

TAC Report

NPRR Number	649	NPRR Title	Addressing Issues Surrounding High Dispatch Limit (HDL) Overrides
Timeline	Normal	Action	Rejected
Date of Decision	November 19, 2015		
Proposed Effective Date	Not applicable		
Priority and Rank Assigned	Not applicable		
Nodal Protocol Sections Requiring Revision	1.3.1.1, Items Considered Protected Information 4.6.5, Calculation of “Average Incremental Energy Cost” (AIEC) 6.5.7.1.10, Network Security Analysis Processor and Security Violation Alarm 6.5.7.1.13, Data Inputs and Outputs for the Real-Time Sequence and SCED 6.6.3.9, Real-Time Lost Opportunity Energy Payment (new) 6.6.3.10, Real-Time Lost Opportunity Energy Charge (new) 9.5.3, Real-Time Market Settlement Charge Types		
Other Binding Documents Requiring Revision or Related Revision Requests	None		
Revision Description	<p>This Nodal Protocol Revision Request (NPRR) proposes a lost opportunity compensation mechanism for Generation Resources that are issued a High Dispatch Limit (HDL) manual override that results in a real power reduction (subject to certain criteria) by compensating the Qualified Scheduling Entity (QSE) for its lost opportunity relative to its expected Real-Time Market (RTM) position.</p> <p>ERCOT submits this NPRR to satisfy its obligations under a settlement agreement reached with Odessa Ector Power Partners, LP in Public Utility Commission of Texas (PUCT) Docket 41790. ERCOT’s submission of this NPRR does not imply ERCOT’s support for or opposition to the principles stated in this NPRR.</p>		
Reason for Revision	<input checked="" type="checkbox"/> Addresses current operational issues. <input type="checkbox"/> Meets Strategic goals (tied to the ERCOT Strategic Plan or directed by the ERCOT Board). <input type="checkbox"/> Market efficiencies or enhancements <input type="checkbox"/> Administrative <input type="checkbox"/> Regulatory requirements		

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	<input checked="" type="checkbox"/> Other: Submitted pursuant to settlement agreement. <i>(please select all that apply)</i>
Credit Work Group Review	ERCOT Credit Staff and the Credit Work Group (Credit WG) have reviewed NPRR649 and do not believe that it requires changes to credit monitoring activity or the calculation of liability.
Procedural History	<ul style="list-style-type: none"> ➤ On 9/12/14, NPRR649 and an Impact Analysis were posted. ➤ On 10/9/14, PRS considered NPRR649. ➤ On 10/28/14, Odessa-Ector comments were posted. ➤ On 12/8/14, WMS comments were posted. ➤ On 3/12/15, PRS again considered NPRR649. ➤ On 4/7/15, a second set of WMS comments were posted. ➤ On 4/24/15, a second set of Odessa-Ector comments were posted. ➤ On 6/4/15, a third set of WMS comments were posted. ➤ On 6/11/15, PRS again considered NPRR649. ➤ On 7/6/15, a third set of Odessa-Ector comments were posted. ➤ On 7/9/15, a revised Impact Analysis was posted. ➤ On 7/15/15, a revised Impact Analysis was posted. ➤ On 7/16/15, PRS considered the 6/11/15 PRS Report and revised Impact Analysis for NPRR649. ➤ On 8/13/15, PRS considered the 7/16/15 PRS Report and revised Impact Analysis for NPRR649. ➤ On 9/30/15, ERCOT comments were posted. ➤ On 10/8/15, a fourth set of WMS comments were posted. ➤ On 10/15/15, PRS considered the 8/13/15 PRS Report and the revised Impact Analysis for NPRR649. ➤ On 10/28/15, a revised Impact Analysis was posted. ➤ On 11/11/15, a fourth set of Odessa-Ector comments were posted. ➤ On 11/12/15, PRS considered the 10/15/15 PRS Report and revised Impact Analysis for NPRR649. ➤ On 11/19/15, TAC considered NPRR649.
PRS Decision	<p>On 10/9/14, PRS unanimously voted to table NPRR649 and to refer the issue to WMS. All Market Segments were present for the vote.</p> <p>On 3/12/15, PRS unanimously voted to table NPRR649 and to refer the issue to WMS. All Market Segments were present for the vote.</p> <p>On 6/11/15, PRS voted via roll call vote to recommend approval of NPRR649 as amended by the 6/4/15 WMS comments. There were four opposing votes from the Consumer (2) and Cooperative (2) Market Segments and four abstentions from the Independent Power Marketer (IPM), Independent Retail Electric Provider (IREP), Investor Owned Utility (IOU), and Municipl Market Segments. All Market Segments were present for the vote.</p>

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	<p>On 7/16/15, PRS unanimously voted to table NPRR649. All Market Segments were present for the vote.</p> <p>On 8/13/15, PRS unanimously voted to table NPRR649 and refer the issue to WMS; and requested that ERCOT consider alternative solutions/language to address the intent of NPRR649 at a lower cost. All Market Segments were present for the vote.</p> <p>On 10/15/15, PRS voted to endorse the 8/13/15 PRS Report as amended by the 9/30/15 ERCOT comments and requested a revised Impact Analysis be brought back to PRS for consideration. There were two abstentions from the Consumer and IREP Market Segments. All Market Segments were present for the vote.</p> <p>On 11/12/15, PRS voted to endorse and forward to TAC the 10/15/15 PRS Report as amended by the 11/11/15 Odessa-Ector comments and the revised Impact Analysis for NPRR649 with a recommended priority of 2016 and rank of 1520. There was one opposing vote from the Consumer Market Segment and one abstention from the IREP Market Segment. All Market Segments were present for the vote.</p>
<p>Summary of PRS Discussion</p>	<p>On 10/9/14, participants questioned the description and cost of the NPRR. ERCOT reiterated it has no preference between the options presented within the NPRR and has no formal opinion on the NPRR at this time.</p> <p>On 3/12/15, participants noted comments under development would benefit from additional WMS discussion and requested PRS formally refer this NPRR to that subcommittee for a second time.</p> <p>On 6/11/15, participants discussed potential risks to generators and consumers related to NPRR649.</p> <p>On 7/16/15, ERCOT reviewed the revised Impact Analysis for NPRR649. Participants noted additional comments proposing a potentially lower cost method to address the intent of NPRR649 were under development and requested additional time for review.</p> <p>On 8/13/15, PRS discussed the cost/benefit of NPRR649; that the issue being addressed is not expected to be a frequent occurrence; and whether implementation of NPRR649 through manual processes was an option.</p> <p>On 10/15/15, participants noted the expected reduction in cost from approving the 9/30/15 ERCOT comments.</p> <p>On 11/12/15, participants reviewed the business case modifications proposed by the 11/11/15 Odessa-Ector comments. Members of the Consumer Market Segment again voiced concern that the benefits of this NPRR do not outweigh its costs.</p>

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TAC Decision	On 11/19/15, the TAC vote to recommend approval of NPRR649 as recommended by PRS in the 11/12/15 PRS Report and as revised by TAC failed via roll-call vote. There were 12 opposing votes from the Consumer (6), Cooperative (3), and IREP (3) Market Segments and three abstentions from the IREP and IOU (2) Market Segments. All Market Segments were present for the vote. Due to lack of a subsequent passing vote, NPRR649 was deemed rejected by TAC pursuant to Section 21.4.8, Technical Advisory Committee Vote.
Summary of TAC Discussion	On 11/19/15, participants discussed the merits and concerns associated with NPRR649. Proponents continued to express concern with HDL overrides not having an appropriate Settlement mechanism. Opponents expressed concern with both the Impact Analysis cost given the infrequent occurrence of the overrides, and that the language in the NPRR may overly compensate generators rather than just making them whole.
ERCOT Opinion	ERCOT supports approval of NPRR649.

