Filing Receipt

Received - 2023-03-20 03:37:45 PM
Control Number - 54584
ItemNumber - 4

TAYLOR
2705 West Lake Dr.
Taylor, Texas 76574
T: 512-248-3000

AUSTIN
8000 Metropolis Dr.
Bldg. E, Suite 100
Austin, Texas 78744
T: 512-225-7000

ercot.com

March 20, 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*
> PUC Project No. 54584, *Reliability Standard for the ERCOT Market*

Dear Chairman and Commissioners:

Pursuant to Public Utility Commission of Texas (PUCT/Commission) discussion at the March 9, 2023 Open Meeting, Electric Reliability Council of Texas, Inc. (ERCOT) provides the following follow-up information regarding the proposed reliability standard framework and potential request for proposal (RFP) for a value of lost load (VOLL) consultant.

Commission input on the various timelines and key design elements is appreciated.

Preferred Reliability Metric – Target Reserve Margin

On March 15, 2023, ERCOT held a technical workshop to start engaging stakeholders on the proposed reliability standard study framework. In general, participants agreed with the duration, frequency, and magnitude parameters. The discussion provided feedback that ERCOT believes can be addressed within the three-part framework and Strategic Energy & Risk Valuation (SERVM) model. The presentation provided to stakeholders is included as Attachment A.

At the workshop, stakeholders raised three main areas of concern:

- Unserved Energy – ERCOT considers expected unserved energy (EUE) to be an output contained within the proposed study framework and whose magnitude can be limited using the proposed duration, frequency, and magnitude parameters. Stakeholders expressed additional ideas for using EUE as a metric within the model. ERCOT anticipates evaluating the initial scenario runs and the outputs to reach an agreement on the metrics.

- Seasonality – PUCT Staff and stakeholders have questioned whether the reliability standard should include a seasonal component. ERCOT believes the framework can be adapted for seasonality and the model will be able to tell during which season the binding constraint will occur. ERCOT currently conducts probabilistic reliability assessments that output monthly results.

- Loss-of-Load Outlier Events – ERCOT appreciates the need to understand all potential loss-of-load outcomes surfaced by SERVM and how a reliability standard constrains them. In reviewing the initial scenario runs, ERCOT will analyze the impact of weatherization standard implementation on outlier events. ERCOT will consider options to address the most extreme tail events that include relaxing the maximum duration and/or magnitude thresholds to a percentile limit (e.g., 98 percentile), applying a soft constraint, and expressing the limits as averages of the most extreme outliers.

ERCOT will work with Astrape to determine how best to consider these items and implement them in SERVM. ERCOT and stakeholders also noted that while the model will have three parameters, only one will be the binding factor for each scenario. ERCOT agrees to identify and highlight the binding constraint when presenting the matrix of reliability outcomes.

ERCOT intends to discuss the reliability framework with the North American Electric Reliability Corporation (NERC) and has added the study to the April 11-12, 2023 Reliability Assessment Subcommittee (RAS) meeting agenda. ERCOT will also continue discussions regarding technical aspects of the reliability standard with stakeholders during its monthly Supply Analysis Working Group (SAWG) meetings.

ERCOT requests direction from the Commission on moving forward with the initial scenario analysis. Given the feedback from the workshop, ERCOT continues to recommend the proposed reliability standard framework as presented to the ERCOT Board's Reliability & Markets Committee.[1] The initial scenario runs would serve as a starting point to allow parties to get comfortable with the model and provide an output to shape further discussion. These scenarios will use industry standard and ERCOT-specified values to represent a range of reliability outcomes. Each output can be used to evaluate market design implications with regards to required generation and potential costs. The initial scenario run is expected to take at least a month and additional technical workshops could take place as early as May. ERCOT can then refine the scenarios, focusing the results and incorporating Commission and stakeholder feedback.
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.

