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BY EMAIL and RESS

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August 29, 2025
Our File: EB20240199

Attn: Ritchie Murray, Acting Registrar

Dear Mr. Murray,

Re: EB-2024-0199 – Vulnerability Assessment Draft Report – SEC Comments

We are counsel to the School Energy Coalition ("SEC"). These are SEC's comments on the final draft Vulnerability Assessment and System Hardening ("VASH") Report ("Draft Report").

SEC actively participated in the VASH consultation and is generally supportive of the Draft Report and accompanying toolkit, which reflects much of the consensus that appeared to exist among stakeholders. That support, however, is premised on the explicit recognition that conducting a benefit-cost analysis ("BCA") of system hardening activities, and the underlying methodologies, inputs, and assumptions, are new and entirely untested. The outcome of the analysis should in no way be determinative of the need for a potential investment. It is one factor, among many, that electricity distributors must consider as part of their capital planning, which includes overall cost and bill impact. The OEB should reinforce this in any final report.

One aspect of the report requires specific comment. The central way that benefits in the BCA are determined is through the use of the Value of Lost Load ("VOLL"). The OEB decided that instead of undertaking its own Ontario-specific survey, which would have been quite costly, it would rely on the publicly available Interruption Cost Estimate ("ICE") Calculator based on U.S. data. SEC can accept this approach in the context of the VASH BCA analysis being just one tool among many in the capital planning process. If it becomes anything more than that, SEC would have serious reservations about using U.S. ICE data for the VOLL calculation.

In the Draft Report, the OEB noted that in May an updated version of the ICE Calculator (version 2.0) was released. However, it has taken the position that "[d]istributors may use either ICE Calculator 1.0 or 2.0 at their discretion."[1] SEC strongly disagrees with this approach. ICE 1.0 is outdated. It was based on surveys of customers conducted as far back as 1989. ICE 2.0 includes a broader array of utilities and more recent survey data from 2022 to 2024. There are significant differences in the results of version 1.0 and 2.0 for non-residential customers (see attachment). The use of version 1.0 would

[1] Draft Report, p. 26, ft 15

result in customer interruption costs that are likely to be significantly overstated in light of the new information. The OEB must mandate the use of version 2.0.

Yours very truly,
Shepherd Rubenstein P.C.

Mark Rubenstein

cc: Brian McKay, SEC (by email)

ICE Calculator 1.0 vs. 2.0:
A Comparison of Estimated Customer Power Interruption Costs

This memorandum compares customer power interruption costs estimated using the recently updated Interruption Cost Estimate (ICE) Calculator ("ICE 2.0") to the original ICE Calculator ("ICE 1.0").[1] ICE 1.0 was developed in 2009 based on 15 independent power interruption cost surveys conducted by 10 electric utilities between 1989 and 2012. ICE 2.0 was developed in 2025 through a national initiative based on a consistent set of power interruption cost surveys and 11 surveying efforts conducted across 24 electric utility service territories between 2022 and 2024.[2]

Differences in the power interruption costs estimated by ICE 2.0 and ICE 1.0 are due to two main factors: (1) their respective sources of and methods to collect customer interruption cost information and (2) the resulting Customer Damage Functions (CDFs) that were developed. See Table 1, below, for a summary of these key differences.

Table 1. Summary of differences between ICE 1.0 and 2.0

	ICE 1.0	ICE 2.0
Surveys Conducted (Years)	• 1989-2012	• 2022-2024
Survey Approach	• Administered independently • Information on sample designs and recruitment procedures not available • Different surveys with different questions	• LBNL/Resource Innovations (RI) administered in a fully coordinated manner • Consistent sample designs and recruitment procedures • Identical set of survey questions • One-and-one-half-bound dichotomous choice contingent valuation (residential)
Geographic Coverage	• 15 distinct surveying efforts conducted across 10 utility service territories • Mostly conducted in western and southeastern U.S.	• 11 distinct survey activities conducted across 24 utility service territories • Eastern and midwestern U.S. as well as the Pacific Northwest (future phases will additional regional representation)
Interruption Durations Considered	• Varied and generally limited to 12 hrs or less	• Momentary (lasting up to 5 min), 2 hrs, 8 hrs, and 24 hrs
Customer Damage Functions	• Residential • Small non-residential • Medium/large non-residential	• Residential • Non-residential

[1] See Schellenberg and Larsen (2018); and Sullivan, et. al. (2015) for documentation of ICE 1.0 development. See Larsen, et. al. (2025), Resource Innovations (2022), and Sullivan, et. al. (2019) for the documentation of ICE 2.0 development.
[2] The national initiative is updating the ICE Calculator in three sequential phases of survey activities. This memorandum is based on the first phase of completed survey activities.

