

Value of Lost Load (VOLL) Study for the ERCOT Region

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Agenda

1. Background and the Objective of the Study
2. VOLL Use Cases and Methodology
3. VOLL Estimates for ERCOT
4. Key Takeaways

Background and Objective

- ERCOT was asked to undertake a Value of Lost Load (VOLL) study by the Public Utility Commission of Texas to determine the estimated value of electric reliability in the ERCOT region
- The Brattle Group (with support from PlanBeyond) completed a VOLL study which involved a survey of residential, commercial, and industrial customers in ERCOT to determine ERCOT-specific VOLL values
- While separate VOLL values are estimated for each customer class, the Brattle team also calculated a single load-weighted average of the customer class VOLLs to be used for ongoing Commission market design initiatives, particularly the development of a reliability standard for the ERCOT Region

What is Value of Lost Load (VoLL)?

- VoLL represents a proxy for the economic costs that customers incur due to a power outage, or an average customer's willingness to pay to avoid an outage
- It is typically expressed in terms of dollars per outage event (\$) or dollars per unserved energy (\$/MWh)
- Electricity use cases differ largely across different customer classes; so are the costs incurred from an outage
- VoLL can prove useful to electric utilities and system operators for planning and operations management
 - Drive cost-benefit decisions with respect to generation/transmission investment on the planning side
 - Inform resource adequacy and resiliency rules on the operations side
 - Inform customers' valuation of reliability and inform new products that could be offered to the customers to achieve enhanced reliability

How to estimate VoLL?

- VoLL is typically estimated through surveying customers; providing them with different outage scenarios, and asking them “how much they would pay to avoid an outage of a given duration” or “how much damage the outage costs to their business”
- Since these are questions about “hypothetical” circumstances, there are well established survey methods to design these surveys to infer customers’ valuation of power, as accurate as possible
 - Surveys conducted for residential, small C&I, and medium/large C&I customers
 - Data collected from March 26 – May 31, 2024
 - 2,991 residential responses (3-7% completion rate); 1,711 C&I responses (1.2% completion rate)
 - Sampling via ERCOT’s Customer Billing Contact Information (CBCI) & NOIE partnerships
 - Statistical models used to estimate VOLL

VOLL per Event Estimates (2024\$)

AVERAGE HOURLY USE AND SHARE OF ANNUAL TOTAL USAGE BY CUSTOMER CLASS

Class	Average Usage (kW per hour)	Usage Share
Residential	1.8	30%
Small C&I	1.9	3%
Medium/Large C&I	326.3	67%

- Residential customers as identified in the CBCI
- Large C&I > 4,500,000 kWh
- Medium C&I > 50,000 kWh
- Small C&I < 50,000 kWh

All three C&I categories complete the same survey instrument. Due to the relatively small number of responses by large customers, we combine the medium and large customer classes in our analysis

VOLL PER EVENT BY CUSTOMER CLASS AND DURATION (2024\$)

	Residential	Commercial & Industrial	
		Small	Medium/Large
1 hour	\$7	\$1,268	\$7,413
2 hours	\$12	\$1,549	\$8,342
4 hours	\$14	\$1,928	\$10,524
8 hours	\$20	\$2,976	\$16,985
16 hours	\$31	\$7,281	\$49,404

We assessed whether these VOLL per event estimates varied by season, time of day, and day type; we did not find any systematic differences along these characteristics

VOLL per Event Estimates (2024\$) - cont'd

AVERAGE INTERRUPTION COST PER EVENT BY SECTOR (2024\$)

	Average cost
Infrastructure	\$50,180
Manufacturing	\$8,574
Health Care and Social Assistance	\$3,589
Consumer Industries	\$2,466
Resource Management	\$2,176
Finance, Technology, and Professional Services	\$1,561
Other Services	\$1,152

AVERAGE INTERRUPTION COST PER EVENT ESTIMATES FOR C&I CUSTOMERS WITH AND WITHOUT ADVANCE WARNING (2024\$)

Duration	Small		Medium/Large	
	No Warning	Advance Warning	No Warning	Advance Warning
Momentary	\$650	\$317	\$2,162	\$1,343
1 hour	\$1,268	\$703	\$7,413	\$5,347
2 hours	\$1,549	\$956	\$8,342	\$6,036
4 hours	\$1,928	\$1,228	\$10,524	\$7,692
8 hours	\$2,976	\$1,923	\$16,985	\$12,315

Costs are substantially largest in the infrastructure sector, which includes refineries and data centers

- These average costs are more than 5 times those for the next highest sector (manufacturing), which itself is more than double costs in the remaining sectors

Advance warning of outages is more effective at reducing costs for small C&I customers than larger customers

- Costs experienced by medium/large customers fall by approximately 20% when warning is provided
- Costs to small customers fall by 35% or more

VOLL per Unserved MWh by Customer Class and Duration (2024\$/MWh)

	Residential	Commercial & Industrial		ERCOT- Wide
		Small	Medium/Large	
1 hour	\$3,964	\$666,907	\$22,721	\$35,685
2 hours	\$3,303	\$407,229	\$12,783	\$21,326
4 hours	\$2,039	\$253,454	\$8,064	\$13,340
8 hours	\$1,407	\$195,591	\$6,507	\$10,435
16 hours	\$1,091	\$239,280	\$9,463	\$13,581

