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Public Utility Commission of Texas (PUCT)

Re: PUC of Texas Memorandum regarding Project No. 54584 - Reliability Standard for the ERCOT Market

RMI (founded as Rocky Mountain Institute), respectfully submits the following comments regarding the above referenced matter pursuant to the memorandum issued March 7, 2023, by the Public Utility Commission of Texas ("Commission"). RMI is an independent, non-partisan, nonprofit organization which works to transform the global energy system to secure a clean, prosperous, zero-carbon future for all.

RMI has conducted independent research on the topic of resource adequacy and reliability in modern power systems, and thanks the Commission for allowing the opportunity to provide comment. Like the Commission, RMI is motivated by recent extreme winter weather events, including Winter Storm Uri in 2021, to identify recommendations and opportunities for regulators, utilities, and other stakeholders to improve grid reliability and mitigate the impacts of grid outages.

RMI agrees with the Commission's direction on this project and believes that establishing a robust reliability standard is a necessary step to ensuring resource adequacy. However, a standard alone is not sufficient. In addition to the following direct responses to the Commission's questions listed in the memorandum, RMI believes it is also critical for the Commission to consider other opportunities to advance grid reliability.

RMI's recent research highlights opportunities that can be considered in concert with the development of a new standard to enhance grid reliability. These include: capturing the reliability value of renewable energy generation, storage and energy efficiency through updating planning, market rules, and compensation; updating planning methodologies to ensure they account for the unique reliability risks that fossil generators and the fossil supply system faces; and breaking down barriers to new regional and inter-regional transmission.[1] Likewise, the Commission should continue to assess opportunities to support deployment of energy efficiency, virtual power plants, and a diverse portfolio of distributed, regional, and interregional resources that cost-effectively strengthen grid reliability. In RMI's January 2023 white paper, *Virtual Power Plants, Real Benefits* we highlighted the opportunity for VPPs to advance power system performance across seven objectives including reliability.[2] Reports from the American Council for an Energy-Efficient Economy (ACEEE) also show how utilities can reduce power outage risk by making cost-effective investments in home energy efficiency and demand-side solutions.[3,4]

(1) The Commission has previously considered various reliability metrics, such as Loss of Load Expectation (LOLE), Loss of Load Hours (LOLH), and Expected Unserved Energy (EUE).
- Which reliability metrics, including those not previously studied, should the Commission consider in establishing a reliability standard for the ERCOT power region?

[1] RMI 2022 Reality Check: Keeping the Lights on in Extreme Winter Weather and RMI 2023 Wasted Wind and Tenable Transmission during Winter Storm Elliott
[2] RMI 2023 Virtual Power Plants, Real Benefits
[3] ACEEE 2021 Utilities Can Lessen Winter Power Outage Risk by Investing in Home Efficiency
[4] ACEEE 2021 Demand-Side Solutions to Winter Peaks and Constraints

- Which reliability metric, or combination of reliability metrics, should the Commission adopt for the reliability standard in ERCOT?
- What are the advantages of your chosen reliability metrics, and what are the disadvantages of alternative approaches?

The Commission should consider a combination of reliability metrics rather than any single metric in establishing a reliability standard for the ERCOT region. One metric does not fully encompass the complexities of reliability events in today's power grids. A combination of metrics should seek to quantify size, frequency, duration, timing, and potential impact of capacity shortfalls in order to find the right resource solutions.[5]

A combination of metrics that provides a robust picture of these attributes of reliability events could include loss of load expectation (LOLE), loss of load events (LOLEv), loss of load hours (LOLH), expected unserved energy (EUE), the value of lost load (VOLL), and various value at risk (VaR) metrics. Each of these metrics attempts to quantify different characteristics of lost load events; a good graphical example of how these metrics illustrate these characteristics can be found in Figure 7 of ESIG's 2021 report.[6]

The two metrics not included in the Commission's memorandum that could be valuable components of a reliability standard are the VOLL and VaR metrics. VOLL should be included in the suite of metrics being considered by the Commission in order to increase transparency surrounding the costs and potential impact of reliability criterion.[7,8] The Commission should work closely with residential, commercial, and industrial stakeholders to better estimate the VOLL and understand customers' expectations and ability to withstand lost load, including during different seasons and varying outage durations, building off of and updating the VOLL report prepared for ERCOT in 2013.[9] VaR is a probabilistic metric useful for understanding tail (i.e, low-frequency or low-likelihood) events; it is defined relative to a risk threshold – specifically, VaR is the "qth percentile worst outcome. For example, a capacity VaR_{95} could measure the highest single-hour capacity shortfall of the 95th percentile worst case observed under probabilistic simulations. This differentiates VaR from other metrics such as LOLP, LOLE and EUE which are based off of averages of probabilistic simulations, to give a more precise understanding of possible worst-case outcomes.