Business Case	
Qualitative Benefits	1) This NPRR is needed to ensure Resources are not financially harmed by following ERCOT reliability instructions. a) In the past, these instructions have been documented to exceed \$300k (PUCT #41790, ODESSA-ECTOR POWER PARTNERS, L.P.'S APPEAL AND COMPLAINT AGAINST ERCOT'S DENIAL OF SETTLEMENT DISPUTES) b) In the future, with the increase offer caps these losses on a single resource following instructions could be much more significant. 2) This NPRR may reduce costly appeals and arbitration 3) Satisfies ERCOT's obligations under settlement agreement from PUCT #41790.
Quantitative Benefits	
Impact to Market Segments	In the event of an HDL override, this NPRR will, under certain circumstances, provide payments to QSEs representing Generation Resources and impose charges on QSEs representing Load.
Credit Implications	No
Other	

Sponsor	
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Company	ERCOT
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Cell Number	
Market Segment	Not applicable

Market Rules Staff Contact	
Name	Cory Phillips
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Comments Received	
Comment Author	Comment Summary
Odessa 102814	Supported Option 1 language and proposed striking Option 2.
WMS 120814	Endorsed NPRR649 as amended by the 10/28/14 Odessa comments.
WMS 040715	Requested continued tabling for additional discussion.
Odessa 042415	Proposed additional language changes to address various stakeholder concerns.
WMS 060415	Endorsed NPRR649 as amended by the 4/24/15 Odessa comments and as revised by WMS.
Odessa 070615	Clarified that a reporting requirement detailed in Section 6.5.7.1.13 is an expansion of an existing manual report to the QSE Managers Working Group (QMWG), not a system change to develop an automated report.
ERCOT 093015	Proposed using 15-minute Settlement calculations, rather than the originally proposed 5-minute calculations in an effort to reduce the costs associated with this NPRR.
WMS 100815	Endorsed the 9/30/15 ERCOT comments.
Odessa 111115	Proposed additional qualitative benefits within the business case.

Comments

Please note that the baseline Protocol language in the following sections has been updated to reflect the incorporation of the following NPRR(s) into the Protocols:

- NPRR626, Reliability Deployment Price Adder (formerly “ORDC Price Reversal Mitigation Enhancements”) (unboxed 6/25/15)
 - Section 9.5.3

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- NPRR664, Fuel Index Price for Resource Definition and Real-Time Make-Whole Payments for Exceptional Fuel Cost Events (sunsetting 5/1/15)
 - Section 9.5.3
- NPRR689, Settlement of Ancillary Service Assignment in Real-Time Operations
 - Section 9.5.3 (incorporated 11/01/15)
- NPRR695, Posting and Notice Requirements for Notifications of Suspension of Operations and Notifications of Change of Generation Resource Designation (incorporated 9/1/15)
 - Section 1.3.1.1
- NPRR703, Clarification of Disclosure Requirements for GINR Study Information (incorporated 9/1/15)
 - Section 1.3.1.1
- NPRR714, Real-Time Make-Whole Payment for Exceptional Fuel Cost
 - Section 9.5.3 (incorporated 11/01/15)

Please also note baseline Protocol language updates to Section 6.6.5.1, Resource Base Point Deviation Charge, implemented the spelling correction proposed by this NPRR, so that section has been removed. No additional changes to this section are proposed by NPRR649.

Due to ERCOT Board approval of NPRR664, Fuel Index Price for Resource Definition and Real-Time Make-Whole Payments for Exceptional Fuel Cost Events, the proposed Sections 6.6.3.7 and 6.6.3.8 in NPRR649 have been renumbered via administrative edits to 6.6.3.9 and 6.6.3.10, respectively.

Please also note the following NPRRs also propose revisions to the following sections:

- NPRR667, Ancillary Service Redesign
 - Section 9.5.3
 - Section 6.5.7.1.10
- NPRR727, Removal of Language Related to NPRR327, State Estimator Data Redaction Methodology
 - Section 6.5.7.1.13
- NPRR733, Delete Expiration of Customer Load Data Protected Information Status
 - Section 1.3.1.1

Proposed Protocol Language Revision
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1.3.1.1^[CPI] Items Considered Protected Information

- (1) Subject to the exclusions set out in Section 1.3.1.2, Items Not Considered Protected Information, and in Section 3.2.5, Publication of Resource and Load Information, “Protected Information” is information containing or revealing any of the following:
 - (a) Base Points, as calculated by ERCOT. The Protected Information status of this information shall expire 60 days after the applicable Operating Day;
 - (b) Bids, offers, or pricing information identifiable to a specific Qualified Scheduling Entity (QSE) or Resource. The Protected Information status of part of this information shall expire 60 days after the applicable Operating Day, as follows:
 - (i) Ancillary Service Offers by Operating Hour for each Resource for all Ancillary Services submitted for the Day-Ahead Market (DAM) or any Supplemental Ancillary Services Market (SASM);
 - (ii) The quantity of Ancillary Service offered by Operating Hour for each Resource for all Ancillary Service submitted for the DAM or any SASM; and
 - (iii) Energy Offer Curve prices and quantities for each Settlement Interval by Resource. The Protected Information status of this information shall expire within seven days after the applicable Operating Day if required to be posted as part of paragraph (5) of Section 3.2.5 and within two days after the applicable Operating Day if required to be posted as part of paragraph (6) of Section 3.2.5;
 - (c) Status of Resources, including Outages, limitations, or scheduled or metered Resource data. The Protected Information status of this information shall expire 60 days after the applicable Operating Day;
 - (d) Current Operating Plans (COPs). The Protected Information status of this information shall expire 60 days after the applicable Operating Day;
 - (e) Ancillary Service Trades, Energy Trades, and Capacity Trades identifiable to a specific QSE or Resource. The Protected Information status of this information shall expire 180 days after the applicable Operating Day;
 - (f) Ancillary Service Schedules identifiable to a specific QSE or Resource. The Protected Information status of this information shall expire 60 days after the applicable Operating Day;
 - (g) Dispatch Instructions identifiable to a specific QSE or Resource, except for Reliability Unit Commitment (RUC) commitments and decommitments as provided in Section 5.5.3, Communication of RUC Commitments and Decommitments. The Protected Information status of this information shall expire 180 days after the applicable Operating Day;

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- (h) Raw and Adjusted Metered Load (AML) data (demand and energy) identifiable to a specific QSE, Load Serving Entity (LSE), or Customer. The Protected Information status of this information shall expire 180 days after the applicable Operating Day;
- (i) Wholesale Storage Load (WSL) data identifiable to a specific QSE. The Protected Information status of this information shall expire 180 days after the applicable Operating Day;
- (j) Settlement Statements and Invoices identifiable to a specific QSE. The Protected Information status of this information shall expire 180 days after the applicable Operating Day;
- (k) Number of Electric Service Identifiers (ESI IDs) identifiable to a specific LSE. The Protected Information status of this information shall expire 365 days after the applicable Operating Day;
- (l) Information related to generation interconnection requests, to the extent such information is not otherwise publicly available. The Protected Information status of this information shall expire when the generation interconnection agreement is executed or a financial arrangement for transmission construction is completed with a Transmission Service Provider (TSP);

[NPRR703: Replace paragraph (l) above with the following upon system implementation of PGRR044:]

- (l) Information related to generation interconnection requests, to the extent such information is not otherwise publicly available. The Protected Information status of certain generation interconnection request information expires as provided in Section 1.3.3, Expiration of Confidentiality;
- (m) Resource-specific costs, design and engineering data;
- (n) Congestion Revenue Right (CRR) credit limits, the identity of bidders in a CRR Auction, or other bidding information identifiable to a specific CRR Account Holder. The Protected Information status of this information shall expire as follows:
 - (i) The Protected Information status of the identities of CRR bidders that become CRR Owners and the number and type of CRRs that they each own shall expire at the end of the CRR Auction in which the CRRs were first sold; and
 - (ii) The Protected Information status of all other CRR information identified above in item (n) shall expire six months after the end of the year in which the CRR was effective.