VOLL values are higher for 1-hour outages than other durations; VOLL values fall until durations of approximately four hours, then level off; they are lower still for the extended durations considered

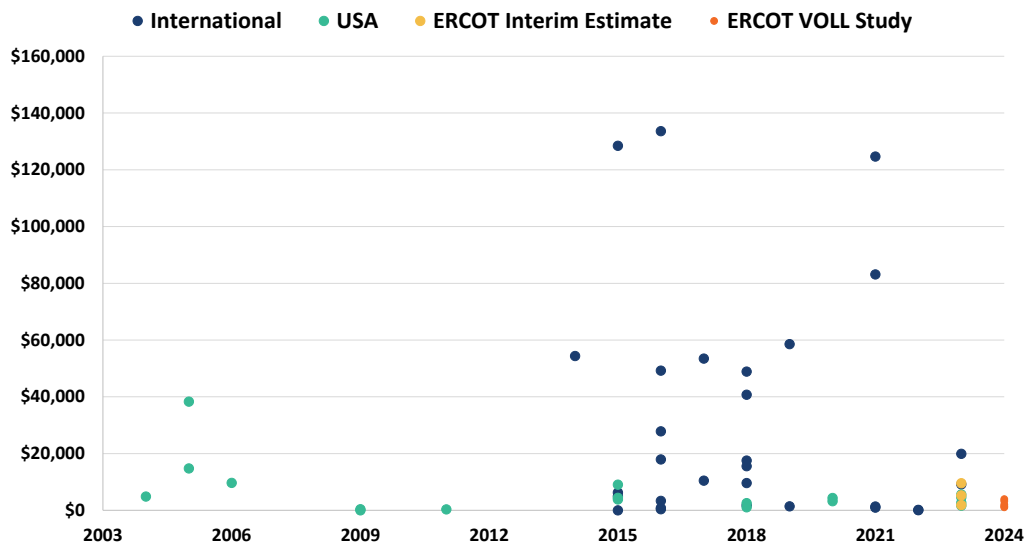
VOLL values generally decline as the outage duration increases. This is due to the spreading of the cost per event on a larger volume of unserved MWh as the outage duration increases

- However, sometimes this relationship is not entirely monotonic as observed going from 8 hour duration to 16 hour duration in the figure

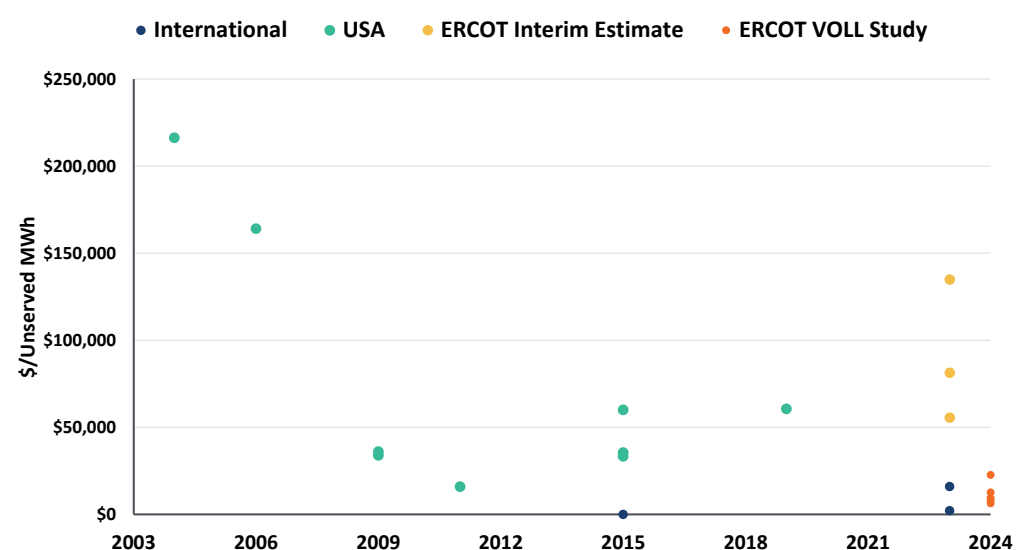
Key Takeaways

- While we surveyed customers to elicit the differences in their VOLLs in summer versus winter seasons, as well as morning, afternoon, and evening times, we did not identify substantive differences in their VOLLs along these dimensions
- Representative estimates are for a weekday afternoon outage without advance warning, irrespective of the season. For an outage with one-hour duration, the ERCOT-wide value is estimated to be \$35,685.
- We found that advance warning lowered customers' VOLLs for all classes
- Based on a literature review, ERCOT residential VOLLs are on the lower side of the distribution whereas ERCOT medium/large C&I estimates are comparable to those from other VOLL studies.

LIT REVIEW RESIDENTIAL VOLL (2024\$/UNSERVED MWH)



LIT REVIEW MEDIUM/LARGE C&I VOLL (2024\$/UNSERVED MWH)



Key Takeaways

- ERCOT small C&I VOLL estimates, however, are very large and at the high end of the estimates from other studies. The latter is mainly driven by moderate levels of VOLLs per event estimated for the small C&I class, resulting in a very large VOLL per unserved MWh given the small size of the customers in this class.

COMPARISON OF ERCOT SMALL C&I VOLL ESTIMATES TO LITERATURE (2024\$/UNSERVED MWh)

