource-specific Startup Costs

~~(5) The Resource's Minimum-Energy Offer must be equal to or less than the Resource Category Generic Minimum-Energy Cost for that type of Resource listed in Section 4.4.9.2.3 unless ERCOT has approved verifiable Resource-specific minimum-energy costs for that Resource, under Section 4.4.9.2.4 in which case the Resource's Minimum-Energy Offer must be equal to or less than those approved verifiable Resource-specific minimum-energy costs.~~

(5) The Resource's Minimum-Energy Offer must not be greater than 200% of the Resource Category Generic Minimum-Energy Cost for that type of Resource listed in Section 4.4.9.2.3 unless ERCOT has approved verifiable Resource-specific minimum-energy costs for that Resource, under Section 4.4.9.2.4 in which case the Resource's Minimum-Energy Offer must not be greater than 200% of those approved verifiable Resource-specific minimum-energy costs.

(6~~4~~6) Prior to 1000 for the effective DAM, a QSE may submit and update a Three-Part Supply Offer for a Resource for any hours which were Weekly Reliability Unit Commitment (WRUC)-instructed.

4.6.2.3 Day-Ahead Make-Whole Settlements

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

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

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

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

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

(2) A QSE that has a Three-Part Supply Offer cleared in the DAM is eligible for Day-Ahead Make-Whole Payment energy cost compensation in a DAM-committed Operating Hour, if, for the Resource associated with the offer the generator's breakers were closed for at least one minute during the DAM-committed Operating Hour.

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

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

4.6.2.3.1 Day-Ahead Make-Whole Payment

(1) ERCOT shall pay the QSE a Day-Ahead Make-Whole Payment for an eligible Resource, except that the Day-Ahead Make-Whole RMR Revenue amount is calculated but not paid for any RMR Unit, for each Operating Hour in a DAM-commitment period.

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

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

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

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

$$DAMWAMT_{q,p,r,h} = (-1) * Max(0, DAMGCOST_{q,p,r} + \sum_{h} DAAREV_{q,p,r,h} + \sum_{h} DAASREV_{q,r,h}) * DAESR_{q,p,r,h} / (\sum_{h} DAESR_{q,p,r,h})$$

(6) The Day-Ahead Make-Whole RMR Revenue to each QSE for each DAM-committed RMR Unit is calculated as follows:

$$DAMWRMRREV_{q,p,r,h} = (-1) * Max(0, DAMGCOST_{q,p,r} + \sum_{h} DAAREV_{q,p,r,h} + \sum_{h} DAASREV_{q,r,h}) * DAESR_{q,p,r,h} / (\sum_{h} DAESR_{q,p,r,h})$$

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

For non-Combined Cycle Trains,

$$DAMGCOST_{q,p,r} = Min(DASUO_{q,p,r}, DASUCAP_{q,p,r}) + \sum_{h} (Min(DAMEO_{q,p,r,h}, DAMECAP_{p,q,r,h}) * DALSL_{q,p,r,h}) + \sum_{h} (DAAIEC_{q,p,r,h} * (DAESR_{q,p,r,h} - DALSL_{q,p,r,h}))$$

For a Resource which is not an AGR,

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

Then, $DASUCAP_{p,q,r} =$ verifiable Startup Costs $_{q,r,s}$

$DAMECAP_{p,q,r,h} =$ verifiable minimum-energy costs $_{q,r,i}$

Otherwise, $DASUCAP_{p,q,r} =$ Resource Category Startup Offer Generic Cap (RCGSC)

$DAMECAP_{p,q,r,h} =$ Resource Category Minimum-Energy Generic Cap (RCGMEC)

For an AGR,

$$DAMGCOST_{q,p,r} = DASUPR_{q,p,r} + \sum_h (Min(DAMEO_{q,p,r,h}, DAMECAP_{p,q,r,h}) * DALSL_{q,p,r,h}) + \sum_h (DAAIEC_{q,p,r,h} * (DAESR_{q,p,r,h} - DALSL_{q,p,r,h}))$$

Where:

$$DASUPR_{q,p,r} = Min(DASUO_{q,p,r}, DASUCAP_{q,p,r})$$

If ERCOT has approved verifiable Startup Costs

Then:

$$DASUCAP_{q,p,r} = Max_c(AGRRATIO_{q,p,r}) * \text{verifiable Startup Costs}_{q,r}$$

Where:

$$AGRRATIO_{q,p,r} = AGRMAXON_{q,p,r} / AGRTOT_{q,p,r}$$

Otherwise:

$$DASUCAP_{q,p,r} = Max_c(AGGRATIO_{q,p,r}) * RCGSC$$

For Combined Cycle Trains,

$$DAMGCOST_{q,p,r} = Min(DASUO_{q,p,r}, DASUCAP_{q,p,r}) + \sum_h (Min(DAMEO_{q,p,r,h}, DAMECAP_{q,p,r,h}) * DALSL_{q,p,r,h})$$

$$+ (Max(0, Min(DASUO_{afterCCGR}, DASUCAP_{afterCCGR}) - Min(DASUO_{beforeCCGR}, DASUCAP_{beforeCCGR}))$$

$$+ \sum_h (DAAIEC_{q,p,r,h} * (DAESR_{q,p,r,h} - DALSL_{q,p,r,h}))$$

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

$$DAEREV_{q,p,r,h} = (-1) * DASPP_{p,h} * DAESR_{q,p,r,h}$$

$$DAASREV_{q,r,h} = ((-1) * MCPCRU_{DAM,h} * PCRUR_{r,q,DAM,h})$$

$$+ ((-1) * MCPCRD_{DAM,h} * PCRDR_{r,q,DAM,h})$$

$$+ ((-1) * MCPCRR_{DAM,h} * PCRRR_{r,q,DAM,h})$$

$$+((-1) * MCPCNS_{DAM,h} * PCNSR_{r,q,DAM,h})$$

The above variables are defined as follows:

Variable	Unit	Definition
$DAMWAMT_{q,p,r,h}$	$	*Day-Ahead Make-Whole Payment per QSE per Settlement Point per Resource per hour*—The payment to QSE *q* to make-whole the Startup Cost and energy cost of Resource *r* committed in the DAM at Resource Node *p* for the hour *h*. When a Combined Cycle Generation Resource is committed in the DAM, payment is made to the Combined Cycle Train for the DAM-committed Combined Cycle Generation Resource.
$DAMWRMRREV_{q,p,r,h}$	$	*Day-Ahead Make-Whole RMR Revenue per QSE per Settlement Point per RMR Resource per hour*—The revenue calculated but not paid to QSE *q* to make-whole the Startup Cost and energy cost of the RMR Resource *r* committed in the DAM at Resource Node *p* for the hour *h*. When a Combined Cycle Generation Resource that is an RMR Resource is committed in the DAM, revenue is calculated for the Combined Cycle Train for the Combined Cycle Generation Resource.
$DAMGCOST_{q,p,r}$	$	*Day-Ahead Market Guaranteed Amount per QSE per Settlement Point per Resource*—The sum of the Startup Cost and the operating energy costs of the DAM-committed Resource *r* at Resource Node *p* represented by QSE *q*, for the DAM-commitment period. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.

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Variable	Unit	Definition
DAEREV $_{q, p, r, h}$	$	*Day-Ahead Energy Revenue per QSE per Settlement Point per Resource by hour*—The revenue received in the DAM for Resource *r* at Resource Node *p* represented by QSE *q*, based on the DAM Settlement Point Price, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
DAASREV $_{q, r, h}$	$	*Day-Ahead Ancillary Service Revenue per QSE per Resource by hour*—The revenue received in the DAM for Resource *r* represented by QSE *q*, based on the Market Clearing Price for Capacity (MCPC) for each Ancillary Service in the DAM, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
DASPP $_{p, h}$	$/MWh	*Day-Ahead Settlement Point Price by Settlement Point by hour*—The DAM Settlement Point Price at Resource Node *p* for the hour *h*.
DAESR $_{q, p, r, h}$	MW	*Day-Ahead Energy Sale from Resource per QSE by Settlement Point per Resource by hour*—The amount of energy cleared through Three-Part Supply Offers in the DAM for Resource *r* at Resource Node *p* represented by QSE *q* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
DASUPR $_{q, p, r}$	$/MWh	*Day-Ahead Startup Price per QSE per Settlement Point per Resource*—The derived Startup Price for an AGR *r* at Resource Node *p* represented by QSE *q*, for the first hour of the DAM-commitment period.
DASUCAP $_{q, p, r,}$	$/~~MWh~~ start	*Day-Ahead Startup Cap per QSE per Settlement Point per Resource*—The amount used for AGR *r or Resource r* as Startup Costs. The cap is the Resource Category Startup Offer Generic Cap (RCGSC) unless ERCOT has approved verifiable unit-specific Startup Costs for that Resource, in which case the startup cap is the scaled verifiable unit-specific Startup Cost for the AGR or the verifiable unit-specific Startup Cost for non AGR Resources. See Section 5.6.1, Verifiable Costs, for more information on verifiable costs.
DAMECAP $_{p,q,r,h}$	$/MWh	*Day-Ahead Minimum-Energy Cap* —The amount used for Resource *r* for minimum-energy costs. The minimum cost is the Resource Category Minimum-Energy Generic Cap (RCGMEC) unless ERCOT has approved verifiable unit-specific minimum energy costs for that Resource, in which case the minimum energy cap is the verifiable unit-specific minimum energy cost. See Section 5.6.1 for more information on verifiable costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
RCGSC	$/Start	*Resource Category Generic Startup Cost*—The Resource Category Generic Startup Cost cap for the category of the Resource, according to Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, for the Operating Day.
PCRUR $_{r, q, DAM, h}$	MW	*Procured Capacity for Reg-Up from Resource per Resource per QSE per hour in DAM*—The Regulation Up (Reg-Up) capacity quantity awarded to QSE *q* in the DAM for Resource *r* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
MCPCRU $_{DAM, h}$	$/MW per hour	*Market Clearing Price for Capacity for Reg-Up per hour in DAM*—The DAM MCPC for Reg-Up for the hour *h*.
PCRDR $_{r, q, DAM, h}$	MW	*Procured Capacity for Reg-Down from Resource per Resource per QSE per hour in DAM*—The Regulation Down (Reg-Down) capacity quantity awarded to QSE *q* in the DAM for Resource *r* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.