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- (o) Renewable Energy Credit (REC) account balances. The Protected Information status of this information shall expire three years after the REC Settlement period ends;
- (p) Credit limits identifiable to a specific QSE;
- (q) Any information that is designated as Protected Information in writing by Disclosing Party at the time the information is provided to Receiving Party except for information that is expressly designated not to be Protected Information by Section 1.3.1.2 or that, pursuant to Section 1.3.3, Expiration of Confidentiality, is no longer confidential;
- (r) Any information compiled by a Market Participant on a Customer that in the normal course of a Market Participant's business that makes possible the identification of any individual Customer by matching such information with the Customer's name, address, account number, type of classification service, historical electricity usage, expected patterns of use, types of facilities used in providing service, individual contract terms and conditions, price, current charges, billing record, or any other information that a Customer has expressly requested not be disclosed ("Proprietary Customer Information") unless the Customer has authorized the release for public disclosure of that information in a manner approved by the Public Utility Commission of Texas (PUCT). Information that is redacted or organized in such a way as to make it impossible to identify the Customer to whom the information relates does not constitute Proprietary Customer Information;
- (s) Any software, products of software, or other vendor information that ERCOT is required to keep confidential under its agreements;
- (t) QSE, TSP, and Distribution Service Provider (DSP) backup plans collected by ERCOT under the Protocols or Other Binding Documents;
- (u) Direct Current Tie (DC Tie) information provided to a TSP or DSP under Section 9.17.2, Direct Current Tie Schedule Information;
- (v) Any Texas Standard Electronic Transaction (TX SET) transaction submitted by an LSE to ERCOT or received by an LSE from ERCOT. This paragraph does not apply to ERCOT's compliance with:
 - (i) PUCT Substantive Rules on performance measure reporting;
 - (ii) These Protocols or Other Binding Documents; or
 - (iii) Any Technical Advisory Committee (TAC)-approved reporting requirements;

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- (w) Information concerning a Mothballed Generation Resource's probability of return to service and expected lead time for returning to service submitted pursuant to Section 3.14.1.9, Generation Resource Status Updates;
- (x) Information provided by Entities under Section 10.3.2.4, Reporting of Net Generation Capacity;
- (y) Alternative fuel reserve capability and firm gas availability information submitted pursuant to Section 6.5.9.3.1, Operating Condition Notice, Section 6.5.9.3.2, Advisory, and Section 6.5.9.3.3, Watch, and as defined by the Operating Guides;
- (z) Non-public financial information provided by a Counter-Party to ERCOT pursuant to meeting its credit qualification requirements as well as the QSE's form of credit support;
- (aa) ESI ID, identity of Retail Electric Provider (REP), and MWh consumption associated with transmission-level Customers that wish to have their Load excluded from the Renewable Portfolio Standard (RPS) calculation consistent with Section 14.5.3, End-Use Customers, and subsection (j) of P.U.C. SUBST. R. 25.173, Goal for Renewable Energy;
- (bb) Generation Resource emergency operations plans and weatherization plans;
- (cc) Information provided by a Counter-Party under Section 16.16.3, Verification of Risk Management Framework; or
- (dd) Any data related to Load response capabilities that are self-arranged by the LSE or pursuant to a bilateral agreement between a specific LSE and its Customers, other than data either related to any service procured by ERCOT or non-LSE-specific aggregated data. Such data includes pricing, dispatch instructions, and other proprietary information of the Load response product.
- (ee) Status of Non-Modeled Generators and Distributed Generation, including Outages, limitations, or scheduled or metered Resource data. The Protected Information status of this information shall expire 60 days after the applicable Operating Day.
- (ff) [Reasons for and future expectations of overrides to a specific Resource's High Dispatch Limit \(HDL\) or Low Dispatch Limit \(LDL\). The Protected Information status of this information shall expire 60 days after the applicable Operating Day.](#)

4.6.5 Calculation of "Average Incremental Energy Cost" (AIEC)

The methodology of AIEC calculation is presented below. AIEC is used to account for the additional cost for a Generation Resource to produce energy above its LSL. This cost calculation methodology is used for the calculation of DAAIEC, RTAIEC, RTVSSAIEC, [RTOPBPAIEC](#).

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and RTHSLAIEC variables. The DAAIEC and RTAIEC are subject to the Energy Offer Curve Cap, while the RTVSSAIEC, RTOPBPAIEC, and RTHSLAIEC are not subject to price caps.

I. Energy Offer Curve:

Index (i)	MW	\$/MWh
1	Q_1	P_1
2	Q_2	P_2
\vdots	\vdots	\vdots
N ($N \leq 10$)	Q_N	P_N

Variables DAAIEC and RTAIEC should calculate the associated price caps as specified in steps II through IV, the calculation process for Variables RTVSSAIEC, RTOPBPAIEC, and RTHSLAIEC should skip steps II through IV and continue with step V.

II. MW quantity corresponding with Energy Offer Curve Cap¹, \bar{P} (\$/MWh), where $P_i < \bar{P} \leq P_{i+1}$ ($i = 1, 2, \dots, N-1$):

$$\bar{Q} \text{ (MW)}, \text{ where } \bar{Q} = Q_i + \frac{Q_{i+1} - Q_i}{P_{i+1} - P_i} (\bar{P} - P_i)$$

III. Energy Offer Curve capped with the Energy Offer Curve Cap:

A. When $\bar{P} < P_N$

Index (j)	MW	\$/MWh
1	Q_1	P_1
\vdots	\vdots	\vdots
i	Q_i	P_i
i+1	\bar{Q}	\bar{P}
i+2	Q_N	\bar{P}

B. When $\bar{P} \geq P_N$:

¹ If the Energy Offer Curve Cap is less than the lowest price of the energy offer curve, the AIEC is the Energy Offer Curve Cap. If the Energy Offer Curve Cap is greater than the highest price of the energy offer curve, then \bar{Q} does not need to be calculated.

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Index (j)	MW	\$/MWh
1	Q_1	P_1
\vdots	\vdots	\vdots
N	Q_N	P_N

IV. Cleared offer on the capped Energy Offer Curve:

A. When $\bar{P} < P_N$:

Q (MW), where $Q_j < Q \leq Q_{j+1}$ ($j = 1, \dots, i, i+1$)

B. When $\bar{P} \geq P_N$:

Q (MW), where $Q_j < Q \leq Q_{j+1}$ ($j = 1, \dots, N-1$)

V. Incremental energy price corresponding with cleared offer, on the capped Energy Offer Curve or between two points along the Energy Offer Curve:

P (\$/MWh), where $P = P_j + \frac{P_{j+1} - P_j}{Q_{j+1} - Q_j}(Q - Q_j)$

VI. AIEC corresponding with ($Q - Q_1 > 0$), on the capped Energy Offer Curve:

$$AIEC = \begin{cases} \frac{P_1 + P}{2}, \text{ for } Q_1 < Q \leq Q_2 \\ \left[\sum_{k=1}^{j-1} \frac{P_k + P_{k+1}}{2} (Q_{k+1} - Q_k) + \frac{P_j + P}{2} (Q - Q_j) \right] / (Q - Q_1), \text{ for } Q > Q_2 \end{cases}$$

6.5.7.1.10 Network Security Analysis Processor and Security Violation Alarm^[LB2]

- (1) Using the input provided by the State Estimator, ERCOT shall use the NSA processor to perform analysis of all contingencies in the active list. For each contingency, ERCOT shall use the NSA processor to monitor the elements for limit violations. ERCOT shall use the NSA processor to verify Electrical Bus voltage limits to be within a percentage

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tolerance as outlined in the Operating Guides. Contingency security violations for transmission lines and transformers occur if:

- (a) The predicted post-contingency MVA exceeds 100% of the Emergency Rating after consideration of Dynamic Ratings; and
 - (b) A RAP or SPS is not defined allowing relief within the time allowed by the security criteria as defined in Operating Guide Section 2.2.2, Security Criteria.
- (2) When the NSA processor notifies ERCOT of a security violation, ERCOT shall immediately:
- (a) Initiate the process described in Section 6.5.7.1.11, Transmission Network and Power Balance Constraint Management;
 - (b) Seek to determine what unforeseen change in system condition has arisen that has resulted in the security violation, especially those that were 125% or greater of the Emergency Rating for a single SCED interval or greater than 100% of the Emergency Rating for a duration of 30 minutes or more; and
 - (c) Where possible, seek to reverse the action (e.g. initiating a transmission clearance that the system was not properly pre-dispatched for) that has led to a security violation until further preventative action(s) can be taken.
- (3) If SCED does not resolve a transmission security violation, ERCOT shall attempt to relieve the security violation by:
- (a) Confirming that pre-determined RAPs are properly modeled in the system;
 - (b) Instructing Resources to follow Base Points from SCED if those Resources are not already doing so;
 - (c) Instructing Resources to update the Resources Status in the COP from ONTEST to ON in order to provide more capacity to SCED;
 - (d) Deploying Resource-Specific Non-Spin;
 - (e) Committing additional Generation Resources through the Reliability Unit Commitment (RUC) process;
 - (f) Removing conflicting non-cascading constraints from the SCED process;
 - (g) Re-Dispatching generation by over-riding HDLs and LDLs;
 - (h) Instructing TSPs to utilize Reactive Power devices to manage voltage; and
 - (i) If all other mechanisms have failed, ERCOT may authorize the expedited use of a Temporary Outage Action Plan (TOAP) or Mitigation Plan.

