Guidehouse

ONTARIO ENERGY BOARD

OEB Electricity Distribution Vulnerability Assessment and System Hardening

Proposed Component 1 and 2 Scope

Agenda

VASH Overview
30 Minutes

Summary of July stakeholder meeting feedback and proposed incorporation into VASH considerations. Review each of the six components in context of this feedback.

Component 1
60 Minutes

Review proposed approach to Component 1: Risk-Based Vulnerability Assessment.

Component 2
30 Hours

Review proposed approach to Component 2: Standardized Vulnerability Assessment Data Sources.

VASH Overview

Summary of July Stakeholder Meeting Feedback

The stakeholder group commented on the VASH approach during the July meeting focused on a high-level initiative overview. Key points that the OEB is considering as we move forward in VASH process include:

- Coordination with CSA guidelines and definitions
- Allowing flexibility to LDCs and noting that a one size fits all approach could disrupt historical planning practices and embedded learning from engineers and system planners
- Limiting burden for LDCs currently incorporating resiliency into planning and provide streamlined method for those that don't
- Ramping up requirements over time to ensure reasonableness of expectations
- Utilizing appropriate values of lost load
  - What is the customer's perspective?
- Acknowledging that HILF mitigation may focus on operational enhancements
- Review of Ontario expectations relative to peers
  - What is the right amount of investment and analysis for Ontario?

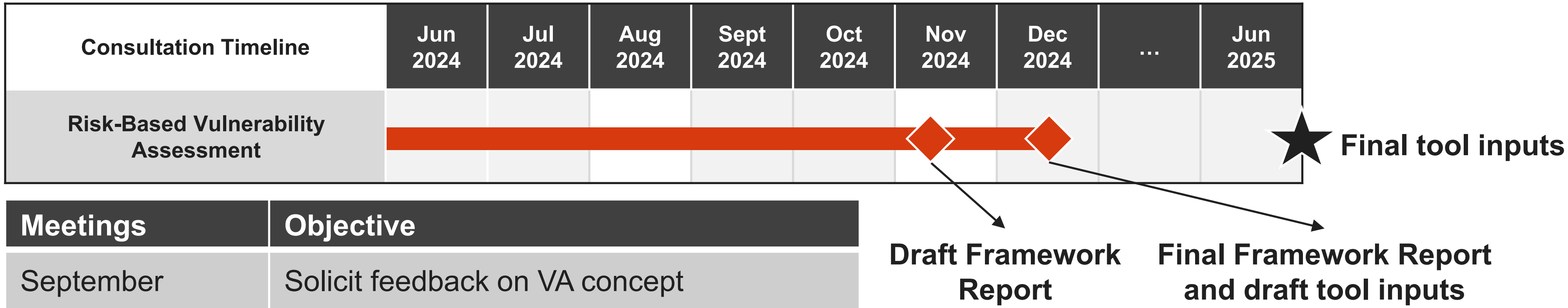
Project Components

Six components combine to inform the final VASH Report and are supported by a scan of 3-5 leading jurisdictions.

Component	*Definition*
1. Risk-Based Vulnerability Assessment	A risk-based Vulnerability Assessment that includes the probability/impact of events. The frequency and time-period of the Vulnerability Assessment should also be included.
2. Standardized Vulnerability Assessment Data Sources	The sources for any standardized input variables to be used in the Vulnerability Assessment (including, for example, the use of a common forecast or model that estimates how climate change is likely to alter the frequency and severity of adverse weather conditions; a common set of equipment impacted; etc.).
3. Value of Lost Load Methodology	A value of lost load methodology to quantify risk reduction value from the Vulnerability Assessment.
4. Benefit-Cost Analysis	A benefit-cost analysis to evaluate whether an LDC should pursue an investment based on the cost of the investment in comparison to the value of lost load mitigated and other applicable benefit streams.
5. DSP Integration Methodology	Methodology for incorporating System Hardening into an LDC's system planning as an additional investment driver within their integrated system planning process.
6. Filing Requirement Updates	Recommend updates to the Chapter 2 and 5 Filing Requirements for Electricity Distribution Rate Applications or develop policies resulting from Report. The recommendations for the Filing Requirements should be included as part of Report.

Vulnerability Assessment Deliverables and Timeline

The Risk-Based Vulnerability Assessment framework will be developed by the end of 2024 with input alignment ongoing as other data sources, including CSA guidelines, become available.