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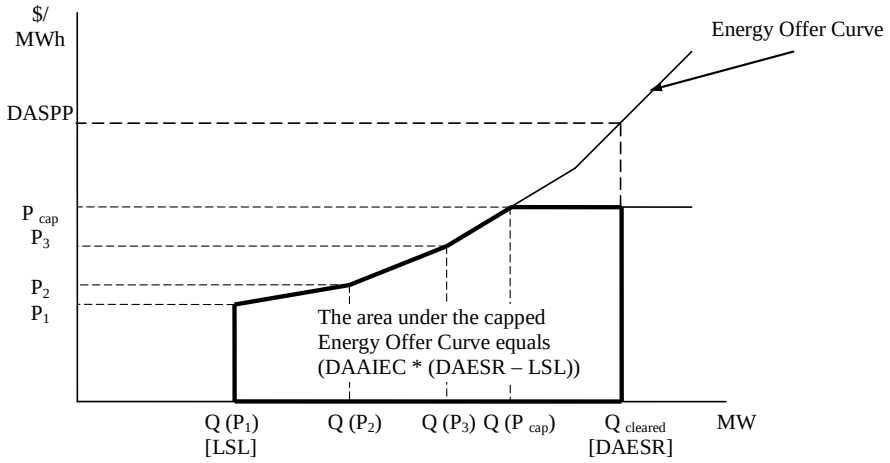
Variable	Unit	Definition
$MCPCRD_{DAM, h}$	$/MW per hour	*Market Clearing Price for Capacity for Reg-Down per hour in DAM*—The DAM MCPC for Reg-Down for the hour *h*.
$PCRRR_{r, q, DAM, h}$	MW	*Procured Capacity for Responsive Reserve from Resource per Resource per QSE per hour in DAM*—The Responsive Reserve (RRS) capacity quantity awarded to QSE *q* in the DAM for Resource *r* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$MCPCRR_{DAM, h}$	$/MW per hour	*Market Clearing Price for Capacity for Responsive Reserve per hour in DAM*—The DAM MCPC for RRS for the hour *h*.
$PCNSR_{r, q, DAM, h}$	MW	*Procured Capacity for Non-Spin from Resource per Resource per QSE per hour in DAM*—The Non-Spinning Reserve (Non-Spin) capacity quantity awarded to QSE *q* in the DAM for Resource *r* for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$MCPCNS_{DAM, h}$	$/MW per hour	*Market Clearing Price for Capacity for Non-Spin per hour in DAM*—The DAM MCPC for Non-Spin for the hour *h*.
$DASUO_{q, p, r}$	$/start	*Day-Ahead Startup Offer per QSE per Settlement Point per Resource*—The Startup Offer included in the Three-Part Supply Offer submitted in the DAM associated with Resource *r* at Resource Node *p* represented by QSE *q*, for the first hour of the DAM-commitment period. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$AGRRATIO_{q, p, r}$	none	*Aggregate Generation Resource Ratio per QSE per Settlement Point per Aggregate Generation Resource*—A value which represents the ratio of the maximum number of generators online in an hour, as indicated by telemetry, compared to the total number of generators registered to the AGR and used in the approved verifiable cost for the AGR. The value is only applicable if the Resource is an AGR.
$AGRMAXON_{q, p, r}$	none	*Aggregate Generation Resource Maximum Online per QSE per Settlement Point per Aggregate Generation Resource*—The maximum number of generators online during an hour, as indicated by telemetry. The value is only applicable if the Resource is an AGR.
$AGRTOT_{q, p, r}$	none	*Aggregate Generation Resource Total per QSE per Settlement Point per Aggregate Generation Resource*—The total number of generators registered to the AGR and used in the approved verifiable cost for the AGR. The value is only applicable if the Resource is an AGR.
$DAMEO_{q, p, r, h}$	$/MWh	*Day-Ahead Minimum-Energy Offer per QSE per Settlement Point per Resource per hour*—The Minimum-Energy Offer included in the Three-Part Supply Offer submitted in the DAM associated with Resource *r* at Resource Node *p* represented by QSE *q*, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$DALSL_{q, p, r, h}$	MW	*Day-Ahead Low Sustained Limit per QSE per Settlement Point per Resource per hour*—The Low Sustained Limit (LSL) of Resource *r* at Resource Node *p* represented by QSE *q*, for the hour *h* as seen in the 1000 Day-Ahead snapshot. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$DAAIEC_{q, p, r h}$	$/MWh	*Day-Ahead Average Incremental Energy Cost per QSE per Settlement Point per Resource per hour*—The average incremental energy cost, calculated according to the Energy Offer Curve capped by the generic energy price, for the output

Variable	Unit	Definition
		levels between the DAESR and the LSL of Resource *r* at Resource Node *p* represented by QSE *q*, for the hour *h*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
q	none	A QSE.
p	none	A Resource Node Settlement Point.
r	none	A DAM-committed Generation Resource.
h	none	An hour in the DAM-commitment period.
c	none	A contiguous block of DAM-committed hours.
afterCCGR	none	The Combined Cycle Generation Resource to which a Combined Cycle Train transitions.
beforeCCGR	none	The Combined Cycle Generation Resource from which a Combined Cycle Train transitions.

(9) The calculation of the Day-Ahead Average Incremental Energy Cost for each Resource for each hour is illustrated with the picture below, where P_{cap} is the Energy Offer Curve Cap. The method to calculate such cost is described in Section 4.6.5, Calculation of "Average Incremental Energy Cost" (AIEC).