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- (4) NSA must be capable of analyzing contingencies, including the effects of SPSs and RAPs. The NSA must fully integrate the evaluation and deployment of SPSs and RAPs and notify the ERCOT Operator of the application of these SPSs and RAPs to the solution.
- (5) The Real-Time NSA may employ the use of appropriate ranking and other screening techniques to further reduce computation time by executing one or two iterations of the contingency study to gauge its impact and discard further study if the estimated result is inconsequential.
- (6) When HDL or LDL overrides are required to pre-posture for an expected Outage, ERCOT shall only be utilized to employ the override until SCED is used to capable of managing the congestion related constraint by economic dispatch.
- (7) ERCOT shall report monthly:
 - (a) All security violations that were 125% or greater of the Emergency Rating for a single SCED interval or greater than 100% of the Emergency Rating for a duration of 30 minutes or more during the prior reporting month and the number of occurrences and congestion cost associated with each of the constraints causing the security violations on a rolling 12 month basis.
 - (b) Operating conditions on the ERCOT System that contributed to each transmission security violation reported in paragraph (6)(a) above. Analysis should be made to understand the root cause and what steps could be taken to avoid a recurrence in the future.

6.5.7.1.13^[CP3] *Data Inputs and Outputs for the Real-Time Sequence and SCED*

- (1) Inputs: The following information must be provided as inputs to the Real-Time Sequence and SCED. ERCOT may require additional information as required, including:
 - (a) Real-Time data from TSPs including status indication for each point if that data element is stale for more than 20 seconds;
 - (i) Transmission Electrical Bus voltages;
 - (ii) MW and MVar pairs for all transmission lines, transformers, and reactors;
 - (iii) Actual breaker and switch status for all modeled devices; and
 - (iv) Tap position for auto-transformers;
 - (b) State Estimator results (MW and MVar pairs and calculated MVA) for all modeled Transmission Elements;
 - (c) Transmission Element ratings from TSPs;

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- (i) Data from the Network Operations Model:
 - (A) Transmission lines – Normal, Emergency, and 15-Minute Ratings (MVA); and
 - (B) Transformers and Auto-transformers – Normal, Emergency, and 15-Minute Ratings (MVA) and tap position limits;
 - (ii) Data from QSEs:
 - (A) Generator Step-Up (GSU) transformers tap position;
 - (B) Resource HSL (from telemetry); and
 - (C) Resource LSL (from telemetry); and
 - (d) Real-Time weather, from WGRs, and where available from TSPs or other sources. ERCOT may elect to obtain other sources of weather data and may utilize such information to calculate the dynamic limit of any Transmission Element.
- (2) ERCOT shall validate the inputs of the Resource Limit Calculator as follows:
- (a) The calculated SURAMP and SDRAMP are each greater than or equal to zero; and
 - (b) Other provision specified under Section 3.18, Resource Limits in Providing Ancillary Service.
- (3) Outputs for ERCOT Operator information and possible action include:
- (a) Operator notification of any change in status of any breaker or switch;
 - (b) Lists of all breakers and switches not in their normal position;
 - (c) Operator notification of all Transmission Element overloads detected from telemetered or State-Estimated data;
 - (d) Operator notification of all Transmission Element security violations; and
 - (e) Operator summary displays:
 - (i) Transmission system status changes;
 - (ii) Overloads;
 - (iii) System security violations; and
 - (iv) Base Points.

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- (4) Every hour, ERCOT shall post on the MIS Secure Area the following information:
 - (a) Status of all breakers and switches used in the NSA except breakers and switches connecting Resources to the ERCOT Transmission Grid;
 - (b) All binding transmission constraints and the contingency or overloaded element pairs that caused such constraint; and
 - (c) Shift Factors by Resource Node.
- (5) Sixty days after the applicable Operating Day, ERCOT shall post on the MIS Secure Area, the following information:
 - (a) Hourly transmission line flows and voltages from the State Estimator, excluding transmission line flows and voltages for Private Use Networks; and
 - (b) Hourly transformer flows, voltages and tap positions from the State Estimator, excluding transformer flows, voltages, and tap positions for Private Use Networks.
- (6) Notwithstanding paragraph (5) above, ERCOT, in its sole discretion, shall release relevant State Estimator data less than 60 days after the Operating Day if it determines the release is necessary to provide complete and timely explanation and analysis of unexpected market operations and results or system events including, but not limited to, pricing anomalies, recurring transmission congestion, and system disturbances. ERCOT's release of data under this paragraph shall be limited to intervals associated with the unexpected market or system event as determined by ERCOT. The data release shall be made available simultaneously to all Market Participants.
- (7) Notwithstanding paragraph (5) above, ERCOT shall develop and post a redacted version of the State Estimator data, as soon as reasonably practicable after collection of the data, so long as a redacted version excludes information (including, but not limited to, voltages, transmission flows and transformer flows) from which resource-specific output levels or offer curves could continually and systematically be derived.

[NPRR327: Replace paragraph (7) above with the following upon system implementation:]

- (7) Notwithstanding paragraph (5) above, ERCOT shall post a redacted version of the State Estimator data every hour to the MIS Secure Area with a validation check to indicate if the State Estimator does not reach a valid solution. The State Estimator data shall include power flow and voltage information for transmission lines and transformers. ERCOT shall only disclose State Estimator data in Real-Time for elements in the published list as described in Section 3.20, Process for Redacting State Estimator Data for Real-Time Publication. If a Market Participant determines that publishing an element of the State Estimator data, as described in Section 3.20, allows systematic and continual derivation of its Resource-specific output levels and Resource Status or its redacted Load, the Market Participant may request ERCOT remove the element from the published list and the request

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will be posted on the MIS Secure Area. ERCOT will remove the questionable element from the reports as soon as practicable and the element will be reviewed by TAC according to Section 3.20.1, Methodology for Redaction of State Estimator Data, during the quarterly process described in paragraph (2) of Section 3.20.

[NPRR327: Insert paragraph (8) below and renumber accordingly upon system implementation:]

- (8) Every hour, ERCOT shall post on the MIS Secure Area from the State Estimator, individual Load on Electrical Buses utilizing the methodology described in Section 3.20.2, Methodology of Identification of Redacted Load, sum of Load in each Load Zone and total Load on Electrical Buses in the ERCOT System.
- (8) Every hour, ERCOT shall post on the MIS Public Area, the sum of ERCOT generation, and flow on the DC Ties, all from the State Estimator.
- (9) After every SCED run, ERCOT shall post to the MIS Public Area the sum of the HDL and the sum of the LDL for all Generation Resources On-Line and Dispatched by SCED.
- (10) Sixty days after the applicable Operating Day, ERCOT shall provide the summary LDL and HDL report from paragraph (9) above [to the appropriate TAC subcommittee](#) and include, for any Generation Resource, instances of manual overrides of HDL or LDL, [the reason for, and the cost associated as calculated in 6.6.3.108, Real-Time Lost Opportunity Energy Charge](#), including the name of the Generation Resource and the type of override.
- (11) After every SCED run, ERCOT shall post to the MIS Certified Area, for any QSE, instances of a manual override of the HDL or LDL for a Generation Resource, including the original and overridden HDL or LDL.