The Commission can look to the Northwest Power and Conservation Council's (NWPCC's) new multi-metric adequacy standard as an example of how to combine resource adequacy metrics into a new reliability standard. NWPCC is a federally authorized organization created by Congress and the states of Oregon, Washington, Idaho, and Montana with a mandate that includes providing planning and policy leadership on regional electric power issues. NWPCC regularly releases a Northwest Power Plan, which is implemented by the Bonneville Power Administration, as well as an annual Pacific Northwest Power Supply Adequacy Assessment, and defines and applies a resource adequacy standard to inform these.[10]

[5] ESIG 2021 Redefining Resource Adequacy for Modern Power Systems
[6] Id.
[7] Id.
[8] MISO Market Subcommittee 2020 Value of Lost Load (VOLL) and Scarcity Pricing
[9] London Economics International LLC 2013 Estimating the Value of Lost Load Briefing paper prepared for the Electric Reliability Council of Texas (ERCOT)
[10] NWPCC 2023 Pacific Northwest Power Supply Adequacy Assessment for 2027

In NWPCC's most recent regional adequacy assessment, NWPCC used a new, multi-metric adequacy standard, moving away from its previous LOLP-based standard and noting that "[b]ecause of the increasing complexity of the power system and because of the limitations of the LOLP metric, it was imperative the Council also enhance its adequacy standard to capture a more precise measure of customer risk."[11] Recognizing that the Texas reliability conditions are unique from those in the Pacific Northwest, we believe that NWPCC's approach offers an innovative example of how multiple metrics can be evaluated and ultimately integrated into an adequacy standard – a process that can be applied in any region. In a January 2023 presentation[12], NWPCC summarized the process of defining a resource adequacy standard, identifying limitations of their previous loss of load probability (LOLP) standard (such as its inability to measure the magnitude, duration, and frequency of shortfall events), evaluating options for a better approach, and finally choosing and applying the new multi-metric approach.

NWPCC also used a robust stakeholder process through which they arrived at their new multi-metric adequacy standard. NWPCC choose their preferred approach, in part, by clearly laying out and evaluating multiple objectives for the new standard, ultimately proceeding with the following four objectives after incorporating stakeholder feedback:

1. Prevent overly frequent use of emergency measures
2. Limit occurrences of excessively long shortfall events
3. Limit occurrences of big capacity shortfalls
4. Limit occurrences of big energy shortfalls

NWPCC's new standard addresses these key objectives through the use of four different RA metrics – one metric corresponding to each objective. The new standard addresses the first objective by establishing limits on LOLEv (to limit the frequency of shortfall events), the second through limits on duration VaR (to limit the duration of the longest shortfall events for tail-end conditions), the third through limits on peak VaR (to limit the highest single-hour shortfall for tail-end conditions), and the fourth through limits on energy VaR (to limit the total annual shortfall energy for tail-end conditions).

The Commission's request for feedback on this topic is a great first step in engaging stakeholders, which should be an important part of developing a new reliability standard. Robust stakeholder engagement that includes input from communities that have the least resources to cope with grid outages, in particular, can help the Commission ensure that they are developing a standard that is focused on the outcomes Texans care about most.

(2) What is the most effective way that the Commission can include deliverability in the reliability standard?

We understand deliverability in this question to be defined as the likelihood that an individual resource is available when called upon to support resource adequacy. Deliverability of resources can be affected by weather, generator outages, transmission outages, and more. Calculating any of the above metrics accurately relies on having a good methodology for assessing the deliverability of resources. Thus, deliverability methodologies should be reassessed in concert with the development of a new standard. Applying a deliverability metric in planning and determining the likelihood of meeting reliability standards is most commonly done by applying effective load carrying capacity, or ELCC, to all resources.

[11] Id.

[12] NWPCC 2023 Transitioning to a Multi-metric Resource Adequacy Standard for the Pacific NW

Approaches to assess resource deliverability should acknowledge "[t]here is no such thing as perfect capacity," and that no resource is guaranteed to be available when called upon.[13] Ensuring that approaches are applied equally across resources, including fossil resources, is critical to ensuring deliverability under even extreme weather conditions.[14] In addition, consideration should be given to both the regional and interregional transmission systems and associated transmission constraints when considering deliverability. Incorporating transmission considerations into deliverability can make the need to enable "access to a greater diversity of variable renewable resources and load across neighboring regions" more transparent.[15,16,17] Additional solutions to deliverability can be found in Section 2.3.2 in the DOE's 2021 report on Research Priorities and Opportunities in United States Competitive Wholesale Electricity Markets.[18]

(3) Additional considerations in establishing the reliability standard in the ERCOT power region.
- Should the reliability standard include a locational requirement?
- Should the reliability standard include a seasonal component?
- How can extreme events be captured in a reliability standard?
- How can the value of distributed energy and load resources be captured in a reliability standard?

A new reliability standard, and the process for demonstrating compliance with the standard, should be designed to ensure resource adequacy across seasons and consistently across the footprint of the ERCOT market. There are two distinct, related ways this can be achieved: (1) through the design of the standard itself (e.g., there are distinct seasonal or locational standards that must be met), (2) through the process for determining how compliance with the standard should be assessed (e.g., there is one common standard, but it must be demonstrated that resources can meet the standard across seasons and geography).