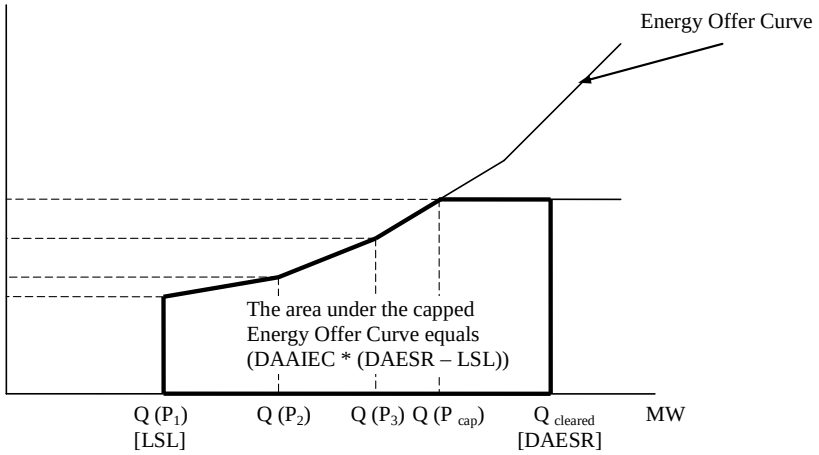


(10) The total of the Day-Ahead Make-Whole Payments to each QSE for non-RMR Generation Resources for a given hour is calculated as follows:

$$DAMWAMTQSETOT_{q} = \sum_{p} \sum_{r} DAMWAMT_{q,p,r}$$

The above variables are defined as follows:

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



(11) The total of the Day-Ahead Make-Whole RMR Revenue for each QSE for RMR Units for a given hour is calculated as follows:

$$DAMWRMRREVQSETOT_{q} = \sum_{p} \sum_{r} DAMWRMRREV_{q, p, r}$$

The above variables are defined as follows:

Variable	Unit	Definition
DAMWRMRREVQSETOT $_{q}$	$	*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.
DAMWRMRREV $_{q, p, r,}$	$	*Day-Ahead Make-Whole RMR Revenue per QSE per Settlement Point per RMR Resource per hour*—The revenue calculated but not paid to QSE *q*

Variable	Unit	Definition
		to make-whole the Startup Cost and energy cost of the RMR Resource *r* committed in the DAM at Resource Node *p* for the hour. When a Combined Cycle Generation Resource that is an RMR Resource is committed in the DAM, revenue is calculated for the Combined Cycle
q	none	A QSE.
p	none	A Settlement Point.
r	none	A DAM-committed RMR Unit.

5.1 Introduction

(1) Transmission security analysis and Reliability Unit Commitment (RUC) are used to ensure ERCOT System reliability and to ensure that enough Resource capacity, in addition to Ancillary Service capacity, is committed in the right locations to reliably serve the forecasted Load on the ERCOT System including Direct Current Tie (DC Tie) Load that has not been curtailed.

(2) ERCOT shall conduct at least one Day-Ahead RUC (DRUC) and at least one Hourly RUC (HRUC) before each hour of the Operating Day. ERCOT, in its sole discretion, may conduct a RUC at any time to evaluate and resolve reliability issues.

(3) The DRUC must be run after the close of the Day-Ahead Market (DAM).

(4) The DRUC uses Three-Part Supply Offers, capped at the maximum of generic or verifiable minimum energy and Startup Costs, submitted before the DAM by Qualified Scheduling Entities (QSEs) that were considered in the DAM but not awarded in the DAM. A QSE may not submit a Three-Part Supply Offer to be considered in the DRUC unless the offer was also submitted for consideration in the DAM.

(5) ERCOT must initiate the HRUC process at least one hour before the Operating Hour to fine-tune the Resource commitments using updated Load forecasts and updated Outage information.

(6) The RUC Study Period for DRUC is the next Operating Day. The RUC Study Period for HRUC is the balance of the current Operating Day plus the next Operating Day if the DRUC for the Operating Day has been solved.

(7) HRUC may decommit Resources only to maintain the reliability of the ERCOT System.

(8) For each RUC Study Period, the RUC considers capacity requirements for each hour of the RUC Study Period with the objective of minimizing costs based on Three-Part Supply Offers and while substituting a proxy Energy Offer Curve for the Energy Offer Curve. The proxy Energy Offer Curve is calculated in a way that minimizes the effect of the proxy Energy Offer Curves on optimization.

(9) The calculated Resource commitments arising from each RUC process must be reviewed by ERCOT before issuing Dispatch Instructions to QSEs to commit, extend, or decommit Resources.

(10) The Security Sequence is a set of prerequisite processes for RUC that describes the key system components and inputs that are required to support the RUC process, the RUC process itself, and the ERCOT review of the Resource commitment recommendations made by the RUC process.

(11) The RUC process may not be used to buy Ancillary Service unless the Ancillary Service Offers submitted in the DAM are insufficient to meet the requirements of the Ancillary Service Plan.

(12) After the use of market processes to the fullest extent practicable without jeopardizing the reliability of the ERCOT System, any ERCOT Dispatch Instructions for additional capacity that order a QSE to commit a specific Generation Resource to be On-Line shall be considered a RUC Dispatch for the purpose of the Settlement of payments and charges related to the committed Generation Resource. An Operating Condition Notice (OCN), Advisory, Watch, or Emergency Notice requesting the available capacity of any currently available Generation Resources but not naming specific Generation Resources is not considered a RUC Dispatch for purposes of Settlement.

(13) ERCOT shall post on the Market Information System (MIS) Certified Area, for each Off-Line Generation Resource that may be selected by a RUC process, the current time since the Generation Resource last went Off-Line (in hours) and the corresponding start-up times ERCOT is using for each such Off-Line Generation Resource. The time since the Generation Resource last went Off-Line and start-up times shall be updated at least hourly.

(14) Prior to 1330 in the Day-Ahead, ERCOT may issue a Weekly Reliability Unit Commitment (WRUC) Verbal Dispatch Instruction (VDI) to inform a QSE that a Resource is required to be On-Line for all or part of a future Operating Day. Following the receipt of a WRUC:

(a) The QSE may self-commit the Resource for the WRUC-instructed hours by updating the Resource's Current Operating Plan (COP) to reflect the appropriate On-Line Resource Status for the WRUC-instructed hours prior to the DRUC process execution for the associated Operating Day. Resources that have been self-committed by a QSE in accordance with a WRUC:

(i) May have a Three-Part Supply Offer submitted into the DAM, and any of the WRUC-instructed hours in which the Three-Part Supply Offer is awarded in the DAM become DAM-Committed Intervals for the Resource and are settled accordingly; and

(ii) Will not be issued a RUC commitment for the WRUC-instructed hours that were self-committed or DAM-committed.