---

[1] *See* Development of Reliability Standard presentation to the Reliability & Markets Committee (February 20, 2023), https://www.ercot.com/files/docs/2023/02/20/8.1.1%20Development%20of%20Reliability%20Standard.pdf

Value of Lost Load (VOLL)

When directed, ERCOT will commence an RFP process and engage a consultant to conduct an updated analysis of VOLL. ERCOT anticipates the scope of work for the VOLL RFP to consist of two stages, including the foundational steps to establish a general magnitude of VOLL and a comprehensive customer survey. The consultant will produce a report on the quantification of the estimated VOLL for the ERCOT region.

Stage one will mirror the work conducted by London Economics International LLC (LEI) in 2013.[2] The RFP will require the consultant to include an updated review of published studies indicating the VOLL in the United States and other countries, as appropriate. This review will provide an assessment of the applicability of the findings from specific studies to market conditions and customers in the ERCOT region. If there is sufficient information available, VOLL estimates by customer class should be developed to estimate the potential VOLL in the ERCOT region. LEI conducted a literature review and performed a macroeconomic analysis to establish a general magnitude of VOLL. Stage one will inform the consultant's work with ERCOT in designing the customer survey and procedures for survey administration.

Stage two will consist of a comprehensive customer survey and evaluation of the impacts to customers from loss-of-load events in the ERCOT region. This stage will include a review of current emergency load-shedding practices of distribution service providers (including municipal entities and electric cooperatives) and a characterization of the customers that are affected or are likely to be affected by rotating outages. The selected consultant will develop surveys and conduct interviews with various customers classes to assess the economic impact of outages and the willingness of these customers to pay to reduce the likelihood of future outages. Survey procedures and interview questions will be reviewed with ERCOT, discussed with stakeholders, and brought to the Commission prior to implementation. The consultant will contact sufficient customers in all relevant customer classes to ensure validity of results.

ERCOT will work with the Commission and PUCT Staff throughout this process. ERCOT anticipates bringing forward specific decision points regarding the customer survey for Commission deliberation ahead of stage two. Threshold decisions will include confirming the customer class breakdown for the survey, whether critical loads should be explicitly considered, and whether the consultant should include a case study of specific loss-of-load events such as Winter Storm Uri.

The final report will include an assessment of all information compiled over the course of both stages of the study, as well as a quantification of the estimated VOLL for the ERCOT region (both in aggregate and by customer class). The report will also provide recommendations for any

---

[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.

changes in emergency load-shedding procedures that could increase the equity of or reduce the economic and/or societal impact of these activities.

ERCOT will be available at the upcoming March 23, 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

