

Proposed TPL-007-2 Canadian Variance

For Canadian registered entities, all references to “Attachment 1” in the standard are replaced with “Attachment 1 or Attachment 1-CAN.”

The following variance shall be applicable for Canadian registered entities and replaces, in its entirety, Requirement R7:

- R7.** Each responsible entity, as determined in Requirement R1, that concludes through the benchmark GMD Vulnerability Assessment conducted in Requirement R4 that their System does not meet the performance requirements for the steady state planning benchmark GMD event contained in Table 1, shall develop a Corrective Action Plan (CAP) addressing how the performance requirements will be met. Prior to the implementation of any element of a CAP developed in accordance with Requirement R7, any required regulatory approvals must be obtained. The CAP shall: *[Violation Risk Factor: High] [Time Horizon: Long-term Planning]*

7.1. List System deficiencies and the associated actions needed to achieve required System performance. Examples of such actions include:

- Installation, modification, retirement, or removal of Transmission and generation Facilities and any associated equipment.
- Installation, modification, or removal of Protection Systems or Remedial Action Schemes.
- Use of Operating Procedures, specifying how long they will be needed as part of the CAP.
- Use of Demand-Side Management, new technologies, or other initiatives.

7.2. Be developed within one year of completion of the benchmark GMD Vulnerability Assessment.

7.3. Include a timetable, subject to revision by the responsible entity in Part 7.4, for implementing the selected actions from Part 7.1. The timetable shall:

7.3.1. Specify implementation of non-hardware mitigation, if any, within two years of the later of the development of the CAP or receipt of regulatory approvals, if required; and

7.3.2. Specify implementation of hardware mitigation, if any, within four years of the later of the development of the CAP or receipt of regulatory approvals, if required.

7.4. Be revised if situations beyond the control of the responsible entity determined in Requirement R1 prevent implementation of the CAP within the timetable for implementation provided in Part 7.3. The revised CAP shall document the following, and be updated at least once every 12 calendar months until implemented:

Attachment 1-CAN

Background

While Attachment 1 is an acceptable approach for Canadian registered entities to use, Attachment 1-CAN provides an alternative methodology for defining a 1-in-100 year GMD planning event for study as part of the GMD Vulnerability Assessment(s) in lieu of the benchmark and supplemental GMD events defined in Attachment 1.

General Considerations

The benchmark GMD Vulnerability Assessment requires the use of geophysical and engineering models that need information on a wide range of parameters. One particular approach and a specific data set is used in Attachment 1. As research on these topics continues, Canadian jurisdictions have access to additional data sets and are developing detailed models and analysis techniques that more accurately characterize the region-specific parameters. Such data includes geomagnetic field (based on magnetometers) and earth conductivity information. In some cases, direct geomagnetically induced current measurements are also available to help validate modeling and simulation results. Attachment 1-CAN provides an approach for using such data, where available, to conduct GMD Vulnerability Assessment(s). Where the information available is insufficient to support an alternative approach, Canadian registered entities should use the methodology in Attachment 1.

Given that in some cases no suitable model data exists, assumed values may be used. Any assumptions used must be clearly documented and technically justified. In these cases, a sensitivity analysis may be completed to identify how the assumptions affect the results. In order to facilitate simulation works during planning studies, a simplified model could be used as long as the model is more conservative than a more detailed model.

Calculation of Geoelectric Fields

The benchmark factors involved in the calculation of geoelectric fields are geomagnetic field variations and earth transfer function.¹ The earth transfer function can be obtained from magnetotelluric measurements or earth conductivity models. Assumptions made in doing the modeling must be clearly stated and technically justified. Technically justified information used for calculating geoelectric field may include: technical documents written by governmental entities such as Natural Resources Canada and United States Geological Survey, technical papers published in peer-reviewed journals, or measurements based on sound geophysical principles.

Geomagnetic Disturbance Planning Events

The 1-in-100 year planning event should be based on regionally specific data and technically justifiable statistical analyses (e.g., extreme value theory) and applied to the benchmark and supplemental GMD Vulnerability Assessment(s).

¹ The “earth transfer function” is the relationship between the electric fields and magnetic field variations at the surface of the earth.

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For the benchmark GMD Vulnerability Assessment(s), an entity should consider the large-scale spatial structure of the GMD event. For the supplemental GMD Vulnerability Assessment(s), an entity should consider the small-scale spatial structure of the GMD event (e.g., using magnetometer measurements or realistic electrojet calculations).