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Public Utility Commission of Texas

Memorandum

TO: Chairman Thomas Gleeson
Commissioner Lori Cobos
Commissioner Jimmy Glotfelty
Commissioner Kathleen Jackson

FROM: Chris Brown PhD, Market Analysis
Brendan Ok, Market Analysis

DATE: January 25, 2024

RE: February 1, 2024, Open Meeting – Item No. 27
Project No. 55837 – *Review of Value of Lost Load in the ERCOT Market*
Staff recommendations for interim VOLL

Electric Reliability Council of Texas, Inc. (ERCOT) recently provided an update regarding the ongoing Value of Lost Load (VOLL) study for the ERCOT region.[1] This filing included analysis conducted by ERCOT's contractor, The Brattle Group (Brattle), which provides a set of VOLL estimates for the Commission to consider in determining an interim VOLL value, until a survey of customers in the ERCOT region can be completed. Staff anticipates the ERCOT-specific customer survey will provide another significant data point to help the Commission understand the preferences of Texas electric customers and develop robust, consumer-focused reliability policy. In the meantime, the interim VOLL will inform ongoing studies, but it will have no immediate market impacts.

During the January 18, 2024 Open Meeting, the Commission directed Staff to review this filing and provide an interim VOLL recommendation.

Overview:

Brattle conducted a review of selected existing literature that estimated VOLL in various regions, provided an overview of the strengths and weaknesses of the different research methodologies employed by these studies, and described the range of estimates obtained. Brattle then proposed several options for estimating the cost of outages for different customer classes--residential, small/medium commercial and industrial (C&I), and large C&I—and for aggregating these estimates into a single region-wide VOLL estimate.

Option 1: The first option proposed by Brattle utilizes an existing Lawrence Berkeley National Lab (LBNL) econometric model, with coefficients estimated from a meta data set obtained

[1] *Review of Value of Lost Load in the ERCOT Market*, Project No. 55837, VOLL Study Literature Review and Interim VOLL (December 21, 2023).

through previous customer surveys, and ERCOT-specific data to obtain an estimate of the cost of outages in ERCOT. The table below summarizes the results of this analysis. By taking a simple average of the various duration cost outage estimates within each customer class and then averaging these figures, weighted according to each customer class's share of ERCOT retail sales, we can obtain a system wide VOLL estimate of **$67,822**.

Brattle (Option 1)	**VOLL Estimate ($ per unserved MWh)**				
	2022 share of retail sales	30 minute outage cost	1 hour outage cost	8 hour outage cost	Average
Residential	36%	$9,283	$5,122	$1,817	$5,407
Small/Medium C&I	35%	$167,315	$102,490	$81,172	$116,992
Large C&I	29%	$130,797	$78,824	$53,954	$87,858
Weighted Average	-	**$99,052**	**$60,093**	**$44,320**	**$67,822**

Staff appreciates the econometric approach used in this option but has concerns about employing a model with coefficients estimated using data that is not ERCOT-specific to estimate outage costs in ERCOT. Additionally, while the data used for the ERCOT-specific covariates in the model are the best currently available, this approach could benefit from more recent and accurate data directly surveyed. As such, Staff believes that conducting a similar analysis with the responses collected from the forthcoming customer survey is likely to produce more accurate results. Finally, it is important to point out that this option produces C&I estimates that are unexpectedly high, relative to the estimates described in the literature review. Therefore, Brattle proposed options below to address this anomalous finding.

Option 2: Brattle proposed three alternative options that involve capping the C&I values according to the median of a subset of the reviewed literature. This approach is motivated by the observation that the C&I estimates obtained by option 1 are noticeably larger than most of the estimates obtained in previous studies. These three approaches are described below, and the results obtained by each are summarized in the following table.

- Option 2a proposes capping C&I values according to the median value across all studies reviewed by Brattle, regardless of jurisdiction or outage duration.
- Option 2b proposes capping C&I values according to the median value across all studies reviewed by Brattle that were conducted in the U.S.
- Option 2c proposes capping C&I values according to the median value across all studies reviewed by Brattle that were conducted in the U.S. and tested a one-hour duration outage.

Brattle (Option 2)	**VOLL Estimate ($ per unserved MWh)**			
	2022 share of retail sales	Option 2a	Option 2b	Option 2c
Residential	36%	$5,407	$5,407	$5,122
Small/Medium C&I	35%	$52,520	$56,136	$116,935
Large C&I	29%	$15,837	$16,884	$34,588
Weighted Average	-	**$24,693**	**$26,245**	**$52,259**

The motivation behind these approaches is to constrain the C&I estimates to a range that is more consistent with the extant literature. During the January 18, 2024 Open Meeting, there was discussion about the practical effects of capping the C&I estimates. Placing a binding cap on any of the estimates will reduce the final VOLL estimate. For the present analysis, Staff believes that this a reasonable approach to reduce the unexpectedly high C&I estimates observed in Option 1. However, Staff would like to note its general concern about the approach of grouping and comparing different studies to obtain a single value. Study 9 in Brattle's literature review states that, "[VOLL] is only capable of mapping one individual case as an economic evaluation index of power supply security, and the respective results must be considered and assessed against the background of the analytical framework." [2]. Once the customer survey has been completed and ERCOT specific data has been obtained, Staff believes that we will be better equipped to conduct analysis tailored to the scope of this project, mitigating the need to compare results against those of previous studies.

