ARC TPWG Assessment and Conversion of NERC TPL-004-0 for Alberta TPL-004-AB-0 System Performance Following Extreme BES Events			
Section	**NERC TPL-004-0**	**Alberta TPL-004-AB-0**	**Reason for Difference**
Purpose	System simulations and associated assessments are needed periodically to ensure that reliable systems are developed that meet specified performance requirements, with sufficient lead time and continue to be modified or upgraded as necessary to meet present and future System needs.	The purpose of this reliability standard is to ensure that a reliable transmission system is planned that meets specified performance requirements with sufficient lead time. The transmission system must continue to be modified or upgraded to meet present and future system needs by periodically performing system simulations and associated assessments.	Change to writing style.
Applicability	4.1 Planning Authority 4.2 Transmission Planner	ISO transmission facilities rated at 100 kV and above.	Identify the responsible entity in Alberta. To clarify specific application to BES elements (over 100 kV).
Effective Date		365 calendar days after the date of approval by the Commission.	
Definitions		Italicized terms used in this reliability standard have the meanings as set out in the Alberta Reliability Standards Glossary and in Part 1 of the ISO Rules[1].	Identify defined terms in the ISO Rules.
Requirement	**R1.** The Planning Authority and Transmission Planner shall each demonstrate through a valid assessment that its portion of the interconnected transmission system is evaluated for the risks and consequences of a number of each of the extreme contingencies	**R1.** The ISO must demonstrate through a valid planning assessment that a transmission system is planned such that it has been evaluated for the risks and consequences of a number of each of the extreme contingencies that are listed under	

[1] Defined terms are not italicized in this document, but will appear in the Alberta Reliability Standards document.

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	that are listed under Category D of Table I. To be valid, the Planning Authority's and Transmission Planner's assessment shall:	Category D of Appendix I. To be valid, the ISO planning assessment must:	
Requirement	**R1.1.** Be made annually.	**R1.1** Be carried out annually.	
	R1.2. Be conducted for near-term (years one through five).	**R1.2** Be conducted for near term (year one through five).	
	R1.3. Be supported by a current or past study and/or system simulation testing that addresses each of the following categories, showing system performance following Category D contingencies of Table I. The specific elements selected (from within each of the following categories) for inclusion in these studies and simulations shall be acceptable to the associated Regional Reliability Organization(s).	**R1.3** Be supported by a study and/or system simulation that addresses each of the following categories, showing system performance following Category D contingencies of Appendix I.	**R1.3** Do not require a reference to the RRO.
	R1.3.1. Be performed and evaluated only for those Category D contingencies that would produce the more severe system results or impacts. The rationale for the contingencies selected for evaluation shall be available as supporting information. An explanation of why the remaining simulations would produce less severe system results shall be available as supporting information.	**R1.3.1** Be performed and evaluated only for those Category D contingencies that would produce the more severe system results or impacts. The rationale for the contingencies selected for evaluation must be available as supporting information. An explanation of why the remaining simulations would produce less severe system results must be available as supporting information.	
	R1.3.2. Cover critical system conditions and study years as deemed appropriate by the	**R1.3.2** Cover critical system conditions and study years as considered necessary by the	**R1.3.2** The ISO is the only responsible entity performing

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	responsible entity.	ISO.	the study.
Requirements	**R1.3.3.** Be conducted annually unless changes to system conditions do not warrant such analyses.	**R1.3.3** Be conducted annually unless changes to system conditions do not warrant such analyses.	
	R1.3.4. Have all projected firm transfers modeled.	**R1.3.4** Have all projected firm transfers modeled, if any.	
	R1.3.5. Include existing and planned facilities.	**R1.3.5** Include existing and planned facilities as considered necessary by the ISO.	**R1.3.5** To clarify the entity responsible for determining planned facilities to be included
	R1.3.6. Include Reactive Power resources to ensure that adequate reactive resources are available to meet system performance.	**R1.3.6** Include reactive power resources to ensure that adequate reactive resources are available to meet system performance.	
	R1.3.7. Include the effects of existing and planned protection systems, including any backup or redundant systems.	**R1.3.7** Include the effects of existing and planned protection systems, including any backup or redundant systems.	
	R1.3.8. Include the effects of existing and planned control devices.	**R1.3.8** Include the effects of existing and planned control devices.	
	R1.3.9. Include the planned (including maintenance) outage of any bulk electric equipment (including protection systems or their components) at those demand levels for which planned (including maintenance) outages are performed.	**R1.3.9** Include the planned (including maintenance) outage of any bulk electric equipment (including protection systems or their components) at those demand levels for which planned (including maintenance) outages are performed. This requirement applies only to BES facilities greater than 200 kV or other facilities as specified by the ISO.	**Alberta Variance[2]: R1.3.9** For planned purpose, maintenance outages on 200 kV and greater only are studied with multiple outages. Excluded 138 kV due to uncertainties in planned cases and not practical.