(b) ERCOT will commit the Resource as part of the DRUC process for the relevant Operating Day for all WRUC-instructed hours not DAM-committed or QSE self-committed. For all purposes, including RUC Settlement, the Resource will be considered as committed by the DRUC for these hours.

5.7.1.1 RUC Guarantee

(1) The allowable Startup Costs and minimum-energy costs of a Resource committed by RUC is the RUC Guarantee. The RUC Guarantee minimum-energy costs are prorated according to the actual generation when the Resource's average output during a 15-minute Settlement Interval is below the corresponding LSL.

(2) The SUPR, MEPR and LSL used to calculate the RUC Guarantee for a Combined Cycle Train are the SUPR, MEPR and LSL that correspond to the Combined Cycle Generation Resource, within the Combined Cycle Train, that is RUC-committed for the hour.

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

(4) The RUC Guarantee is calculated for non-Combined Cycle Trains as follows:

$$RUCG_{q,r,d} = \sum_{s} (SUPR_{q,r,s} * RUCSUFLAG_{q,r,s}) + \sum_{i} (MEPR_{q,r,i} * Min ((LSL_{q,r,i} * (¼)), RTMG_{q,r,i}))$$

(5) The RUC Guarantee is calculated for Combined Cycle Trains as follows:

$$RUCG_{q,r,d} = (SUPR_{q,r,s} * RUCSUFLAG_{q,r,s}) + \sum_{t} (MAX (0, SUPR - SUPR)) + \sum_{i} (MEPR_{q\,r,i} * Min ((LSL_{q,r,i} * (¼)), RTMG_{q,r\,i}))$$

(a) If a Combined Cycle Train transitions to a RUC-committed configuration from a QSE-committed or other RUC-committed configuration, the transition is calculated as follows:

$$MAX (0, SUPR_{afterCCGR} - SUPR_{beforeCCGR})$$

(b) If a Combined Cycle Train transitions to a QSE-committed configuration from a RUC-committed configuration, the transition is calculated as follows:

$$MAX (0, SUPR_{beforeCCGR} - SUPR_{afterCCGR})$$

(6) If a validated Three-Part Supply Offer has been submitted for a Resource for the RUC, then the RUC Guarantee for that Resource is based on the minimum of the Startup Offer in that validated Three-Part Supply Offer and Startup Cap and the lesser of the Minimum-Energy Offer in that validated Three-Part Supply Offer and the Minimum-Energy Offer Cap~~in that validated Three-Part Supply Offer~~. If a validated Three-Part Supply Offer has not been submitted for a Resource for the RUC and ERCOT has not yet approved verifiable unit-specific costs for the Resource, then the RUC Guarantee for a Resource is based on the Resource Category Startup Generic Cap and the Resource Category Minimum-Energy Generic Cap. If a validated Three-Part Supply Offer has not been submitted for a Resource for the RUC and ERCOT has approved verifiable unit-specific costs for the Resource, then the RUC Guarantee for a Resource is based on the most recent ERCOT-approved verifiable unit-specific costs for that Resource.

For a Resource which is not an AGR,

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

Then,	$SUPR_{q,r,s}$	=	Min ($SUO_{q,r,s}$, $SUCAP_{q,r,s}$)
	$MEPR_{q,r,i}$	=	Min ($MEO_{q,r,i}$, $MECAP_{q,r,i}$)
Otherwise,	$SUPR_{q,r,s}$	=	$SUCAP_{q,r,s}$
	$MEPR_{q,r,i}$	=	$MECAP_{q,r,i}$

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

Then,	$SUCAP_{q,r,s}$	=	verifiable Startup Costs $_{q,r,s}$
	$MECAP_{q,r,i}$	=	verifiable minimum-energy costs $_{q,r,i}$
Otherwise,	$SUCAP_{q,r,s}$	=	$RCGSC_{s}$
	$MECAP_{q,r,i}$	=	$RCGMEC_{i}$

For AGRs,

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

Then,	$SUPR_{q,r,s}$	=	Min($SUO_{q,r,s}$, $SUCAP_{q,r,s}$)
	$MEPR_{q,r,i}$	=	Min($MEO_{q,r,i}$, $MECAP_{q,r,i}$)
Otherwise,	$SUPR_{q,r,s}$	=	$SUCAP_{q,r,s}$
	$MEPR_{q,r,i}$	=	$MECAP_{q,r,i}$

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

Then, $SUCAP_{q,r,s}$ = $Max_c (AGRRATIO_{q,p,r})$ * verifiable Startup Costs $_{q,r,s}$

$MECAP_{q,r,i}$ = verifiable minimum-energy costs $_{q,r,i}$

Where, $AGRRATIO_{q,p,r}$ = $AGRMAXON_{q,p,r} / AGRTOT_{q,p,r}$

Otherwise, $SUCAP_{q,r,s}$ = $Max_c (AGRRATIO_{q,p,r}) * RCGSC_s$

$MECAP_{q,r,i}$ = $RCGMEC_i$

The above variables are defined as follows:

Variable	Unit	Definition
$RUCG_{q,r,d}$	$	*RUC Guarantee*—The sum of eligible Startup Costs and minimum-energy costs for Resource *r* during all RUC-Committed Hours, for the Operating Day. When one or more Combined Cycle Generation Resources are committed by RUC, guaranteed costs are calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources.
$SUPR_{q,r,s}$	$/Start	*Startup Price per start*—The ~~settlement~~ Settlement price for Resource *r* for the start *s*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$SUO_{q,r,s}$	$/Start	*Startup Offer per start*—Represents an offer for all costs incurred by Generation Resource *r* in starting up and reaching the Resource's LSL, minus the average energy produced during the time period between breaker close and LSL multiplied by the heat rate proxy multiplied by the appropriate Fuel Index Price (FIP) or Fuel Oil Price (FOP), as described in the Verifiable Cost Manual. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$SUCAP_{q,r,s}$	$/Start	*Startup Cap*—The amount used for AGR *r* or Resource *r* as Startup Costs ~~if the QSE did not submit a validated Three-Part Supply Offer~~. The cap is the Resource Category Startup Offer Generic Cap (RCGSC) unless ERCOT has approved verifiable unit-specific Startup Costs for that Resource, in which case the startup cap is the scaled verifiable unit-specific Startup Cost for the AGR or the verifiable unit-specific Startup Cost for non--AGRs ~~verifiable unit-specific Startup Cost~~. See Section 5.6.1, Verifiable Costs, for more information on verifiable costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$AGRRATIO_{q,p,r}$	none	*Aggregate Generation Resource Ratio per QSE per Settlement Point per Aggregate Generation Resource*—A value which represents the ratio of the maximum number of generators online during an hour, as indicated by telemetry, compared to the total number of generators registered to the AGR and used in the approved verifiable cost for the AGR. The value is only applicable if the Resource is an AGR.
$AGRMAXON_{q,p,r}$	none	*Aggregate Generation Resource Maximum Online per QSE per Settlement Point per Aggregate Generation Resource*—The maximum number of generators online during an hour, as indicated by telemetry. The value is only applicable if the Resource is an AGR.

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Variable	Unit	Definition
$AGRTOT_{q, p, r}$	none	*Aggregate Generation Resource Total per QSE per Settlement Point per Aggregate Generation Resource*—The total number of generators registered to the AGR and used in the approved verifiable cost for the AGR. The value is only applicable if the Resource is an AGR.
$RCGSC_s$	$/Start	*Resource Category Generic Startup Cost*—The Resource Category Generic Startup Cost cap for the category of the Resource, according to Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, for the Operating Day.
$RUCSUFLAG_{q,r,s}$	none	*RUC Startup Flag*—The flag that indicates whether or not the start *s* for Resource *r* is eligible for RUC Make-Whole Payment. Its value is one if eligible; otherwise, zero. See Section 5.6.2, RUC Startup Cost Eligibility, and Section 5.6.3, Forced Outage of RUC-Committed Resource, for more information on startup eligibility. For a Combined Cycle Train, the Resource *r* must be one of the registered Combined Cycle Generation Resources within the Combined Cycle Train. When one or more Combined Cycle Generation Resources are committed by RUC, the RUC Startup Flag is calculated for the Combined Cycle Train for all RUC-committed Combined Cycle Generation Resources.
$MEPR_{q,r,i}$	$/MWh	*Minimum-Energy Price*—The Ss~~s~~ettlement price for Resource *r* for minimum energy for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$MEO_{q,r,i}$	$/MWh	*Minimum-Energy Offer*—Represents an offer for the costs incurred by Resource *r* in producing energy at the Resource's LSL for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$MECAP_{q,r,i}$	$/MWh	*Minimum-Energy Cap*—The amount used for Resource *r* for minimum-energy ~~costs~~ costs~~if the QSE did not submit a validated Three-Part Supply Offer~~. The minimum cost is the Resource Category Minimum-Energy Generic Cap (RCGMEC) ~~cap is the RCGMEC~~ unless ERCOT has approved verifiable unit-specific minimum energy costs for that Resource, in which case the Minimum-Energy Cap is the verifiable unit-specific minimum energy cost. See Section 5.6.1 for more information on verifiable costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$RCGMEC_i$	$/MWh	*Resource Category Generic Minimum-Energy Cost*—The Resource Category Generic Minimum Energy Cost cap for the category of the Resource, according to Section 4.4.9.2.3, for the Operating Day.
$RTMG_{q,r,i}$	MWh	*Real-Time Metered Generation*—The Resource *r*'s metered generation for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$LSL_{q,r,i}$	MW	*Low Sustained Limit*—The LSL of Generation Resource *r* represented by QSE *q* for the hour that includes the Settlement Interval *i*, as submitted in the Current Operating Plan (COP). 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 RUC-committed Generation Resource.
d	none	An Operating Day containing the RUC-commitment.
i	none	A 15-minute Settlement Interval within the hour that includes a RUC-commitment.
s	none	A start that is eligible to have its costs included in the RUC Guarantee.
t	none	A transition that is eligible to have its costs included in the RUC Guarantee.

Variable	Unit	Definition
c	none	A contiguous block of RUC–Committed Hours.
afterCCGR	none	The Combined Cycle Generation Resource to which a Combined Cycle Train transitions.
beforeCCGR	none	The Combined Cycle Generation Resource from which a Combined Cycle Train transitions.

5.7.1.4 Revenue Less Cost During QSE Clawback Intervals

(1) The total revenue for a Resource less the cost based on the Resource's Energy Offer Curve capped by the Energy Offer Curve Cap (as described in Sections 4.4.9.3, Energy Offer Curve, and 4.4.9.3.3, Energy Offer Curve Caps for Make-Whole Calculation Purposes) or proxy Energy Offer Curve described in Section 6.5.7.3, Security Constrained Economic Dispatch, as applicable, during all QSE Clawback Intervals of the Operating Day is Revenue Less Cost During QSE-Clawback Intervals.