Meetings	Objective
September	Solicit feedback on VA concept
October	Discuss details on climate perils selected, asset failure modes, and vulnerability scores
November	Review proposed Vulnerability Assessment methodology and draft report
December	Review finalized report

Component 1: Risk-Based Vulnerability Assessment

Risk-Based Vulnerability Assessment (Method TBD)

A risk-based Vulnerability Assessment will include the probability of a climate peril at severity levels observed in historic HILFs, as well as failure thresholds for the most common utility assets in alignment with CSA standards, resulting in a usable toolkit to support LDC risk analysis.

Applicable Event Definition

Establish a definition for VASH applicable events

- Align with HILF definitions across OEB work streams for consistency
- Defines level of event that investments will address through risk mitigation

Climate Peril Identification

Identify historical severe weather events

- Determine list of weather types and severities that have been observed as components of applicable HILF events
- Use discrete climate perils to map risk to evaluated asset classes

Climate Peril Forecast

Provide expected annual probability of climate perils

- Review publicly available climate data for each climate peril
- Forecast climate peril frequency at HILF severities with spatial granularity suitable to peril characteristics

Asset Class Failure Modes & Thresholds

Identify climate perils that each asset class is vulnerable to and their associated failure threshold

- Develop list of asset classes and failure modes
- Provide expected failure thresholds for asset classes and specifications by climate peril
- Treat asset vulnerability identification in a similar manner to asset condition assessments

Climate Peril Probability Tool

Asset Class Failure Mode & Threshold Tool

Draft Climate Peril and Severity List

12 HILF events occurring in Ontario since 2019 were analyzed to determine the weather-related root cause of widespread failures and estimate the severity of each. These severity thresholds represent estimates based on observed values and distributor reports from historic HILF events and may be aligned with CSA guidelines published summer 2025

Climate Peril	Draft Severity Thresholds
Wind	100 kph gusts
Snow / Ice	Severe winter storm
Tornado	Any event
Precipitation	Freezing rain

Vulnerability Assessment Toolkit Usage Overview

The toolkit, comprised of the Climate Peril Probability Tool and the Asset Class Failure Mode & Threshold Tool, may be used by LDCs to identify areas of HILF event vulnerability and expected frequency of these events at the specified severity.

1 **Base DSP Scenario Assets**

Develop asset-level DSP base scenario without consideration of HILF resiliency actions.

2 **Asset Class Failure Mode & Threshold Tool**

Utilize the Asset Class Failure Mode & Threshold Tool to determine applicable failure modes and thresholds for asset classes in base scenario.

3 **Climate Peril Forecast Tool**

Apply Climate Peril Forecast Tool to targeted asset locations in base scenario to determine areas of vulnerability.

4 **System Hardening Plan**

Develop a new scenario with updated asset classes or other mitigation strategies (i.e., network redundancy, restoration preparedness, etc.) that address the risk from climate perils through reductions in failures or expected outage durations.

5 **Apply BCA Methodology**

Apply a standardized BCA methodology, including value of lost load, by project based on framework to be developed in Components 3 and 4.

Open Discussion – Component 1

Stakeholder Feedback:

- TBD
- TBD
- TBD

Component 2: Standardized Vulnerability Assessment Data Sources

Standardized Vulnerability Assessment Data Sources

Guidehouse will develop a detailed summary of the sources used for the standardized toolkit input variables and necessary assumptions as well as guidelines for optional augmentation with industry leading proprietary data sources.

Critical Climate Data Considerations:

Spatial Resolution

Certain perils occur with greater spatial granularity than others. For example, wind gust probability or extreme heatwaves may be similar across a wide area, whereas flood depths along a river may be highly location specific. A substation sited 200m from a river may have very different annual flood risk from one sited 100m away in the flood plain.

Forecast vs Historical

Electricity distribution assets are long-lived and therefore accrue distribution service benefits decades into the future. When developing a benefit-cost analysis for system hardening it is important to model potential changes in climate throughout an asset's lifetime. Therefore, attention should be paid to the forecasting method used for climate perils where changes in severity or frequency are expected. Historical values and trends may be appropriate in certain instances, however, due to non-linear and highly variable models used to forecast climates, detailed models are preferred as available.

Climate Peril Severity

Many common data sources include summaries of mean or average weather events. Generally, all utility assets are designed to withstand these common weather events and therefore are not exposed to risk in these circumstances. It is important to utilize data on extreme event probability that match or exceed expected failure thresholds for the asset classes relevant to system hardening plans.

Open Discussion – Component 2

<u>Stakeholder Feedback:</u>

- TBD
- TBD
- TBD

Your guides

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