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| NPRR Number | [1226](https://www.ercot.com/mktrules/issues/NPRR1226) | NPRR Title | Demand Response Monitor |
| Date Posted | | April 23, 2024 | |
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| Requested Resolution | | Normal | |
| Nodal Protocol Sections Requiring Revision | | 2.1, Definitions  2.2, Acronyms and Abbreviations  6.5.7.1.13, Data Inputs and Outputs for the Real-Time Sequence and SCED | |
| Related Documents Requiring Revision/Related Revision Requests | | None | |
| Revision Description | | Since the inception of ERCOT, Demand Response from Loads has continuously grown and has become critical to understanding the risks to reliably operating the ERCOT System. Significant amounts of new “Demand Responsive Load” are forecast to continue to increase in the next few years from loads operating large data centers and those producing hydrogen.  Following a presentation on this subject, the Large Flexible Load Task Force (LFLTF) recommended that a better understanding of Demand response occurring in Real-Time is needed to better understand risks during projected critical shortages of generation capacity to serve load.  This Nodal Protocol Revision Request (NPRR) creates a Demand Response Monitor to assist Market Participants and ERCOT Operators in making judgements of near-future capacity needs. The Monitor will detect a response by selected Load responses attributable to:   * Locational Marginal Prices (LMPs); * 4-Coincident Peak (4-CP); * Near 4-CP; * Conservation Alerts; and * Other ERCOT actions.   Over time, empirical data collected from the Demand Response Monitor could be used by ERCOT to predict future Demand response for other reliability applications. | |
| Reason for Revision | | [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 1 – Be an industry leader for grid reliability and resilience  [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 2 - Enhance the ERCOT region’s economic competitiveness with respect to trends in wholesale power rates and retail electricity prices to consumers  [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 3 - Advance ERCOT, Inc. as an independent leading industry expert and an employer of choice by fostering innovation, investing in our people, and emphasizing the importance of our mission  General system and/or process improvement(s)  Regulatory requirements  ERCOT Board/PUCT Directive  *(please select ONLY ONE – if more than one apply, please select the ONE that is most relevant)* | |
| Justification of Reason for Revision and Market Impacts | | Significant amounts of new “Demand Responsive Load” (well over 3,000 MWs) has been observed and is expected to continue to increase in the next few years. New Loads operating large data centers and those producing hydrogen are expanding their footprint in the ERCOT Region and are expected to be responsive to high ERCOT Real-Time LMPs among other pricing characteristics of retail Loads. | |

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| Proposed Protocol Language Revision |

## 2.1 DEFINITIONS

**State Estimator**

A computational algorithm that uses Real-Time inputs from the network’s Supervisory Control and Data Acquisition (SCADA) system that measure the network’s electrical parameters, including its topology, voltage, power flows, etc., to estimate electrical parameters (such as line flows and Electrical Bus voltages and Loads) in the ERCOT Transmission Grid. The State Estimator’s output is a description of the network and all of the values (topology, voltage, power flow, etc.) to describe each Electrical Bus and line included in the system model.

State Estimated Load (SEL)

The amount of instantaneous electric power in MW delivered to consumers at a substation calculated as an output of the State Estimator.

## 2.2 ACRONYMS AND ABBREVIATIONS

**SEL** State Estimated Load

***6.5.7.1.13 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;

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| ***[NPRR857: Replace paragraph (a) above with the following upon system implementation and satisfying the following conditions: (1) Southern Cross provides ERCOT with funds to cover the entire estimated cost of the project; and (2) Southern Cross has signed an interconnection agreement with a TSP and the TSP gives ERCOT written notice that Southern Cross has provided it with: (a) Notice to proceed with the construction of the interconnection; and (b) The financial security required to fund the interconnection facilities:]***  (a) Real-Time data from TSPs and DCTOs 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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| ***[NPRR857: Replace paragraph (c) above with the following upon system implementation and satisfying the following conditions: (1) Southern Cross provides ERCOT with funds to cover the entire estimated cost of the project; and (2) Southern Cross has signed an interconnection agreement with a TSP and the TSP gives ERCOT written notice that Southern Cross has provided it with: (a) Notice to proceed with the construction of the interconnection; and (b) The financial security required to fund the interconnection facilities:]***  (c) Transmission Element ratings from TSPs and DCTOs; |

(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 Wind-powered Generation Resources (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.

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| ***[NPRR857: Replace paragraph (d) above with the following upon system implementation and satisfying the following conditions: (1) Southern Cross provides ERCOT with funds to cover the entire estimated cost of the project; and (2) Southern Cross has signed an interconnection agreement with a TSP and the TSP gives ERCOT written notice that Southern Cross has provided it with: (a) Notice to proceed with the construction of the interconnection; and (b) The financial security required to fund the interconnection facilities:]***  (d) Real-Time weather, from Wind-powered Generation Resources (WGRs), and where available from TSPs, DCTOs, 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.

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| ***[NPRR1010: Delete paragraph (2) above upon system implementation of the Real-Time Co-Optimization (RTC) project and renumber accordingly.]*** |

(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.

(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, including Private Use Network Settlement Points, by Resource Node, Hub, Load Zone, and DC Tie.

(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) Every hour, ERCOT shall post on the ERCOT website, the sum of ERCOT generation, and flow on the DC Ties, all from the State Estimator.

(8) After every SCED run, ERCOT shall post to the ERCOT website the sum of the HDL and the sum of the LDL for all Generation Resources On-Line and Dispatched by SCED.

(9) Sixty days after the applicable Operating Day, ERCOT shall post to the ERCOT website the summary LDL and HDL report from paragraph (8) above and include instances of manual overrides of HDL or LDL, including the name of the Generation Resource and the type of override.

(10) No sooner than sixty days after the applicable Operating Day, ERCOT shall provide to the appropriate TAC subcommittee instances of manual overrides of HDL or LDL, including the name of the Generation Resource, the reason for the override, and, as applicable, the cost as calculated in Section 6.6.3.6, Real-Time High Dispatch Limit Override Energy Payment.

(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.

(12) After every SCED run, ERCOT shall prepare and publish on the ERCOT website data for the Demand Response Monitor containing analysis of the Demand response of aggregated State Estimated Load (SEL) exhibiting a significant decrease in consumption likely due to responses to Locational Marginal Prices (LMPs), 4-Coincident Peak (4CP), ERCOT-wide appeal(s) through the public news media for voluntary energy conservation, or other ERCOT actions. The Demand response shall be calculated by comparing the positive difference in peak consumption of a Load in the past two hours to the current SEL of selected substations.

(a) Selection of Loads to be used in the Demand Response Monitor would be by off-line analysis of various Loads’ responses observed in historical State Estimator data. ERCOT may aggregate sub-sets of SEL for use by the ERCOT operators in Real-Time.

(b) The ERCOT website posting will include a graphical depiction of the aggregate Demand response observed compared to the average LMP from each SCED run, plotted as separate time series in descending chronological order, for the past two hours of SCED executions.