Sources and methods to collect interruption costs

The survey responses used to develop ICE 1.0 were collected through 15 distinct and independently sponsored utility value of lost load (VOLL) study activities conducted over several decades from 1989 to 2012. A majority of these surveys were administered on behalf of utilities in the western U.S. Most surveyed both residential and non-residential customers. However, some utilities only surveyed non-residential customers. Some utilities conducted repeated surveys of their customers during this 24-year period. Most survey activities involved conducting thousands of survey responses so that the results would produce statistically defensible estimates of the cost of power interruptions for each individual participating utility.

While all the ICE 1.0 surveys relied on similar approaches—i.e., willingness-to-pay for residential customers, and direct cost measurement for non-residential customers—the questions included in each survey differed. For example, the range of interruption durations included in the surveys varied considerably. Only one survey included interruptions lasting 24 hours, and only two surveys included interruptions lasting 12 hours. In addition, some, but not all, surveys included interruption scenarios in which advance warning was provided and questions regarding ownership of backup generation (BUG).

In contrast, the surveys used to develop ICE 2.0 were collected through 11 coordinated activities conducted between 2022 and 2024. Most of these surveys were administered on behalf of utilities in the eastern and midwestern U.S. as well as one in the Pacific Northwest. Each surveyed both residential and non-residential customers. By design, the number of survey responses collected from each sponsoring utility's customers was less than in the development of ICE 1.0.

Each survey was conducted using identical survey instruments and consistent survey administration procedures in ICE 2.0. Notably, each survey considered the same number and range of interruption durations, from momentary up to 24 hours. In addition, the surveys also considered both advance notification and ownership of BUG. Finally, the residential survey featured an updated, state-of-the-art implementation of the willingness-to-pay survey approach, called "one-and-one-half-bound dichotomous choice" (OHDC).

Development of customer damage functions (CDF)

ICE 1.0 consists of three distinct and separately estimated CDFs for residential, small non-residential, and medium/large non-residential customers, respectively. All three CDFs were estimated using a two-part model that included the same explanatory variables in both parts of the model. All three CDFs included interruption duration and annual electricity usage as explanatory variables. The residential CDF also included average household income, time of day, and season. The small non-residential CDF also included time of day, season, industry type (construction and manufacturing), and ownership of backup generation (BUG) and/or power conditioning (PC). The medium/large non-residential CDF also included state-level GDP/non-residential kWh, season, and industry type (manufacturing).

In contrast, ICE 2.0 consists of two distinct and separately estimated CDFs for residential and non-residential customers. The residential CDF was estimated using a one-part model owing to its reliance on the OHDC willingness-to-pay approach. The non-residential CDF was estimated using a two-part model, but the explanatory variables were allowed to vary for each of the two parts of the model. Both CDFs continued to include interruption duration and annual electricity usage as explanatory

variables. The residential CDF also included household income (expressed as percentages in four income ranges), season, ownership of BUG, and percentage of customers working from home (WFH). The non-residential CDF also included the day of the week, industry type (health care and social assistance or manufacturing), and percent of customers with advance warning.

Figures 1-3 show the comparison of the estimated power interruption costs using both ICE 1.0 and 2.0, holding the input assumptions as consistent as possible. The red line for ICE 1.0 is inflated to 2023$ using the Consumer Price Index (CPI) and stops at 16 hours based on model capability. Table 2 shows the input assumptions used for each of the model runs in ICE 1.0 and 2.0.

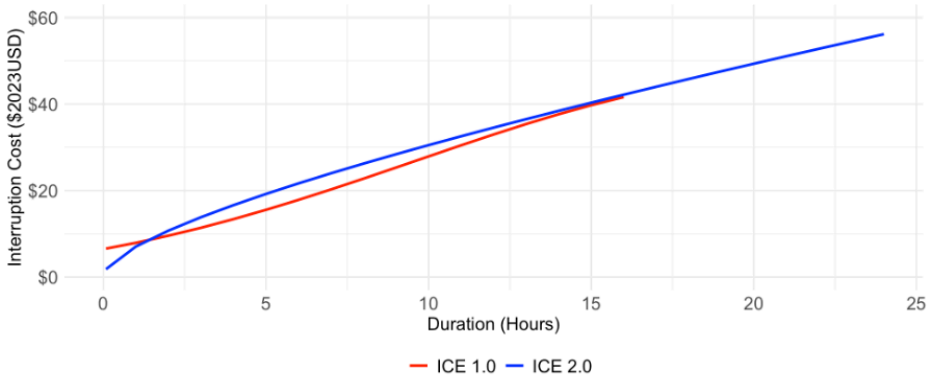

Figure 1. Residential customer interruption costs estimated using ICE 1.0 and 2.0

