PEMBINA Institute

SUBMISSION

Wiring Up for Resilience

Pembina Institute comments and recommendations

Submitted to Alberta Electric System Operator

Regarding: Climate Resiliency White Paper Scope of Work

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Wiring Up for Resilience

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Context

The Pembina Institute welcomes the opportunity to provide input on the AESO's proposed climate resiliency white paper.

The affordability, reliability, and sustainability of Alberta's electricity system depends on becoming sufficiently resilient to meteorological, wildfires, floods, and other weather events that are intensifying and worsening due to anthropogenic climate change.

Pembina Institute applauds the AESO's proactive work to improve the resilience of the electricity system and recommends the Government of Alberta rapidly develop a plan to decarbonize its economy by 2050.

Discussion

Do you agree with the items outlined in the AESO's Climate Resiliency White Paper Scope of Work?

Yes, the subsections cover important topics.

Are there other industry references that the AESO should evaluate as part of the jurisdictional review?

Improving the resilience of the existing grid will take investments across the system over many years. Climate adaptation pathways standards such as BS 8631:2021 could help the AESO make decisions on priorities and timelines for projects.[1]

[1] British Standards Institute, "BS 8631:2021 Adaptation to climate change. Using adaptation pathways for decision making. Guide," (2021). https://doi.org/10.3403/30390355

Two guides from Electricity Canada and the International Institute for Sustainable Development also offer relevant suggestions.[2,3]

Are there other objectives and areas that the AESO should be covering in the white paper?

Assessing Actual Performance Characteristics

As Alberta is geographically diverse and power plants vary in age, technology, and operator, their individual vulnerabilities vary. It would be useful for resilience planning to quantify the impact of historic weather events on the actual performance characteristics of each existing and proposed electricity facility. For example, several of Alberta's recent Energy Emergency Alerts (EEA) have been triggered by unexpected outages in thermal plants and in intertie connections. Understanding weather-related performance impacts on individual facilities will help to plan for resource adequacy at a grid level.

One approach could be calculating a *qualified capacity* used in some resource adequacy regimes. For example, the Western Resource Adequacy Pool, which includes several of Alberta's neighbouring jurisdictions, uses Qualified Capacity Contributions (QCC).[4] As proposed by Powerex following the January 2024 EEA, updating QCCs will help calibrate resource adequacy planning[5] and thus resilience to similar extreme temperature events.

Consider the Role of Grid Flexibility for Resilience

Similarly, for both the purposes of climate resilience and resource adequacy, the AESO should review the contribution of all technologies and services that provide grid flexibility.

A key gap for Alberta's electricity system is to have multiple, independent intertie connections to Alberta. The work underway to decouple the line to B.C. from the line to Montana is promising. But Alberta should consider developing further interties to B.C. and other neighbouring jurisdictions to cost-effectively bolster resilience and reliability and improve affordability and emissions objectives.

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[2] Electricity Canada, *Climate Change & Extreme Weather: A Guide to Adaptation Planning for Electricity Companies in Canada* (2020). https://www.electricity.ca/files/reports/english/CEA_ClimateAdaptationGuide_2020.pdf

[3] International Institute for Sustainable Development, *Advancing the Climate Resilience of Canadian Infrastructure,* 2021. https://www.iisd.org/publications/climate-resilience-canadian-infrastructure

[4] Western Power Pool, *Western Resource Adequacy Program* (2023). https://www.westernpowerpool.org/private-media/documents/BPM_105_Qualifying_Resources_Final_Clean.pdf

[5] Powerex, *Analysis of the January 2024 Winter Weather Event* (2024), 16. https://powerex.com/sites/default/files/2024-03/Analysis%20of%20the%20January%202024%20Winter%20Weather%20Event.pdf

Examining the potential of distributed energy resources is also crucial, especially as the electricity grid technologies are modernizing around the world. Alberta should adopt demand-side management (DSM) mechanisms including energy efficiency and demand response programs, which can also save customers millions.[6] In 2023 U.S., there was at least 10 GW of realized peak demand savings through demand response programs[7] and Ontario's energy efficiency programs have lowered total energy demand by 15%. Alberta can learn from DSM best practices that have been established in similar markets.

Battery energy storage in transmission and distribution systems is also important. Incorporating neighbourhood-, street-, and customer-level energy storage devices would materially improve resilience outcomes. While the relevant regulations for distribution devices may be more under the mandate of the Alberta Utilities Commission, the resilience of the grid involves every component physically connected to the grid. Therefore, its inclusion in this AESO white paper would be appropriate. The possible recommendations in section 3 could also include these.

Grid Enhancing Technologies (GETs)

Lastly, the white paper should review the role of GETs for climate resilience. Grid-forming inverters can bolster restoration efforts. Dynamic line ratings and advanced composite core conductors, which the AESO and transmission facility owners (TFOs) have already been studying, could not only help relieve current congestion issues but also provide defences against heat-induced sagging or damages.

Do you find Alberta's electricity system effectively handles extreme events including extreme cold, extreme heat, and wildfires? Please provide rationale for your response.

Alberta's system has recently struggled to handle these types of extreme events. Reviewing the actual vulnerabilities of individual generation facilities and transmission facilities will help plan for future resource adequacy and resilience. Including climate impacts in peak load forecasts is also essential to proactive planning.

Furthermore, as stated in the section above, the AESO, along with the Government of Alberta and the Alberta Utilities Commission (AUC), should:

[6] Monica Curtis and Kari Hyde, "How utilities can reach customers who need energy savings the most," January 15, 2025. https://www.pembina.org/blog/how-utilities-can-reach-customers-who-need-energy-savings-most

[7] Final data on 2023 U.S. demand response programs. U.S. Energy Information Administration, "Annual Electric Power Industry Report, Form EIA-861" (2024). https://www.eia.gov/electricity/data/eia861/

- Expand the availability of independent interties, which could have a positive impact on potential investments by increasing the MSSC limit and enabling larger power plants. Several recent projects are already oversized relative to the MSSC limit.
- Accelerate the use of grid-forming inverters.
- Reform market, tariffs, and other regulations to encourage:
    - energy storage deployment across transmission and distribution systems.
    - strategic opportunities for energy efficiency, demand response, coordinated distributed energy resources, and other demand-side management approaches.

What other factors should be considered when addressing potential transmission system risks related to extreme weather events?

A key lesson in California transmission in recent years is that infrastructure must be maintained and modernized to be fire safe. The AESO and the AUC should work together to ensure there are sufficient maintenance and FireSmart standards for TFOs and to incentivize grid modernization.

As stated above, low-cost grid-enhancing technologies should be adopted as soon as possible to improve transmission line resilience. Dynamic line ratings will also provide data on actual thermal performance of systems. Advanced conductors are by material less prone to sagging. Typology optimization will help optimize and automate where electricity flows, which will be even more necessary during extreme events. Transmission-tied storage should also be encouraged.

Do you have any additional comments?

Pembina Institute appreciates that the AESO is undertaking this work and the contributions of all members of the Alberta Reliability Committee subgroup.

As electricity system resilience is of public interest, we encourage further engagement to continue to invite public input.