(2) The MEPR, LSL and RTAIEC used to calculate Revenue Less Cost During QSE Clawback Intervals for a Combined Cycle Train is the MEPR, LSL and RTAIEC that corresponds to the Combined Cycle Generation Resource, within a Combined Cycle Train, that operates in Real-Time for the QSE Clawback Interval.

(3) For each QSE Clawback Interval, Revenue Less Cost During QSE Clawback Intervals is calculated as follows:

$$\begin{aligned} RUCEXRQC_{q,r,d} = \text{Max}\ \{0,\ \sum_i [&(RTSPP_{p,i} * RTMG_{q,r,i}) \\ &+ (-1) * (VSSVARAMT_{q,r,i} + VSSEAMT_{q,r,i}) \\ &+ (-1) * EMREAMT_{q,r,i} \\ &- [MEPR_{q,r,i} * \text{Min}\ (RTMG_{q,r,i}, (LSL_{q,r,i} * (¼)))] \\ &- [RTAIEC_{q,r,i} * \text{Max}\ (0, RTMG_{q,r,i} - (LSL_{q,r,i} * (¼)))]]\} \end{aligned}$$

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

Then, $MEPR_{q,r,i} = \underline{\text{Min}(MEO_{q,r,i}, MECAP_{q,r,i})}$

Otherwise, $MEPR_{q,r,i} = MECAP_{q,r,i}$

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

Then, $MECAP_{q,r,i} =$ verifiable minimum-energy $costs_{q,r,i}$

Otherwise, $MECAP_{q,r,i} = RCGMEC_i$

The above variables are defined as follows:

Variable	Unit	Definition
$RUCEXRQC_{q,r,d}$	$	*Revenue Less Cost During QSE-Clawback Intervals*—The sum of the total revenue for Resource *r* less the cost during all QSE-Clawback Intervals for the Operating Day. When one or more Combined Cycle Generation Resources are committed by RUC, Revenue Less Cost During QSE-Clawback Intervals is calculated for the Combined Cycle Train for all Combined Cycle Generation Resources earning revenue in QSE-Clawback Intervals.
$RTSPP_{p,i}$	$/MWh	*Real-Time Settlement Point Price*—The Real-Time Settlement Point Price at the Resource's Settlement Point for the Settlement Interval *i*.
$MEPR_{q,r,i}$	$/MWh	*Minimum-Energy Price*—The Settlement price for Resource *r* for minimum energy for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$MEO_{q,r,i}$	$/MWh	*Minimum-Energy Offer*—Represents an offer for the costs incurred by Resource *r* in producing energy at the Resource's LSL for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$MECAP_{q,r,i}$	$/MWh	*Minimum-Energy Cap*—The amount used for Resource *r* for minimum-energy costs ~~if the QSE did not submit a validated Three-Part Supply Offer~~. The minimum cost is the Resource Category Minimum-Energy Generic Cap (RCGMEC)~~cap is the RCGMEC~~ unless ERCOT has approved verifiable unit-specific minimum energy costs for that Resource, in which case the Minimum-Energy Cap is the verifiable unit-specific minimum energy cost. See Section 5.6.1, Verifiable Costs, for more information on verifiable costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$RCGMEC_i$	$/MWh	*Resource Category Generic Minimum-Energy Cost*—The Resource Category Generic Minimum-Energy Cost cap for the category of the Resource, according to Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, for the Operating Day.
$RTAIEC_{q,r,i}$	$/MWh	*Real-Time Average Incremental Energy Cost*—The average incremental energy cost for Resource *r*, calculated using the Energy Offer Curve capped by the Energy Offer Curve Cap, for the Resource's generation above the LSL for the Settlement Interval *i*. See Section 4.6.5, Calculation of "Average Incremental Energy Cost" (AIEC). Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$RTMG_{q,r,i}$	MWh	*Real-Time Metered Generation*—The Resource *r*'s metered generation for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is the Combined Cycle Train.
$LSL_{q,r,i}$	MW	*Low Sustained Limit*—The LSL of Generation Resource *r* represented by QSE *q* for the hour that includes the Settlement Interval *i*, as submitted in the COP. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$VSSVARAMT_{q,r,i}$	$	*Voltage Support Service VAr Amount by interval*—The payment to the QSE for the VSS provided by Generation Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.6.7.1, Voltage Support Service Payments. Payment for VSS is made to the Combined Cycle Train.
$VSSEAMT_{q,r,i}$	$	*Voltage Support Service Energy Amount by interval*—The lost opportunity payment to the QSE for ERCOT-directed VSS from the Generation Resource *r* for the 15-minute Settlement Interval *i*. See Section 6.6.7.1. Payment for VSS is made to the Combined Cycle Train.

Variable	Unit	Definition
$EMREAMT_{q,r,i}$	$	*Emergency Energy Amount by interval*—The payment to the QSE as additional compensation for the additional energy produced by the Generation Resource *r* in Real-Time during the Emergency Condition, for the 15-minute Settlement Interval *i*. See Section 6.6.9.1, Payment for Emergency Power Increase Directed by ERCOT. Payment for emergency energy is made to the Combined Cycle Train.
q	none	A QSE.
r	none	A RUC-committed Generation Resource.
d	none	An Operating Day containing the RUC-commitment.
p	none	A Resource Node Settlement Point.
I	none	A 15-minute Settlement Interval within the hour that is identified as a QSE-Clawback Interval.