In considering a locational requirement, which would require ERCOT subregions to individually meet the reliability standard, in the design of the standard itself, the Commission should seek to balance two factors: a locational requirement could help ensure that the responsibility of maintaining grid reliability is distributed equitably across ERCOT, but could limit the potential for a more geographically diverse set of resources to contribute to grid reliability. Renewable resources across a broader region that experience different weather conditions, for example, provide a greater reliability benefit than those in a constrained region (see the section entitled "Recognition of Resources' Limitations and Strengths", in ESIG 2021).[19] As an example, Public Service Company of Colorado's 2021 IRP ELCC study highlights the ELCC diversity benefit of geographically well-diversified portfolios of solar and wind resources at higher penetration levels.[20]

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[13] *Supra* note 3.
[14] ESIG's 2023 Ensuring Efficient Reliability: New Design Principles for Capacity Accreditation
[15] NREL 2022 Assessing Power System Reliability in a Changing Grid, Environment
[16] Grid Strategies 2021 Transmission Makes the Power System Resilient to Extreme Weather
[17] Grid Strategies 2021 Ensuring Low-cost Reliability: Resource Adequacy for a Clean Energy Grid
[18] US DOE Grid Modernization Laboratory Consortium 2021 Research Priorities and Opportunities in United States Competitive Wholesale Electricity Markets
[19] *Supra* note 3.
[20] Public Service Company of Colorado's 2021 Electric Resource Plan Filing on Effective Load Carrying Capability Study of Existing and Incremental Renewable Generation and Storage Resources

Both locational and temporal granularity should be used in assessing whether or not a resource mix can comply with the updated reliability standard. Resources should be modeled with as specific temporal and spatial granularity as practicable, with chronological operations across weather years to be able to identify weather-correlated outages.

VaR metrics are an option for the Commission to consider to incorporate extreme events into the reliability standard. The VaR metrics adopted by the NWPCC in their new multi-metric adequacy standards (see response to 1.) provide one example of how extreme events can be captured in an adequacy standard. As another example, Oregon IRP planning guidelines require electric utilities to compute both expected and worst-case unserved energy for top-performing portfolios.[21]

Distributed energy resources including virtual power plants and flexible load can play a key role in supporting grid reliability and their contribution should be evaluated consistently with supply-side resources. This can include but is not limited to: residential weatherization measures, controllable electric appliances like heat pumps and heat pump water heaters, intelligent operation of household and commercial buildings (such as through smart thermostats), distributed storage, managed electric vehicle charging, and time differentiated pricing. In determining if a system can meet reliability standards, these technologies should be accounted for in a way that is consistent with supply-side options, based on their operational characteristics, potential, forced outage rates, and weather-dependent availability. This may require data collection and validation, to refine demand-side resource definitions over time.

(4) How frequently should the Commission update the calculation of the requirement necessary to meet the reliability standard?
- What criteria should help determine the frequency of the update?

RMI does not have a comment in response to this question.

(5) If you have any industry or academic papers on the topic and best practices that you believe the Commission should review while establishing the reliability standard for the ERCOT power region, please provide them.

In addition to the resources referenced in footnotes throughout this document, RMI offers the following resources for the Commission's review:

1. GridLab's 2022 Advancing resource adequacy analysis with the GridPath RA Toolkit
2. NARUC's 2021 Resource Adequacy Primer for State Regulators
3. CAISO's Generation Deliverability Assessment documentation

[21] Public Utility Commission of Oregon 2007 Investigation into Integrated Resource Planning

RMI executive summary of comments:
RMI thanks the Commission for allowing the opportunity to submit comments on this important topic. We would like to highlight some major recommendations we have made in the above comments:

- The Commission should consider a combination of reliability metrics rather than any single one; this combination could include VOLL and VaR metrics in addition to those the Commission has already considered.
- A new reliability standard, and the process for demonstrating compliance with the standard, should be designed to ensure resource adequacy across seasons and consistently across the footprint of the ERCOT market.
- Distributed energy resources including virtual power plants and flexible load can play a key role in supporting grid reliability and their contribution should be evaluated consistently with supply-side resources.
- The Commission should consider options beyond the development of a new reliability standard to enhance reliability – supporting efforts to expand deployment of energy efficiency, demand response, and a diverse portfolio of distributed, regional, and interregional resources.

Respectfully submitted,

/s/ Lauren Shwisberg
Principal
RMI
17 State Street, Fl 25, Suite 2500
New York, NY 10004
lshwisberg@rmi.org

/s/ Aaron Schwartz
Senior Associate
RMI
2490 Junction Pl #200
Boulder, CO 80301
aschwartz@rmi.org

/s/ Sarah Toth, PhD
Senior Associate
RMI
2490 Junction Pl #200
Boulder, CO 80301
stoth@rmi.org