Workshop on ERCOT's Proposed Reliability Standard Study Framework

Woody Rickerson
VP Planning and Weatherization

Pete Warnken
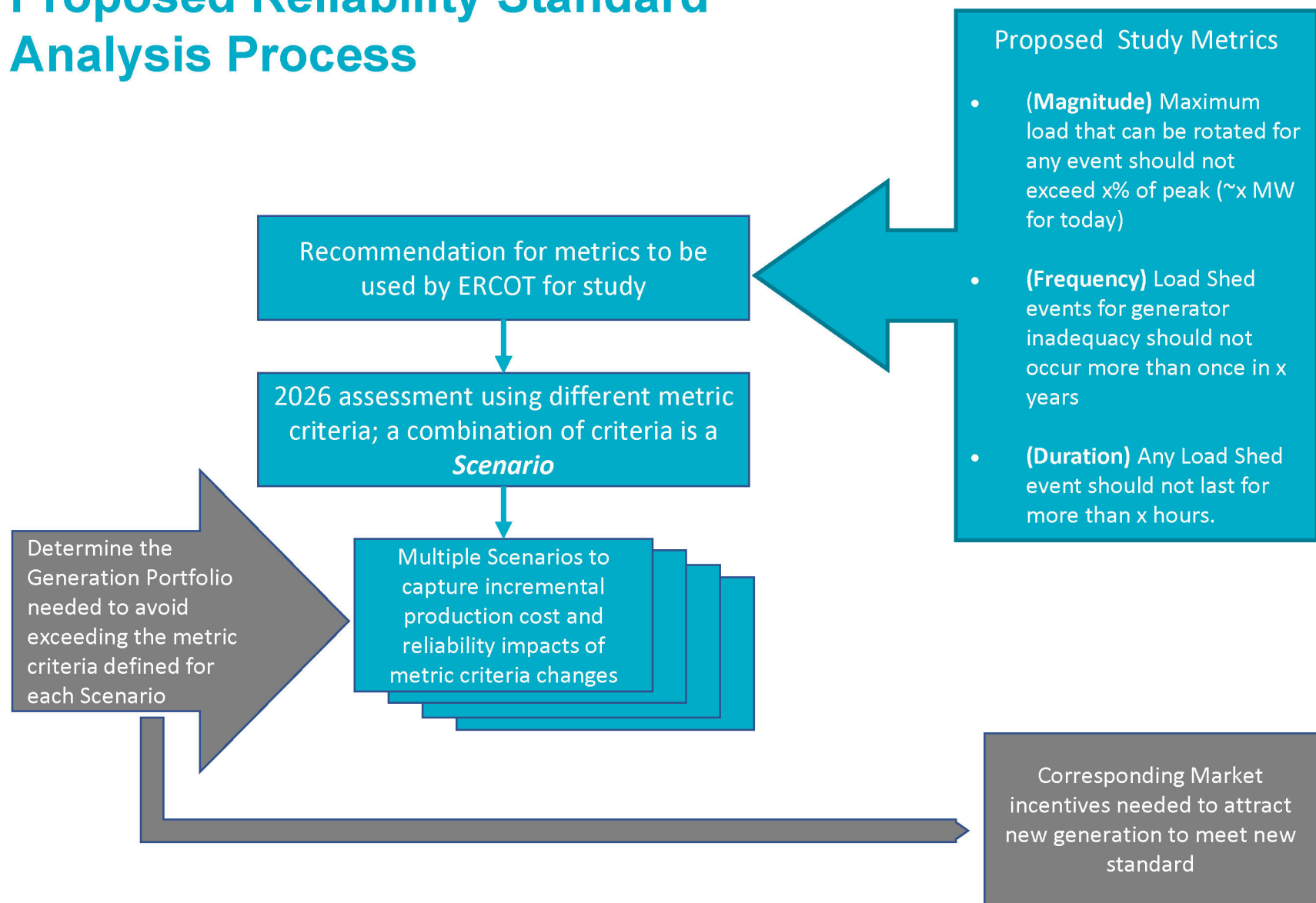Senior Manager, Resource Adequacy

ERCOT Public
March 15, 2023

Reliability Standard Study Process

Key Takeaways:

1. Senate Bill 3 mandated the creation of an ERCOT Reliability Standard by the Public Utility Commission.

2. The Public Utility Commission created a Project (#54584) to facilitate that work, and issued a list of stakeholder questions on March 7, 2023.

3. A memo from Commissioner McAdams has requested ERCOT to work with PUC staff and Market Participants to begin the analysis.

4. ERCOT will use the Strategic Energy & Risk Valuation (SERVM) model for the study.

5. ERCOT presented a proposed study framework to its Board Members; the purpose of this workshop is to present, and solicit comments on, the study framework.

6. ERCOT is recommending a standard for study defined by three probabilistic metrics that cover the dimensions of loss-of-load events and addresses both average reliability and extreme event avoidance:
   1. Limit on the magnitude of any single loss of load event
   2. Limit the frequency of loss of load events
   3. Limit on the duration of any single loss of load event

Proposed Reliability Standard Analysis Process

Proposed Study Metrics

- **(Magnitude)** Maximum load that can be rotated for any event should not exceed x% of peak (~x MW for today)

- **(Frequency)** Load Shed events for generator inadequacy should not occur more than once in x years

- **(Duration)** Any Load Shed event should not last for more than x hours.

