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March 6, 2023

Public Utility Commission of Texas
Chairman Peter Lake
Commissioner Will McAdams
Commissioner Lori Cobos
Commissioner Jimmy Glotfelty
Commissioner Kathleen Jackson
1701 N. Congress Ave.
Austin, Texas 78711

Re: PUC Project No. 52373, *Review of Wholesale Electric Market Design*
PUC Project No. 53298, *Wholesale Electric Market Design Implementation*

Dear Chairman and Commissioners:

Pursuant to Public Utility Commission of Texas (PUCT/Commission) discussion at the February 16, 2023 Open Meeting, Electric Reliability Council of Texas, Inc. (ERCOT) provides the following information regarding the parameters laid out in Commissioner McAdams' February 15th Memo.[1]

The top-down, bottom-up approach of VOLL and reliability standard development will require substantial coordination between ERCOT and PUCT Staff. Commission input on the various timelines and key design elements is appreciated.

Value of Lost Load (VOLL)

In 2013, ERCOT engaged London Economics International LLC (LEI) to estimate VOLL in relation to potential outages caused by insufficient operating reserves in the ERCOT region. LEI conducted a literature review and performed a macroeconomic analysis as foundational steps to establish a general magnitude of VOLL.[2] As noted by Commissioner McAdams, LEI detailed a comprehensive survey process it believed necessary to determine a robust VOLL specific to the ERCOT region. The Commission did not move forward with a customer survey at that time.

When directed, ERCOT will engage a consultant to conduct an updated analysis of VOLL including a comprehensive customer survey. The request for proposal (RFP) process will take approximately eight weeks from defining the project requirements to onboarding the consultant.

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[1] *See* Commissioner Will McAdams, Memorandum, Docket No. 52373 (Feb. 15, 2023), https://interchange.puc.texas.gov/Documents/52373_398_1272439.PDF.

[2] *See* Value of Lost Load Literature Review and Macroeconomic Analysis Prepared for ERCOT by London Economics International LLC (June 18, 2013), https://interchange.puc.texas.gov/Documents/40000_427_759499.ZIP.

During this time, ERCOT will determine project timelines, milestones and deliverables, evaluate RFP responses, and conduct contract negotiations.

Once a contract is awarded, the consultant will likely need several months to conduct a jurisdictional and best practices review along with macroeconomic analysis. These foundational steps will inform the consultant's work with ERCOT in designing the customer survey and procedures for survey administration. The timeline for a VOLL deliverable will likely include additional months to conduct the survey and benchmark the survey results to the macroeconomic analysis for the development of final findings. Of course, once a consultant is on-board, ERCOT will be able to provide a more certain timeline for these activities and therefore update the Commission. ERCOT will work with PUCT Staff throughout this process.

ERCOT would anticipate bringing the report to the ERCOT Board of Directors (Board) for review before filing for Commission deliberation.

Preferred Reliability Metric
Target Reserve Margin

Senate Bill (SB) 3 required the Commission to ensure that ERCOT establishes requirements to meet the reliability needs of the power region.[3] Developing this reliability metric necessitates moving beyond 0.1 Loss of Load Expectation (LOLE) as the default standard. ERCOT has started working on a proposed process and framework for the development of a reliability standard for Commission consideration. An initial overview was presented to the ERCOT Board's Reliability and Markets Committee at its February 27, 2023 meeting. The "Development of a Reliability Standard" presentation is included as Attachment A.

At a high level, ERCOT proposes to establish a framework for defining the reliability standard, set parameters used within the framework for each scenario, and compare the market impact of each scenario decision. To facilitate this analysis, ERCOT will utilize the Strategic Energy & Risk Valuation (SERVM) model. SERVM is a probabilistic Monte Carlo simulation tool that produces a distribution of expected reliability events and their costs based on many independent hourly chronological simulations (or trials). It is currently being updated to include the latest ERCOT load forecast, Capacity, Demand and Reserves (CDR) resources, and fuel price forecasts. ERCOT has been utilizing SERVM since 2014 for reserve margin and probabilistic loss-of-load studies and, in Fall 2022, began training to move resource reliability studies previously performed by Astrape in house. Energy and Environmental Economics, Inc. (E3) utilized SERVM in its analysis for the

[3] *See* Public Utility Regulatory Act (PURA), TEX. UTIL. CODE ANN. § 39.159

"Assessment of Market Reform Options to Enhance Reliability of the ERCOT System" that developed the Performance Credit Mechanism (PCM) adopted by the Commission.[4]

The proposal recommends a reliability standard defined by a three-part framework with each parameter tied to a specific reliability metric:

- Duration – Parameter places a limit on the duration of any single loss of load event so that any load shed event should not last for more than x hours.