[2] An Alberta variance is a change from the US Reliability Standard that the AESO has determined is material.

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Section	**NERC TPL-004-0**	**Alberta TPL-004-AB-0**	**Reason for Difference**
	R1.4. Consider all contingencies applicable to Category D.	**R1.4** Consider all contingencies applicable to Category D.	
Measure	**M1.** The Planning Authority and Transmission Planner shall have a valid assessment for its system responses as specified in Reliability Standard TPL-004-0_R1.	The following measures correspond to the requirements identified in Section 5 of this reliability standard. For example, MR1 is the measure for R1. These measures will be used by the ISO in carrying out its compliance monitoring duties in accordance with ISO Rule 12. The ISO may consider other data and information, including any provided by a market participant.	Expanded measures to be more specific.
		MR1 The planning assessment will be valid and meet requirement in R1 and associated sub-sections through the following measures: • The scope of the planning assessment identifies where area studies have been conducted in the past year. It also identifies area studies that have been conducted in previous years and are still valid. Where area studies have not been conducted, a plan and schedule to conduct one is included in the planning assessment.	

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		• The planning assessment includes time horizons as specified in R1.2 • The planning assessment has been prepared within the last year. • A certification that the planning assessment complies with each of the R1 technical requirements is provided and states that the planning assessment meets all requirements, identifies requirements not met, and states reasons where the requirement was not met. • A summary list of supporting area studies and needs identification documents is provided. The summary list includes the title and date of the study. The area studies and needs identification documents are provided if requested.	
Requirement	**R2.** The Planning Authority and Transmission Planner shall each document the results of its reliability assessments and shall annually provide the results to its entities' respective NERC Regional Reliability Organization(s), as required by the Regional Reliability Organization.	**R2** The ISO must provide the planning assessment to WECC (as the RE) on an annual basis.	**R2** Identify the responsible entity in Alberta and the reporting relationship. Changed passive term shall to must.

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Section	**NERC TPL-004-0**	**Alberta TPL-004-AB-0**	**Reason for Difference**
Measure		**MR2** A written or email confirmation from WECC (as the RE) that it has received the planning assessment from the ISO. The confirmation includes the date of when the planning assessment was received and source identification information.	
Procedures			
Compliance	**D. Compliance** **1. Compliance Monitoring Process** **1.1. Compliance Monitoring Responsibility** Compliance Monitor: Regional Reliability Organization. Each Compliance Monitor shall report compliance and violations to NERC via the NERC Compliance Reporting Process. **1.2. Compliance Monitoring Period and Reset Timeframe** Annually. **1.3. Data Retention** None specified. **1.4. Additional Compliance Information**		There is no compliance section currently proposed in the Alberta Reliability Standards. A compliance program will be developed at a later date for Alberta Reliability Standards that recognizes the compliance monitoring and enforcement structure in Alberta. This approach is deemed consistent with the existing ISO Rules.