Recommendation for metrics to be used by ERCOT for study

2026 assessment using different metric criteria; a combination of criteria is a *Scenario*

Determine the Generation Portfolio needed to avoid exceeding the metric criteria defined for each Scenario

Multiple Scenarios to capture incremental production cost and reliability impacts of metric criteria changes

Corresponding Market incentives needed to attract new generation to meet new standard

Current Study Work and Modeling Details

- SERVM is a probabilistic Monte Carlo simulation tool, used by ERCOT for reserve margins and NERC probabilistic loss-of-load studies since 2014, that produces a distribution of expected reliability events and their costs based on many independent hourly chronological simulations (or trials).

- ERCOT began training to enable staff to perform resource reliability studies previously performed by Astrape Consulting.

- The current phase of work consists of updating the SERVM model:
  - Latest ERCOT load forecast, November CDR resources, and fuel price forecasts
  - Include ERCOT Contingency Reserve Service and update Load Resources
  - Coding to implement new metric definitions (extreme event limits)
  - Address expected impact of weatherization standards
  - Conduct test model runs to assess reasonability of results

- The Scenario resource 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 level of reliability defined for each Scenario.

- Scenario outputs will be used to compare:
  - Incremental amounts of additional dispatchable resources
  - Overall production cost
  - Cost to the Market

Next Steps

1. ERCOT anticipates commissioning a study to determine the Value of Lost Load (VOLL); decisions on the study scope and timeline are expected to be made at the March 23 PUC Open Meeting.

2. ERCOT is engaging Market Participants and PUC staff for input concerning the metrics used for the Reliability Standard study.

3. ERCOT will present a final proposed study framework to the PUCT and stakeholders:
   - Metrics selected
   - Scenarios defined for the study
   - Metric criteria selected for each Scenario

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

5. An update on the progress will be made at appropriate stakeholder meetings, as well as the April and June ERCOT Board Meetings.

Reliability Metrics / Criteria Used in Other Jurisdictions

North America [3][4]		
System/Region	**Metrics/Criteria**	**Responsible Entity**
MISO	LOLE ≤ 0.1 days per year	MISO
MRO-Manitoba Hydro	LOLE ≤ 0.1 days per year	Manitoba Public Utilities Board
NPCC-Maritimes	LOLE ≤ 0.1 days per year	Maritimes Sub-areas and NPCC
NPCC-New England	LOLE ≤ 0.1 days per year	ISO-NE and NPCC
NPCC-New York	LOLE ≤ 0.1 days per year	NYSRC and NPCC
NPCC-Ontario	LOLE ≤ 0.1 days per year	IESO and NPCC
NPCC-Québec	LOLE ≤ 0.1 days per year	Hydro-Québec and NPCC
PJM	LOLE ≤ 0.1 days per year	PJM Board of Managers
SERC-C	LOLE ≤ 0.1 days per year	Member Utilities
SERC-E	LOLE ≤ 0.1 days per year	Member Utilities
SERC-FP	LOLE ≤ 0.1 days per year	Florida Public Service Commission
SERC-SE	LOLE ≤ 0.1 days per year	Member Utilities
SPP	LOLE ≤ 0.1 days per year	SPP TRO Staff and Stakeholders
RTE-ERCOT	LOLE ≤ 0.1 days per year [5]	ERCOT Board of Directors
WECC-AB	LOLP ≤ 0.02%	WECC
WECC-BC	LOLP ≤ 0.02%	WECC
WECC-NWPP-US & RMRG	LOLE ≤ 0.1 events/year	WECC
WECC-SRSG	LOLP ≤ 0.02%	WECC
WECC-CAMX [6]	PRM ≥ 15%	CPUC
Hawaii [7]	ERM ≥ 30% (3 islands), 60% (2 islands)	HECO

Hawaii: ERM is the Energy Reserve Margin, defined as "the percentage of system load in which the system capacity must exceed the system load in each hour."