- Frequency –Parameter places a limit on the frequency of loss of load events so that load shed events for generator inadequacy should not occur more than once in x years. This is a standard industry measure called Loss of Load Expectation (LOLE).

- Magnitude –Parameter places a limit on the magnitude of any single loss of load event so that the maximum load that can be rotated for any event should not exceed x% of peak (~x MW for today).

An initial workshop to begin engaging stakeholders on the proposed framework has been scheduled for March 15, 2023. ERCOT will work with PUCT Staff on framework feedback to bring forward at the March 23, 2023 Open Meeting for Commission review.

ERCOT will start the scenario analysis upon receiving direction from the Commission. The initial scenarios run will use industry standard and ERCOT-specified values to represent a range of reliability outcomes. Scenario outputs will be compared for incremental amounts of additional dispatchable resources required, overall production costs, and cost to the market. The parameters used in the framework and the number of scenarios produced will be presented to the Commission for approval.

The initial scenario run is expected to take at least a month and produce a menu of options. Technical workshops to discuss the initial scenarios could take place as early as May. Additional Commission and stakeholder requested scenarios would then be run and could be presented to the ERCOT Board as early as its June 20, 2023 meeting. The menu of scenario outcomes will inform a decision on the reliability standard and the development of PCM inputs needed to attract new generation to meet the standard.

Deliverability and Regionality

ERCOT agrees that deliverability is an integral component of the broader reliability discussion. In August 2021, ERCOT sponsored Planning Guide Revision Request (PGRR) 095, *Establish*

[4] See Assessment of Market Reform Options to Enhance Reliability of the ERCOT System Prepared for the Public Utility Commission of Texas by Energy and Environmental Economics, Inc. (Nov. 10, 2022), https://interchange.puc.texas.gov/Documents/52373_382_1251437.ZIP.

Minimum Deliverability Criteria, to ensure that dispatchable resources are simultaneously able to deliver their full output to serve demand when needed.[5] As approved by the Commission at its March 31, 2022 Open Meeting, the minimum deliverability criteria ensures that resources located within the ERCOT region and whose output is primarily within ERCOT's control, through dispatch instructions, are simultaneously deliverable to serve demand when needed.[6]

Incorporating minimum deliverability criteria into the planning process facilitates the identification of transmission needs to maintain reliability under system conditions with the potential for resource shortages (e.g., peak load conditions). With the criteria in place, future dispatchable generation will have the transmission needed to reach load.[7] ERCOT supports a full deliverability study but recommends the study and further look at regionality be delayed until after market design enhancements are implemented and new dispatchable generation projects can be announced and cited.

ERCOT will be available at the upcoming March 9, 2023 Open Meeting to answer any questions the Commission may have and stands ready to take action as directed by the Commission.

Regards,

/s/*Woody Rickerson*
Woody Rickerson
Vice President, System Planning and Weatherization

[5] *See* PGRR 095, Establish Minimum Deliverability Criteria (August 26, 2021), https://www.ercot.com/files/docs/2021/08/26/095PGRR-01_Establish_Minimum_Deliverability_Criteria_082621.docx.
[6] *See* PUCT Report, PGRR 095, (March 31, 2022), https://www.ercot.com/files/docs/2022/04/01/095PGRR-19%20PUCT%20Report%20033122.docx.
[7] PGRR 095 was implemented June 1, 2022.