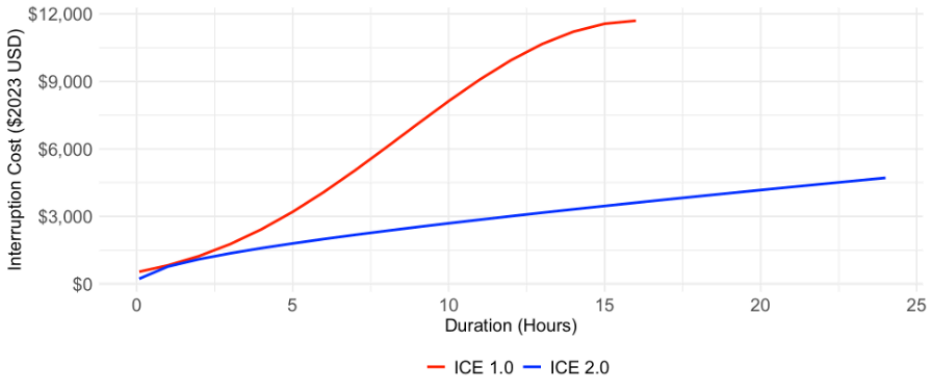

Figure 2. Small non-residential customer interruption costs estimated using ICE 1.0 and 2.0

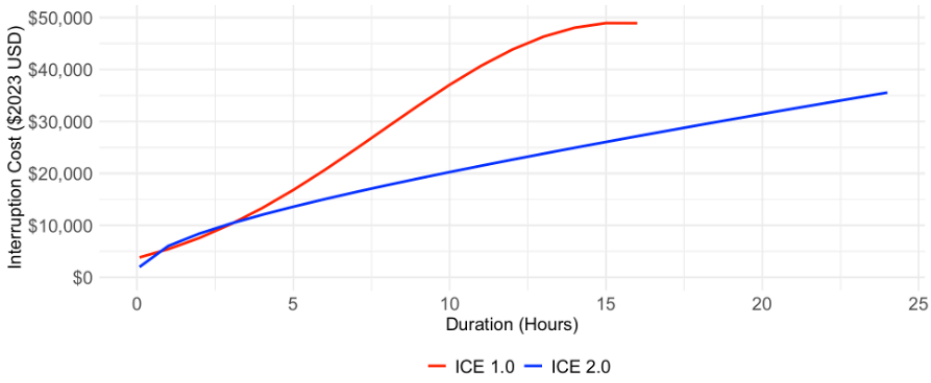

Figure 3. Medium/large non-residential customer interruption costs estimated using ICE 1.0 and 2.0

Overall, residential power interruption costs estimated using ICE 2.0 are lower than ICE 1.0 for the shortest duration power interruptions (interruptions lasting less than ~90 minutes), but higher for longer duration power interruptions. Interruption costs for non-residential costs are similar for shorter duration interruptions, but the ICE 2.0 estimates are 50-75% lower than ICE 1.0 for interruptions lasting 10 or more hours.

Table 2. Input assumptions for ICE Calculator model runs

Input Assumption	Residential	Small Non-residential	Medium/Large Non-residential
Annual Electricity Usage	12,167 kWh	18,100 kWh	459,000 kWh
Annual Household Income (2013$)	$79,986 (ICE 1.0) $104,620 (ICE 2.0)*		
Time of Day	Afternoon: 20.8%, Evening: 20.8% (ICE 1.0), N/A (ICE 2.0)	Morning: 25%, Afternoon: 20.8% (ICE 1.0), N/A (ICE 2.0)	
Day of Week		N/A (ICE 1.0), 71% Weekday, 29% Weekend (ICE 2.0)	
Season	Summer: 33% (ICE 1.0 and ICE 2.0)	Summer: 33% (ICE 1.0), N/A (ICE 2.0)	
Industry		Manuf: 5%, Construction: 9.5% (ICE 1.0) Manuf: 5%, Health Care: 12% (ICE 2.0)	Manuf: 17.1% (ICE 1.0) Manuf: 17.1%, Health Care: 12% (ICE 2.0)
Other	BUGs: N/A (ICE 1.0), 19% (ICE 2.0) WFH: N/A (ICE 1.0), 20% (ICE 2.0)	BUGs and PC: 13.5% (ICE 1.0), N/A (ICE 2.0) BUGs or PC: 0% (ICE 1.0), N/A (ICE 2.0) Adv Warning: N/A (ICE 1.0), No (ICE 2.0)	Adv Warning: N/A (ICE 1.0), 0% (ICE 2.0)

*This is the weighted average from the four household income category ranges (reported in 2023$).