Reliability Metrics / Criteria Used in Other Jurisdictions

Europe [8][9]		
System/Region	**Metrics/Criteria**	**Responsible Entity**
Belgium [10]	LOLH ≤ 3 hours per year LOLE95[11] ≤ 20 hours per year	Elia Group
France [12]	LOLH ≤ 3 hours per year	RTE
Great Britain [13]	LOLH ≤ 3 hours per year	National Grid ESO
Ireland and Northern Ireland [14]	LOLH ≤ 8 hours per year (Ireland) LOLH ≤ 4.9 hours per year (Northern Ireland)	EirGrid and SONI
Netherlands [15]	LOLH ≤ 4 hours per year	TenneT
Poland [16]	LOLH ≤ 3 hours per year	PSE
Portugal [12]	LOLH ≤ 5 hours per year	REN
Spain [12][17]	PRM ≥ 10% (mainland) LOLE ≤ 1 day in 10 years (island grids)	REE
Oceania		
System/Region	**Metrics/Criteria**	**Responsible Entity**
Australia-NEM [18]	NEUE ≤ 0.002% per region	AEMO
Australia-NT [19]	NEUE ≤ 0.002%	AEMO
Australia-WEM [20]	PRM ≥ WEM[21] metric, NEUE ≤ 0.002%	AEMO
New Zealand [22][23]	WEM ≥ 14-16% (New Zealand) WEM ≥ 25.5-30% (South Island) WCM[24] ≥ 630-780 MW (North Island)	Transpower

Australia/New Zealand: WEM/WCM (winter energy margin/winter capacity margin).

Reliability Metrics / Criteria Used in Other Jurisdictions

Africa		
System/Region	**Metrics/Criteria**	**Responsible Entity**
South Africa [25]	EUE < 20 GWh/year OCGT capacity factor < 6%/year Baseload stations capacity factor < 50%/year	Eskom

Asia		
System/Region	**Metrics/Criteria**	**Responsible Entity**
India [26]	LOLP ≤ 0.2%, NEUE ≤ 0.05%	CEA
Indonesia [27]	PRM (2019-2028) ≥ 30% (national)	Ministry of Energy and Mineral Resources
Japan [28]	PRM (2020-2029) ≥ 8% per region	OCCTO
Laos [29]	PRM (2020-2030) ≥ 15%	Ministry of Energy and Mines
Malaysia [30]	LOLE ≤ 1 days/year	TNB
Philippines [31]	PRM (2017-2040) ≥ 25%	DOE
Singapore [32][33]	LOLH ≤ 3 hours/year	EMA
Thailand [34][35]	PRM (2015-2036) ≥ 15%	EGAT
Vietnam [36]	LOLH ≤ 12 hours/year per region	MOIT

Middle East		
System/Region	**Metrics/Criteria**	**Responsible Entity**
Saudi Arabia [37]	PRM (2016) ≥ 8-10%	SEC
Oman [38]	LOLH ≤ 24 hours/year	OPWP
Qatar [39]	PRM (2019) ≥ 6%	KAHRAMAA

- Countries with multiple metrics:
  - Belgium – LOLH, LOLE95
  - Spain – PRM, LOLE
  - South Africa – EUE, Capacity Factor exceedance for backup capacity

Supplemental

Loss-of-Load Reliability Metric Definitions

- A *LOL event* is defined as an hour during which firm load exceeds available generation capacity.
- A *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

Loss-of-Load Reliability Metric Definitions

Measure	Definition	LOL Attribute of Interest	Calculation Example
Loss of Load Probability (LOLP)	The probability that a LOL event will occur over a given period.	Likelihood of occurrence (probability)	For the winter period, there are 25 trials that had a total of 120 LOL days. The remaining 75 trials had no LOL days: LOLP = 120 / (90 days x 100 trials) = 1.3%