Attachment A

Item 8.1.1: Development of Reliability Standard

Woody Rickerson
Vice President, System Planning and Weatherization

Reliability and Markets Committee Meeting

ERCOT Public
February 27, 2023

Development of Reliability Standard: Overview

- **Purpose**
  - Begin discussion with the R&M Committee on an ERCOT Reliability Standard to be developed by the Public Utility Commission of Texas (PUC)
- **Voting Items / Requests**
  - No action is requested of the R&M Committee or Board; for discussion only

- **Key Takeaways**
  - Senate Bill 3 mandated the creation of an ERCOT Reliability Standard by the PUC.
  - PUC has created a Project to facilitate that work.
  - On February 15, 2023, Commissioner McAdams filed a Memo requesting ERCOT work with PUC staff and stakeholders to begin the analysis.
  - ERCOT has the Strategic Energy & Risk Valuation (SERVM) model and is trained in using that model to produce scenarios that can be used in this analysis.
  - ERCOT requests Board Members review a proposed process to be used in the study.
  - ERCOT recommends a standard defined by a three-part Framework that consists of the following limits.
    1. Limit on the magnitude of any single loss of load event
    2. Limit the frequency of loss of load events
    3. Limit the duration of any single loss of load event

Process Overview

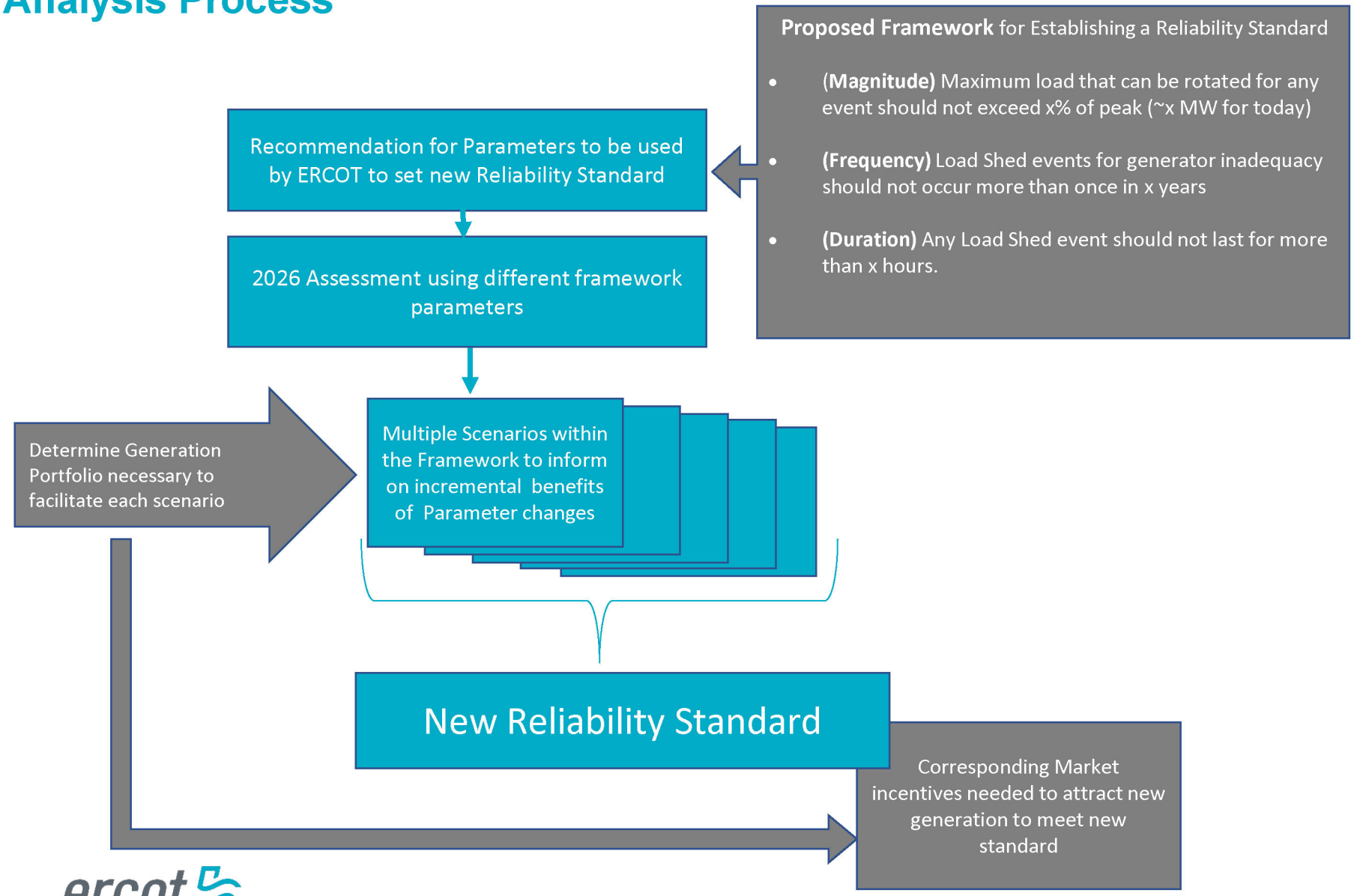
Establish the **Framework** for defining the Reliability Standard