5.7.3 Payment When ERCOT Decommits a QSE-Committed Resource

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

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

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

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

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

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

(5) ERCOT shall produce a report each April that provides the percentage of the RUC Decommitment Payment Amounts that are a result of RUC cancellations during the 12

months of the previous calendar year. The report shall be based on the Final Settlements. ERCOT shall present the results of this study to the appropriate Technical Advisory Committee (TAC) subcommittee.

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

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

(8) The payment for a RUC decommitment instruction for a Resource, including RMR Units, is calculated for each hour as follows:

$$RUCDCAMT_{q,r,h} = (-1) * Max\ (0, (SUPR_{q,r,s} - \sum_{i} (Max\ (0, MEPR_{q,r,i} - RTSPP_{p,i}) * (LSL_{q,r,i} * (¼))))) / NCDCHR_{q,r,h}$$

Where:

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

Then, $SUPR_{q,r,s} = Min(SUO_{q,r,s}, SUCAP_{q,r,s})$

$MEPR_{q,r,i} = Min(MEO_{q,r,i}, MECAP_{q,r,i})$

Otherwise, $SUPR_{q,r,s} = SUCAP_{q,r,s}$

$MEPR_{q,r,i} = MECAP_{q,r,i}$

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

Then, $SUCAP_{q,r,s}$ = verifiable Startup Costs$_{q,r,s}$

$MECAP_{q,r,i}$ = verifiable minimum-energy costs$_{q,r,i}$

Otherwise, $SUCAP_{q,r,s} = RCGSC_{s}$

$MECAP_{q,r,i} = RCGMEC_{i}$

The above variables are defined as follows:

Variable	Unit	Definition

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Variable	Unit	Definition
$RUCDCAMT_{q,r,h}$	$	*RUC Decommitment Payment Amount*—The payment to the QSE for the Resource that was decommitted by ERCOT but that was not scheduled to shut down in the Operating Day, for each decommited hour of the Operating Day. When one or more Combined Cycle Generation Resources are decommitted by RUC, payment is made to the Combined Cycle Train for all RUC-decommitted Combined Cycle Generation Resources.
$SUPR_{q,r,s}$	$/Start	*Startup Price per start*—The Ssettlement price for Resource *r* for the start *s*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$SUO_{q,r,s}$	$/Start	*Startup Offer per start*—Represents an offer for all costs incurred by Generation Resource *r* in starting up and reaching the Resource's LSL, minus the average energy produced during the time period between breaker close and LSL multiplied by the heat rate proxy multiplied by the appropriate FIP or FOP, as described in the Verifiable Cost Manual. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$SUCAP_{q,r,s}$	$/Start	*Startup Cap*—The amount used for Resource *r* as Startup Costs if the QSE did not submit a validated Three-Part Supply Offer. The cap is the Resource Category Startup Offer Generic Cap (RCGSC) unless ERCOT has approved verifiable unit-specific Startup Costs for that Resource, in which case the Startup Cap is the verifiable unit-specific Startup Cost. See Section 5.6.1, Verifiable Costs, for more information on verifiable costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$RCGSC_s$	$/Start	*Resource Category Generic Startup Cost*—The Resource Category Startup Offer Generic Cap cost for the category of the Resource, according to Section 4.4.9.2.3, Startup Offer and Minimum-Energy Offer Generic Caps, for the Operating Day.
$MEPR_{q,r,i}$	$/MWh	*Minimum-Energy Price*—The Ssettlement price for Resource *r* for minimum energy for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$MEO_{q,r,i}$	$/MWh	*Minimum-Energy Offer*—Represents an offer for the costs incurred by Resource *r* in producing energy at the Resource's LSL for the Settlement Interval *i*. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$MECAP_{q,r,i}$	$/MWh	*Minimum-Energy Cap*—The amount used for Resource *r* for minimum-energy costs if the QSE did not submit a validated Three-Part Supply Offer. The minimum cost is the Resource Category Minimum-Energy Generic Cap (RCGMEC)cap is the RCGMEC unless ERCOT has approved verifiable unit-specific minimum energy costs for that Resource, in which case the Minimum-Energy Cap is the verifiable unit-specific minimum energy cost. See Section 5.6.1 for more information on verifiable costs. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$RCGMEC_i$	$/MWh	*Resource Category Generic Minimum-Energy Cost*—The Resource Category Minimum-Energy Generic Cap cost for the category of the Resource, according to Section 4.4.9.2.3.
$LSL_{q,r,i}$	MW	*Low Sustained Limit*—The LSL of Generation Resource *r* represented by QSE *q* for the hour that includes the Settlement Interval *i*, as submitted in the COP. Where for a Combined Cycle Train, the Resource *r* is a Combined Cycle Generation Resource within the Combined Cycle Train.
$RTSPP_{p,i}$	$/MWh	*Real-Time Settlement Point Price*—The Real-Time Settlement Point Price at the Resource's Settlement Point for the Settlement Interval *i*.

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Variable	Unit	Definition
$NCDCHR_{q,r,h}$	none	*Number of Continuous Decommitted Hours*—The number of continuous decommitment hours for Resource *r* within an Operating Day. When one or more Combined Cycle Generation Resources are decommitted by RUC, the Number of Continuous Decommitted Hours is calculated for the Combined Cycle Train for all RUC-decommitted Combined Cycle Generation Resources.
q	none	A QSE.
r	none	A RUC-decommitted Generation Resource.
h	none	An hour in the RUC decommitment period.
p	none	A Resource Node Settlement Point.
s	none	A start.
i	none	A 15-minute Settlement Interval within the contiguous decommited period.