6.6.3.79 Real-Time Lost Opportunity Energy Payment ~~(option 1)~~

- (1) If ERCOT directs a reduction in a Generation Resource's real power output by employing a manual High Dispatch Limit (HDL) override, [and the QSE representing the Resource files a dispute requesting a lost opportunity payment](#), ERCOT shall [grant the dispute and calculate](#) provide a lost opportunity energy payment ~~for a given 15-minute Settlement Interval~~ [for](#) to the Generation Resource's QSE for each Settlement Interval that contains a SCED interval in which the Generation Resource's Base Point is equal to its HDL. The payment shall be calculated as follows:

$$LOPEAMT_{q,r,p,i} = (-1) * \text{Max}(0, ((RTSPP_{p,i} \text{TOPVAL}_{q,r,p,i} - RTRSVPOR_i - RTRDPP_i - RTLOPBPAIEC_{q,r,p,i}) * OPQTY_{q,r,p,i} \frac{1}{4} (\text{OPBP}_{q,r,p,i} - \text{AVGHDL}_{q,r,p,i}))))$$

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Where:

$$\text{TOPVAL}_{q,r,p,i} = \frac{\sum_y (\text{OPVAL5M}_{q,r,p,i,y})}{y}$$

If $\text{AVGBP5M}_{q,r,p,i,y} = \text{AVGHDL5M}_{q,r,p,i,y}$ then

$$\text{OPVAL5M}_{q,r,p,i,y} = \text{RTLMP5M}_{p,i,y}^*$$

$$1/12(\text{OPBP5M}_{q,r,p,i,y} - \text{AVGHDL5M}_{q,r,p,i,y})$$

If $\text{AVGBP5M}_{q,r,p,i,y} < \text{AVGHDL5M}_{q,r,p,i,y}$ then

$$\text{OPVAL5M}_{q,r,p,i,y} = 0$$

$$\text{OPQTY}_{q,r,p,i} = \text{Max}(0, (1/4 (\text{OPBRKP}_{q,r,p,i} - \text{AVGHDL}_{q,r,p,i})))$$

$$\text{OPBRKP} \text{ OPBP5M}_{q,r,p,i,y} = \text{Min}(\text{AVGHASL5M}_{q,r,p,i,y}, \text{OPBRKPCP} \text{ OPBP5M}_{q,r,p,i,y})$$

$$\text{OPBP}_{q,r,p,i} = \text{AVERAGE}(\text{OPBP5M}_{q,r,p,i,y})$$

$$\text{AVGHDL}_{q,r,p,i} = \text{AVERAGE}(\text{AVGHDL5M}_{q,r,p,i,y})$$

The above variables are defined as follows:

Variable	Unit	Definition
$\text{LOPEAMT}_{q,r,p,i}$	\$	<i>Lost opportunity energy amount per QSE per Generation Resource—The lost opportunity payment to QSE q for an ERCOT-issued HDL override for Generation Resource r at Settlement Point p for the 15-minute Settlement Interval. For a combined cycle Resource, r is a Combined Cycle Train.</i>
$\text{TOPVAL}_{q,r,p,i}$	\$	<i>Total opportunity value per QSE per Generation Resource—The average of the OPVAL5M over the 15 minute Settlement Interval. For a combined cycle Resource, r is a Combined Cycle Train.</i>
$\text{OPVAL5M}_{q,r,p,i,y}$	\$	<i>Opportunity value per QSE per Generation Resource per five minute clock interval—The value of lost production opportunity (without regard to avoided cost) for QSE q due to an ERCOT issued HDL override for Generation Resource r for the five minute clock Interval y 15 minute Settlement Interval i. For a combined cycle Resource, r is a Combined Cycle Train.</i>
$\text{RTLMP5M}_{p,i,y}$	\$/MWh	<i>Real Time Locational Marginal Price per five minute clock interval—The Real Time time weighted LMP at the Settlement Point for the five minute clock interval y, within the 15 minute Settlement Interval i.</i>

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Variable	Unit	Definition
OPBRKP5M_{q, r, p, i}	MW	Opportunity break point per QSE per Resource per five-minute clock interval The point on the Energy Offer Curve corresponding to the lesser of the AVGHASL5M or the interception between the RTLMPRTSPP5M _y of the Generation Resource r represented by QSE q minus the Real-Time Reserve Price for On-Line Reserves and the Real-Time On-Line Reliability Deployment Price and the Energy Offer Curve of Generation Resource r represented by QSE q , for the five-minute clock interval 15-minute Settlement Interval i . For a combined cycle Resource, r is a Combined Cycle Train.
AVGHDL5M_{q, r, p, i}	MW	Average five-minute clock interval High Dispatch Limit per QSE per Settlement Point per Resource —The time-weighted average of all 4-second High Dispatch Limit values calculated by the Resource Limit Calculator, subject to the manual HDL override, for the Generation Resource or Controllable Load Resource r represented by QSE q at Settlement Point p for each five-minute clock interval y within the 15-minute Settlement Interval i . For a Combined Cycle Train, the Resource r is a Combined Cycle Generation Resource within the Combined Cycle Train.
AVGBP5M_{q, r, p, i}	MW	Average five minute clock interval Base Point per QSE per Settlement Point per Resource —The time-weighted average of all linearly ramped Base Points for a Generation Resource or Controllable Load Resource r represented by QSE q at Settlement Point p , for the five-minute clock interval y within the 15-minute Settlement Interval i . The linearly ramped Base Point is the MW value, calculated every four seconds, that corresponds with a linear, five-minute ramp from each SCED Base Point to the next.
AVGHASL5M_{q, r, p, i}	MW	Average five minute clock interval High Ancillary Service Limit per QSE per Settlement Point per Resource —The time-weighted average High Ancillary Service Limit calculated every four seconds by the Resource Limit Calculator for the Generation Resource or Controllable Load Resource r represented by QSE q at Settlement Point p for the five-minute clock interval y within the 15-minute Settlement Interval i . For a Combined Cycle Train, the Resource r is a Combined Cycle Generation Resource within the Combined Cycle Train.
OPBP_{q, r, p, i}	MW	Opportunity break point per QSE per Resource —The average of the OPBP5M over the 15-minute Settlement Interval for the Generation Resource r represented by QSE q . For a combined cycle Resource, r is a Combined Cycle Train.
OPBPCP5M_{q, r, p, i}	MW	Opportunity break point at clearing price per QSE per Resource —The MW value on the Energy Offer Curve corresponding to the Real-Time Locational Marginal Price per five-minute clock 15-minute settlement interval (RTLMP5M) of Generation Resource r represented by QSE q . For a combined cycle Resource, r is a Combined Cycle Train.
OPBRKPCP_{q, r, p, i}	MW	Opportunity break point at clearing price per QSE per Resource —The MW value on the Energy Offer Curve corresponding to the Real-Time Settlement Point Price of Generation Resource r represented by QSE q at Settlement Point p minus the Real-Time Reserve Price for On-Line Reserves and the Real-Time On-Line Reliability Deployment Price. For a combined cycle Resource, r is a Combined Cycle Train.
LOPAIEC_{q, r, p, i}	\$/MW h	Lost Opportunity Average Incremental Energy Cost per QSE per Resource —The average incremental cost (not subject to the cost cap) to operate the Generation Resource r represented by QSE q at Settlement Point p from its AVGHDL to its OPBRKP for the 15-minute Settlement Interval i and as described in Section 4.6.5, Calculation of “Average Incremental Energy Cost” (AIEC). For a combined cycle Resource, r is a Combined Cycle Generation Resource.