Set the **Parameters** used within the Framework for each Scenario

Compare the market impact of each **Scenario**

Decision on Reliability Standard

Proposed Reliability Standard Analysis Process



Background

- SERVM is a probabilistic Monte Carlo simulation tool that produces a distribution of expected reliability events and their costs based on many independent hourly chronological simulations (or trials).
- ERCOT has been using SERVM since 2014 to produce reserve margin studies as well as conduct probabilistic loss-of-load studies required by NERC.
- In Fall of 2022, ERCOT began training to enable staff to perform resource reliability studies previously performed by Astrape.
- The current phase of work consists of updating the SERVM model to include the latest ERCOT load forecast, the November CDR resources, and fuel price forecasts.
- Scenarios will represent a range of Reliability Standard metric threshold levels.
- The scenario portfolios will reflect new generation that is already expected to be built, likely retirements, and incremental levels of new dispatchable generation needed to meet the different levels of reliability defined for each scenario.
- Scenario outputs will be compared for:
  - Incremental amounts of additional dispatchable resources
  - Overall production cost
  - Cost to the Market

Next Steps

1. ERCOT will commission a study to determine the Value of Loss Load (VOLL) as requested by Commissioner McAdams' 2/15/23 Memo.

2. ERCOT will engage PUC staff and stakeholders for input concerning the process and Framework definition proposed to be used in the Reliability Standard study.

3. ERCOT will present the proposed Framework, the Parameters used in the Framework for each Scenario, and the number of Scenarios produced to the PUC for approval.

4. ERCOT will start the Scenario analysis upon receiving direction from the PUC.

5. An update on the progress will be made at the April 2023 R&M Committee meeting.

Supplemental: Reliability Standard Definitions

- An *LOL event* is defined as an hour during which firm load exceeds available generation capacity.
- An *LOL day* is defined as a day during which there is at least one LOL event; note that a day with one LOL event is equivalent to a day with two or more LOL events.
- The table below provides descriptions and calculation examples of the key probabilistic Reliability Standard metrics that should be considered by the Commission. For the measure calculation examples, it is assumed that there are 100 Monte Carlo simulation trials conducted for a given forecast year, and each trial has the same probability of occurrence, which is 1% (0.01).

Measure	Definition	LOL Attribute of Interest	Calculation Example
Loss of Load Hours (LOLH)	The expected number of LOL events for a given period. Alternatively, LOLH is the expected combined duration of LOL events for a given period.	Duration (number of hours)	There are 10 trials that had 2 LOL events, and 2 trials that had 4 hours of LOL. The remaining 88 trials had no LOL events: LOLH = (10 trials x 2 hours/year x 0.01) + (2 trials x 4 hours/year x 0.01) = 0.2 + 0.08 = 0.28 hours/year
Loss of Load Expectation (LOLE)	The expected number of LOL days for a given period.	Frequency (number of days)	There are 6 trials that had one day with a single LOL event, and 4 trials that had two days with two LOL events during each day. The remaining 90 trials had no LOL events: LOLE = (6 trials x 1 day/year x 0.01) + (4 trials x 2 days/year x 0.01) = 0.06 + 0.08 = 0.14 days/year Note that the conventional definition of LOLE does not distinguish between a day with a single LOL event and a day with multiple LOL events.
Expected Unserved Energy (EUE)	The expected total magnitude (in MWh) of LOL events for a given period. A variant, Normalized EUE (NEUE), is EUE divided by the total annual energy.	Size (MWh)	There is one trial with 2,500 MWh of unserved energy and one trial with 1,000 MWh of unserved energy. The remaining 98 trials had no LOL events: EUE = (1 trial x 2,500 MWh/year x 0.01) + (1 trial x 1,000 MWh/year x 0.01) = 25 + 10 = 35 MWh/year