Additional information:

Staff would also like to highlight two other points of reference which may be helpful in choosing an interim VOLL.

1. In the *2022 State of the Market Report for the MISO Electricity Markets*, Potomac Economics (Potomac) conducted a VOLL analysis that has many similarities, in both methods and results, to the analysis conducted by Brattle.[3] Potomac also employed an existing LBNL model and updated MISO-specific data to estimate outage costs. Their results suggest that outage costs range from:
    - $4,200 to $4,600 per MWh for residential customers.
    - $96,000 to $211,000 per MWh for small C&I customers.
    - $36,000 to $84,000 per MWh for large C&I customers.

    They noted that their estimates for *small C&I customers* are outside the range of values obtained by prior studies. Therefore, they chose to base their VOLL estimate only on the average of *residential and large C&I customers*, weighted according to annual consumption, resulting in a region wide estimate of **$25,000 per MWh**.[4]

2. In the *2022 State of the Market Report for the ERCOT Electricity Markets*, Potomac noted that the shape of the Operating Reserve Demand Curve (ORDC) implied an

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[2] Schröder T and Kuckshinrichs W (2015) Value of Lost Load: An Efficient Economic Indicator for Power Supply Security? A Literature Review. *Front. Energy Res.* 3:55. doi: 10.3389/fenrg.2015.00055

[3] 2022 State of the Market Report for the MISO Electricity Markets, prepared by Potomac Economics (June 15, 2023). Details of the econometric analysis employed to estimate VOLL are contained in the technical appendix.

[4] Potomac goes on to say that, while they support a VOLL of $25,000 per MWh as the basis for an efficient ORDC, they believe "it would be reasonable to cap the maximum ORDC at a lower value (e.g., $10,000) because: (i) very few shortages would be priced in this range; (ii) pricing shortages at higher prices could result in inefficient interchange with MISO's neighbors who price shortages at lower levels; and (iii) pricing at higher levels could cause MISO's dispatch model to make inefficient trade-offs between retaining reserves and managing flows on network constraints."

underlying VOLL of approximately $47,000 per MWh.[5] However, they also stated that they believe an average VOLL of between $20,000 and $30,000 per MWh is reasonable based on prior studies.

Staff recommendations:

VOLL in the ERCOT region is currently set at $5,000 per MWh. Prior to January 1, 2022, VOLL was set at $9,000 per MWh, but it was reduced to the current level[6] and subsequently decoupled from the System-Wide Offer Cap[7] (SWCAP) during a redesign of the wholesale electric market. Any of the estimates described above represent a considerable increase from the current level. However, as noted by Potomac in the *2022 State of the Market Report for the ERCOT Electricity Markets*, the current level likely underestimates VOLL by a substantial amount. Based on the various analyses described above, Staff agrees with ERCOT's assessment that Options 2a ($24,693 per MWh) and 2b ($26,245 per MWh) represent the most reasonable estimates of VOLL, but for the sake of simplicity, we would recommend that an intermediate value be selected for the interim VOLL.

Recommendation No 1:
Staff proposes that the interim VOLL be set at $25,000 per MWh.

However, Staff also recognizes that many of the proposed options are imperfect due to their reliance on an existing model and data that are not specific to the ERCOT region. Therefore, we would also recommend that any study employing the interim VOLL as an input should, whenever feasible, conduct sensitivity analysis to examine how relevant outcomes are impacted by different VOLL values. For example, the interim VOLL will be used to estimate the marginal cost curve as a part of the ongoing reliability standard study, as described by ERCOT in their most recent reliability standard study update.[8] Relying on a single, imperfectly estimated VOLL for the purpose of important, policy relevant projects is ill-advised.

Staff refers to the estimates described above to provide guidance on the range of VOLL values that should be considered in any such analysis. The lowest VOLL estimate of $20,000 per MWh is provided by Potomac in the *2022 State of the Market Report for the ERCOT Electricity Markets*. The highest VOLL estimates are described in Brattle's Option 1, from which we would recommend using the average system wide estimate of $67,822 as a point of reference.

Recommendation No. 2:
Staff recommends that any study that uses VOLL as an input should conduct sensitivity analysis, varying VOLL between $20,000 and $70,000 per MWh.

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[5] *2022 State of the Market Report for the ERCOT Electricity Markets*, prepared by Potomac Economics (May 2023).

[6] *Review of Wholesale Electric Market Design*, Project No. 52373, Approval of Blueprint for Wholesale Electric Market Design and Directives to ERCOT (January 13, 2022).

[7] *Reorganization of 25.505*, Project No. 53191, Order Repealing 25.505 and Adopting New 16 TAC 25.505, New 16 TAC 25.506, and New 16 TAC 25.509 as Approved at the April 21 Open Meeting (April 29, 2022).

[8] *Reliability Standard for the ERCOT Market*, Project No. 54584, ERCOT Reliability Standard Study Update (January 11, 2024).

The number of values within this range that should be considered for the sensitivity analyses may be situation specific, but in each case, the analysis should include sufficiently many different values to ensure a full understanding of how VOLL affects the results. Once the survey of customers in the ERCOT region has been completed and a new VOLL estimate has been obtained, the need for sensitivity analysis and the range of values can be re-evaluated.