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<u>Variable</u>	<u>Unit</u>	<u>Definition</u>
<u>OPQTY_{q, r, p, i}</u>	<u>MWh</u>	<u>Lost Opportunity Quantity per QSE per Generation Resource</u> —The lost opportunity quantity due to an ERCOT-issued HDL override for Generation Resource <i>r</i> represented by QSE <i>q</i> at Settlement Point <i>p</i> for the 15-minute Settlement Interval <i>i</i> . For a combined cycle Resource, <i>r</i> is a Combined Cycle Train.
<u>RTSPP_{p, i}</u>	<u>\$/MWh</u>	<u>Real-Time Settlement Point Price per Settlement Point</u> —The Real-Time Settlement Point Price at Settlement Point <i>p</i> , for the 15-minute Settlement Interval <i>i</i> .
<u>RTRSVPOR_i</u>	<u>\$/MWh</u>	<u>Real-Time Reserve Price for On-Line Reserves</u> —The Real-Time Reserve Price for On-Line Reserves for the 15-minute Settlement Interval <i>i</i> .
<u>RTRDP_i</u>	<u>\$/MWh</u>	<u>Real-Time On-Line Reliability Deployment Price</u> —The Real-Time price for the 15-minute Settlement Interval <i>i</i> , reflecting the impact of reliability deployments on energy prices that is calculated from the Real-time On-Line Reliability Deployment Price Adder.
<u>RTOPBPAIEC_{q, r}</u>	<u>\$/MWh</u>	<u>Real Time Average Incremental Energy Cost per QSE per Resource</u> —The average incremental cost (not subject to the cost cap) to operate the Generation Resource <i>r</i> , represented by QSE <i>q</i> from its AVGHDL to its OPBRKP for the 15-minute Settlement Interval and as described in Section 4.6.5, Calculation of “Average Incremental Energy Cost” (AIEC). For a combined cycle Resource, <i>r</i> is a Combined Cycle Generation Resource.
<u>AVGHDL_{q, r, p, i}</u>	<u>MW</u>	<u>Average High Dispatch Limit per Settlement Point per Resource</u> —The average of the AVGHDL5M over the 15 minute Settlement Interval for the Generation Resource <i>r</i> represented by QSE <i>q</i> at Settlement Point <i>p</i> , within the 15 minute Settlement Interval <i>i</i> . For a Combined Cycle Train, the Resource <i>r</i> is a Combined Cycle Generation Resource within the Combined Cycle Train.
<i>q</i>	<u>none</u>	<u>A QSE.</u>
<i>r</i>	<u>none</u>	<u>A Generation Resource.</u>
<i>p</i>	<u>none</u>	<u>A Resource Node Settlement Point.</u>
<i>i</i>	<u>none</u>	<u>A 15-minute Settlement Interval.</u>
<i>Δ</i>	<u>none</u>	<u>A five minute clock interval in the Settlement Interval.</u>

(2) The total compensation to each QSE for lost opportunity for the 15-minute Settlement Interval is calculated as follows:

$$\underline{\text{LOPEAMTQSETOT}}_{q, i} = \sum_r \sum_p \underline{\text{LOPEAMT}}_{q, r, p, i}$$

<u>Variable</u>	<u>Unit</u>	<u>Definition</u>
<u>LOPEAMT_{q, r, p, i}</u>	<u>\$</u>	<u>Lost Opportunity Energy Amount per QSE per Generation Resource</u> —The payment to QSE <i>q</i> for the lost opportunity energy payment calculated for each Generation Resource <i>r</i> , for the 15-minute Settlement Interval. Where for a combined cycle Resource, <i>r</i> is a Combined Cycle Train.
<u>LOPEAMTQSETOT_{q, i}</u>	<u>\$</u>	<u>Lost Opportunity Energy Amount QSE total per QSE</u> —The total of the energy payments to QSE <i>q</i> as compensation for lost opportunity for this QSE for the 15-minute settlement interval.
<i>q</i>	<u>none</u>	<u>A QSE.</u>

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<u>Variable</u>	<u>Unit</u>	<u>Definition</u>
r	<u>none</u>	<u>A Generation Resource.</u>
p	<u>none</u>	<u>A Resource Node Settlement Point.</u>
i	<u>none</u>	<u>A 15-minute Settlement Interval.</u>

6.6.3.7—Real-Time Lost Opportunity Energy Payment Option 2

If ERCOT directs a reduction in a Generation Resource's real power output by employing a manual High Dispatch Limit (HDL) override, ERCOT shall calculate a lost opportunity energy payment for a given 15-minute Settlement Interval for the Generation Resource's QSE as follows:

$$\text{LOPEAMT}_{q,r,p,i} = (-1) * \text{Min}[(\text{Max}(0, 1/4 (\text{DAES}_{q,p} - \text{DAEP}_{q,p})) - \frac{\sum_r \text{RTMG}_{q,r,i}}{r} * (\text{RTSPP}_p - \text{RTRSVPOR})) - \frac{\sum_r (\text{LOPEVAL}_{q,r,p})}{r}]$$

Where:

$$\text{LOPEVAL}_{q,r,p,i} = (-1) * \text{Max}(0, (\text{TOPVAL}_{q,r,p,i} - \text{RTOPBPAIEC}_{q,r} * 1/4 (\text{OPBP}_{q,r,p,i} - \text{AVGHDL}_{q,r,p,i})))$$

$$\text{TOPVAL}_{q,r,p,i} = \frac{\sum_y (\text{OPVAL5M}_{q,r,p,i,y})}{y}$$

If $\text{AVGBP5M}_{q,r,p,i,y} \geq \text{AVGHDL5M}_{q,r,p,i,y}$, then

$$\text{OPVAL5M}_{q,r,p,i,y} = \frac{\text{RTLMP5M}_{p,i,y} * 1/12 (\text{OPBP5M}_{q,r,p,i,y} - \text{AVGHDL5M}_{q,r,p,i,y})}{\text{AVGHDL5M}_{q,r,p,i,y}}$$

If $\text{AVGBP5M}_{q,r,p,i,y} < \text{AVGHDL5M}_{q,r,p,i,y}$, then

$$\text{OPVAL5M}_{q,r,p,i,y} = 0$$

$$\text{OPBP5M}_{q,r,p,i,y} = \text{Min}(\text{AVGHASL5M}_{q,r,p,i,y}, \text{OPBPCP5M}_{q,r,p,i,y})$$

$$\text{OPBP}_{q,r,p,i} = \text{AVERAGE}(\text{OPBP5M}_{q,r,p,i,y})$$

$$\text{AVGHDL}_{q,r,p,i} = \text{AVERAGE}(\text{AVGHDL5M}_{q,r,p,i,y})$$

The above variables are defined as follows:

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Variable	Unit	Definition
$LOPEAMT_{q,r,p,i}$	\$	<u>Lost opportunity energy amount per QSE per Generation Resource</u> —The lost opportunity payment to QSE q for an ERCOT issued HDL override for Generation Resource r at Settlement Point p for the 15 minute Settlement Interval. For a combined cycle Resource, r is a Combined Cycle Train.
$LOPEVAL_{q,r,p,i}$	\$	<u>Lost Opportunity Energy Value per QSE per Generation Resource</u> —The lost opportunity energy value to QSE q for an ERCOT issued HDL override resulting in lower base points from Generation Resource r for the 15 minute Settlement Interval. Where for a combined cycle Resource, r is a Combined Cycle Train.
$TOPVAL_{q,r,p,i}$	\$	<u>Total opportunity value per QSE per Generation Resource</u> —The average of the $OPVAL5M$ over the 15 minute Settlement Interval. For a combined cycle Resource, r is a Combined Cycle Train.
$OPVAL5M_{q,r,p,i,\gamma}$	\$	<u>Opportunity value per QSE per Generation Resource per five minute clock interval</u> —The value of lost production opportunity (without regard to avoided cost) for QSE q due to an ERCOT issued HDL override for Generation Resource r for the five minute clock Interval γ . For a combined cycle Resource, r is a Combined Cycle Train.
$RTLMP5M_{p,i,\gamma}$	\$/MWh	<u>Real Time Locational Marginal Price per five minute clock interval</u> —The Real-Time time weighted LMP at the Settlement Point for the five minute clock interval γ , within the 15 minute Settlement Interval i .
$OPBP5M_{q,r,p,i,\gamma}$	MW	<u>Opportunity break point per QSE per Resource per five minute clock interval</u> —The point on the Energy Offer Curve corresponding to the lesser of the $AVGHASL5M$ or the interception between the $RTLMP5M_{p,i,\gamma}$ and the Energy Offer Curve of Generation Resource r represented by QSE q , for the five minute clock interval. For a combined cycle Resource, r is a Combined Cycle Train.
$AVGHDL5M_{q,r,p,i,\gamma}$	MW	<u>Average five minute clock interval High Dispatch Limit per QSE per Settlement Point per Resource</u> —The time weighted average of all 4 second High Dispatch Limit values calculated by the Resource Limit Calculator, subject to the manual HDL override, for the Generation Resource or Controllable Load Resource r represented by QSE q at Settlement Point p for each five minute clock interval γ within the 15 minute Settlement Interval i . For a Combined Cycle Train, the Resource r is a Combined Cycle Generation Resource within the Combined Cycle Train.
$AVGBP5M_{q,r,p,i,\gamma}$	MW	<u>Average five minute clock interval Base Point per QSE per Settlement Point per Resource</u> —The time weighted average of all linearly ramped Base Points for a Generation Resource or Controllable Load Resource r represented by QSE q at Settlement Point p , for the five minute clock interval γ within the 15 minute Settlement Interval i . The linearly ramped Base Point is the MW value, calculated every four seconds, that corresponds with a linear, five minute ramp from each SCED Base Point to the next.
$AVGHASL5M_{q,r,p,i,\gamma}$	MW	<u>Average five minute clock interval High Ancillary Service Limit per QSE per Settlement Point per Resource</u> —The time weighted average High Ancillary Service Limit calculated every four seconds by the Resource Limit Calculator for the Generation Resource or Controllable Load Resource r represented by QSE q at Settlement Point p for the five minute clock interval γ within the 15 minute Settlement Interval i .
$OPBP_{q,r,p,i}$	MW	<u>Opportunity break point per QSE per Resource</u> —The average of the $OPBP5M$ over the 15 minute Settlement Interval for the Generation Resource r represented by QSE q . For a combined cycle Resource, r is a Combined Cycle Train.

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<u>Variable</u>	<u>Unit</u>	<u>Definition</u>
<u>OPBPCP5M</u> _{<u>q,r,p,i</u>}	<u>MW</u>	<u>Opportunity break point at clearing price per QSE per Resource</u> —The MW value on the Energy Offer Curve corresponding to the Real Time Locational Marginal Price per five minute clock interval (RTLMP5M) of Generation Resource <u>r</u> represented by QSE <u>q</u> . For a combined cycle Resource, <u>r</u> is a Combined Cycle Train.
<u>RTOPBPAIEC</u> _{<u>q,r</u>}	<u>\$/MWh</u>	<u>Real Time Average Incremental Energy Cost per QSE per Resource</u> —The average incremental cost (not subject to the cost cap) to operate the Generation Resource <u>r</u> represented by QSE <u>q</u> from its AVGHDL to its OPBP for the 15 minute Settlement Interval and as described in Section 4.6.5, Calculation of “Average Incremental Energy Cost” (AIEC). For a combined cycle Resource, <u>r</u> is a Combined Cycle Generation Resource.
<u>AVGHDL</u> _{<u>q,r,p,i</u>}	<u>MW</u>	<u>Average High Dispatch Limit per Settlement Point per Resource</u> —The average of the AVGHDL5M over the 15 minute Settlement Interval for the Generation Resource <u>r</u> represented by QSE <u>q</u> at Settlement Point <u>p</u> , within the 15-minute Settlement Interval <u>i</u> . For a Combined Cycle Train, the Resource <u>r</u> is a Combined Cycle Generation Resource within the Combined Cycle Train.
<u>DAEP</u> _{<u>q,p</u>}	<u>MW</u>	<u>Day Ahead Energy Purchase per QSE per Settlement Point</u> —The QSE <u>q</u> ’s DAM Energy Bids at Settlement Point <u>p</u> cleared in the DAM, for the hour that includes the 15 minute Settlement Interval.
<u>DAES</u> _{<u>q,p</u>}	<u>MW</u>	<u>Day Ahead Energy Sale per QSE per Settlement Point</u> —The QSE <u>q</u> ’s energy offers at Settlement Point <u>p</u> cleared in the DAM, for the hour that includes the 15-minute Settlement Interval.
<u>RTMG</u> _{<u>q,r,i</u>}	<u>MWh</u>	<u>Real Time Metered Generation per QSE per Resource by Settlement Interval by hour</u> —The Real Time energy from Resource <u>r</u> represented by QSE <u>q</u> , for the 15-minute Settlement Interval <u>i</u> in the hour <u>h</u> . Where for a Combined Cycle Train, the Resource <u>r</u> is the Combined Cycle Train.
<u>RTSPP</u> _{<u>p</u>}	<u>\$/MWh</u>	<u>Real Time Settlement Point Price per Settlement Point</u> —The Real Time Settlement Point Price at Settlement Point <u>p</u> , for the 15 minute Settlement Interval.
<u>RTRSVPOR</u>	<u>\$/MWh</u>	<u>Real Time Reserve Price for On Line Reserves</u> —The Real Time Reserve Price for On Line Reserves for the 15 minute Settlement Interval.
<u>q</u>	<u>none</u>	<u>A QSE.</u>
<u>r</u>	<u>none</u>	<u>A Generation Resource.</u>
<u>p</u>	<u>none</u>	<u>A Resource Node Settlement Point.</u>
<u>i</u>	<u>none</u>	<u>A 15 minute Settlement Interval.</u>
<u>y</u>	<u>none</u>	<u>A five minute clock interval in the Settlement Interval.</u>

(2) —The total compensation to each QSE for lost opportunity for the 15-minute Settlement Interval is calculated as follows:

$$\text{LOPEAMTQSETOT}_{q,i} \equiv \sum_r \sum_p \text{LOPEAMT}_{q,r,p,i}$$

<u>Variable</u>	<u>Unit</u>	<u>Definition</u>
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<u>Variable</u>	<u>Unit</u>	<u>Definition</u>
<u>LOPEAMT_{q,r}</u>	<u>\$</u>	<u>Lost Opportunity Energy Amount per QSE per Generation Resource—The payment to QSE <i>q</i> for the lost opportunity energy payment calculated for each Generation Resource <i>r</i>, for the 15-minute Settlement Interval. Where for a combined-cycle Resource, <i>r</i> is a Combined Cycle Train.</u>
<u>LOPEAMTQSETOT_{q,i}</u>	<u>\$</u>	<u>Lost Opportunity Energy Amount QSE total per QSE—The total of the energy payments to QSE <i>q</i> as compensation for lost opportunity for this QSE for the 15-minute settlement interval.</u>
<u>q</u>	<u>none</u>	<u>A QSE.</u>
<u>r</u>	<u>none</u>	<u>A Generation Resource.</u>
<u>p</u>	<u>none</u>	<u>A Resource Node Settlement Point.</u>
<u>i</u>	<u>none</u>	<u>A 15-minute Settlement Interval.</u>

6.6.3.108 Real-Time Lost Opportunity Energy Charge

ERCOT shall allocate to QSEs on a LRS basis the total amount of the payment specified in Section 6.6.3.97, Real-Time Lost Opportunity Energy Payment. The charge to each QSE for a given 15-minute Settlement Interval is calculated as follows:

$$\text{LALOPEAMT}_{q,i} = (-1) * \text{LOPEAMTTOT} * \text{LRS}_{q,i}$$

Where:

$$\text{LOPEAMTTOT}_i = \sum_q \text{LOPEAMTQSETOT}_{q,i}$$

The above variables are defined as follows:

<u>Variable</u>	<u>Unit</u>	<u>Definition</u>
<u>LALOPEAMT_q</u>	<u>\$</u>	<u>Load-Allocated Lost Opportunity Energy Amount per QSE—The charge to QSE <i>q</i> for lost opportunity, for the 15-minute Settlement Interval.</u>
<u>LOPEAMTTOT_i</u>	<u>\$</u>	<u>Lost Opportunity Energy Amount Total—The total of payments to all QSEs for lost opportunity, for the 15-minute Settlement Interval.</u>
<u>LOPEAMTQSETOT_{q,i}</u>	<u>\$</u>	<u>Lost Opportunity Energy Amount QSE total per QSE—The total of the energy payments to QSE <i>q</i> as compensation for lost opportunity for this QSE for the 15-minute settlement interval.</u>
<u>LRS_{q,i}</u>	<u>none</u>	<u>The Load Ratio Share calculated for QSE <i>q</i> for the 15-minute Settlement Interval. See Section 6.6.2.2, QSE Load Ratio Share for a 15-Minute Settlement Interval.</u>
<u>q</u>	<u>none</u>	<u>A QSE.</u>
<u>i</u>	<u>none</u>	<u>A 15-minute Settlement Interval.</u>

9.5.3[CP4] Real-Time Market Settlement Charge Types

(1) ERCOT shall provide, on each RTM Settlement Statement, the dollar amount for each RTM Settlement charge and payment. The RTM Settlement “Charge Types” are:

(a) Section 5.7.1, RUC Make-Whole Payment;

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- (b) Section 5.7.2, RUC Clawback Charge;
- (c) Section 5.7.3, Payment When ERCOT Decommits a QSE-Committed Resource;
- (d) Section 5.7.4.1, RUC Capacity-Short Charge;
- (e) Section 5.7.4.2, RUC Make-Whole Uplift Charge;
- (f) Section 5.7.5, RUC Clawback Payment;
- (g) Section 5.7.6, RUC Decommitment Charge;
- (h) Section 6.6.3.1, Real-Time Energy Imbalance Payment or Charge at a Resource Node;
- (i) Section 6.6.3.2, Real-Time Energy Imbalance Payment or Charge at a Load Zone;
- (j) Section 6.6.3.3, Real-Time Energy Imbalance Payment or Charge at a Hub;
- (k) Section 6.6.3.4, Real-Time Energy Payment for DC Tie Import;
- (l) Section 6.6.3.5, Real-Time Payment for a Block Load Transfer Point;
- (m) Section 6.6.3.6, Real-Time Energy Charge for DC Tie Export Represented by the QSE Under the Oklahoma Exemption;
- (n) Section 6.6.3.7, Real-Time Make-Whole Payment for Exceptional Fuel Cost;
- (o) Section 6.6.3.8, Real-Time Make-Whole Charge for Exceptional Fuel Cost;

[NPRR714: Delete items (n) and (o) above on June 1, 2017 and renumber accordingly.]

[NPRR664: Insert items (n) and (o) below upon system implementation and renumber accordingly.]

- (n) Section 6.6.3.7, Real-Time Make-Whole Payment for Exceptional Fuel Cost;
- (o) Section 6.6.3.8, Real-Time Make-Whole Charge for Exceptional Fuel Cost;

(~~pn~~) Section 6.6.3.97, Real-Time Lost Opportunity Energy Payment;

(~~qe~~) Section 6.6.3.108, Real-Time Lost Opportunity Energy Charge;

(~~rp~~) Section 6.6.4, Real-Time Congestion Payment or Charge for Self-Schedules;

(~~sq~~) Section 6.6.5.1.1.1, Base Point Deviation Charge for Over Generation;

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- (~~tf~~) Section 6.6.5.1.1.2, Base Point Deviation Charge for Under Generation;
- (~~us~~) Section 6.6.5.2, IRR Generation Resource Base Point Deviation Charge;
- (~~vt~~) Section 6.6.5.4, Base Point Deviation Payment;
- (~~wu~~) Section 6.6.6.1, RMR Standby Payment;
- (~~xv~~) Section 6.6.6.2, RMR Payment for Energy;
- (~~yw~~) Section 6.6.6.3, RMR Adjustment Charge;
- (~~zx~~) Section 6.6.6.4, RMR Charge for Unexcused Misconduct;
- (~~aa~~y~~~~) Section 6.6.6.5, RMR Service Charge;
- (~~bb~~z~~~~) Paragraph (2) of Section 6.6.7.1, Voltage Support Service Payments;
- (~~cc~~aa~~~~) Paragraph (4) of Section 6.6.7.1;
- (~~dd~~bb~~~~) Section 6.6.7.2, Voltage Support Charge;
- (~~eee~~) Section 6.6.8.1, Black Start Hourly Standby Fee Payment;
- (~~ff~~dd~~~~) Section 6.6.8.2, Black Start Capacity Charge;
- (~~gg~~ee~~~~) Section 6.6.9.1, Payment for Emergency Power Increase Directed by ERCOT;
- (~~hh~~ff~~~~) Section 6.6.9.2, Charge for Emergency Power Increases;
- (~~ii~~gg~~~~) Section 6.6.10, Real-Time Revenue Neutrality Allocation;
- (~~jj~~hh~~~~) Paragraph (a) of Section 6.7.1, Payments for Ancillary Service Capacity Sold in a Supplemental Ancillary Service Market;
- (~~kk~~ii~~~~) Paragraph (b) of Section 6.7.1;
- (~~ll~~jj~~~~) Paragraph (c) of Section 6.7.1;
- (~~mm~~kk~~~~) Paragraph (d) of Section 6.7.1;

[NPRR689: Insert items (~~ll~~nn~~~~) through (~~nn~~pp~~~~) below upon system implementation and renumber accordingly:]

- (~~nn~~ll~~~~) Paragraph (1)(a) of Section 6.7.2, Payments for Ancillary Service Capacity Assigned in Real-Time Operations;
- (~~oo~~mm~~~~) Paragraph (1)(b) of Section 6.7.2;

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~~(ppmm)~~ Paragraph (1)(c) of Section 6.7.2;

~~(nnll)~~ Paragraph (a) of Section 6.7.2, Charges for Ancillary Service Capacity Replaced Due to Failure to Provide;

~~(oommm)~~ Paragraph (b) of Section 6.7.2;

~~(ppmm)~~ Paragraph (c) of Section 6.7.2;

~~(qqoo)~~ Paragraph (d) of Section 6.7.2;

~~(rrpp)~~ Paragraph (2) of Section 6.7.3, Adjustments to Cost Allocations for Ancillary Services Procurement;

~~(ssqq)~~ Paragraph (3) of Section 6.7.3;

~~(ttrr)~~ Paragraph (4) of Section 6.7.3;

~~(uuss)~~ Paragraph (5) of Section 6.7.3;

~~(vvtt)~~ Paragraph (7) of Section 6.7.4, Real-Time Ancillary Service Imbalance Payment or Charge (Real-Time Ancillary Service Imbalance Amount);

~~(wwuu)~~ Paragraph (7) of Section 6.7.4, (Real-Time Reliability Deployment Ancillary Service Imbalance Amount);

~~(xxvv)~~ Paragraph (8) of Section 6.7.4, (Real-Time RUC Ancillary Service Reserve Amount);

~~(yyww)~~ Paragraph (8) of Section 6.7.4, (Real-Time Reliability Deployment RUC Ancillary Service Reserve Amount);

~~(zzxx)~~ Section 6.7.5, Real Time Ancillary Service Imbalance Revenue Neutrality Allocation (Load-Allocated Ancillary Service Imbalance Revenue Neutrality Amount);

~~(aaayy)~~ Section 6.7.5, (Load-Allocated Reliability Deployment Ancillary Service Imbalance Revenue Neutrality Amount);

~~(bbbzz)~~ Section 7.9.2.1, Payments and Charges for PTP Obligations Settled in Real-Time;

~~(cccaaa)~~ Paragraph (3) of Section 7.9.3.3, Shortfall Charges to CRR Owners; and

~~(dddbbb)~~ Section 9.16.1, ERCOT System Administration Fee.

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- (2) In the event that ERCOT is unable to execute the Day-Ahead Market (DAM), ERCOT shall provide, on each RTM Settlement Statement, the dollar amount for the following RTM Congestion Revenue Right (CRR) Settlement charges and payments:
- (a) Section 7.9.2.4, Payments for FGRs in Real-Time; and
 - (b) Section 7.9.2.5, Payments and Charges for PTP Obligations with Refund in Real-Time.