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	None. **2. Levels of Non-Compliance** **2.1. Level 1:** A valid assessment, as defined above, for the near-term planning horizon is not available. **2.2. Level 2:** Not applicable. **2.3. Level 3:** Not applicable. **2.4. Level 4:** Not applicable.		
Regional Differences	**1.** None identified.		Not applicable in Alberta

Appendix 1 - Transmission System Standards – Normal and Emergency Conditions

Category	Contingencies	System Limits or Impacts		
	Initiating Event(s) and Contingency Element(s)	**System Stable and Both Thermal and Voltage Limits Within Applicable Rating [a]**	**Loss of Demand or Curtailed Firm Transmission Service Transfers**	**Cascading**
A No contingencies	All facilities in service	Yes	No	No
B Event resulting in the loss of a single element	Single Line Ground (SLG) or 3-Phase (3Ø) fault, with normal clearing: 1. Generator 2. Transmission circuit 3. Transformer	Yes Yes Yes Yes	No [b] No [b] No [b] No [b]	No No No No
C Event(s) resulting in the loss of two or more (multiple) elements	SLG fault, with ncrmal clearing[e]: 1. Bus section	Yes	Planned/ Controlled[c]	No
	2. Breaker (failure or internal fault)	Yes	Planned/ Controlled[c]	No
	SLG or 3Ø fault, with normal clearing[e], manual system adjustments, followed by another SLG or 3Ø fault, with normal clearing[e] 3. Category B (B1, B2, B3, or B4) contingency, manual system adjustments, followed by another Category B (B1, B2, B3, or B4) contingency	Yes	Planned/ Controlled[c]	No
	Bipolar block, with normal clearing[e]:			
	4. Bipolar (dc) line fault (non 3Ø), with normal clearing[e]:	Yes	Planned/ Controlled[c]	No
	5. Any two circuits of a multiple circuit towerline[f]	Yes	Planned/ Controlled[c]	No
	SLG fault, with delayed clearing[e] (stuck breaker or protection system failure) 6. Generator	Yes	Planned/ Controlled[c]	No
	7. Transformer	Yes	Planned/ Controlled[c]	No
	8. Transmission circuit	Yes	Planned/ Controlled[c]	No
	9. Bus section	Yes	Planned/ Controlled[c]	No

D [d] Extreme event resulting in two or more (multiple) elements removed or cascading out of service	3Ø fault, with delayed clearing[e] (stuck breaker or protection system failure): 1. Generator 2. Transmission circuit 3. Transformer 4. Bus section	Evaluate for risks and consequences • May involve substantial loss of customer demand and generation in a widespread area or areas • Portions or all of the interconnected systems may or may not achieve a new, stable operating point • Evaluation of these events may require joint studies with neighboring systems
	3Ø fault, with normal clearing[e]: 5. Breaker (failure or internal fault)	
	6. Loss of towerline with three or more circuits 7. All transmission lines on a common right-of -way 8. Loss of a substation (one voltage level plus transformers) 9. Loss of a switching station (one voltage level plus transformers) 10. Loss of all generating units at a station 11. Loss of a large load or major load center 12. Failure of a fully redundant special protection system (or remedial action scheme) to operate when required 13. Operation, partial operation, or misoperation of a fully redundant special protection system (or remedial action scheme) in response to an event or abnormal system 14. Impact of severe power swings or oscillations from disturbances in another Regional Reliability Organization	

a) Applicable rating refers to the applicable normal and emergency facility thermal and voltage rating as applied by the facility owner or system voltage limit as determined and consistently applied by the ISO. Applicable ratings may include emergency ratings applicable for short durations as required to permit operating steps necessary to maintain system control. All ratings must be established by the applicable entity consistent with applicable ISO rules addressing facility ratings.

b) Planned or controlled interruption of electric supply to radial customers or some local network customers, connected to or supplied by the faulted element or by the affected area, may occur in certain areas without impacting the overall reliability of the interconnected transmission systems. To prepare for the next contingency, system adjustments are permitted, including curtailments of contracted firm (non-recallable reserved) transmission service electric power transfers.

c) Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted firm (non-recallable reserved) transmission service electric power transfers may be necessary to maintain the overall reliability of the interconnected transmission systems.

d) A number of extreme contingencies that are listed under Category D and judged to be critical by the transmission planning entity(ies) will be selected for evaluation. It is not expected that all possible facility outages under each listed contingency of Category D will be evaluated.

e) Normal clearing is when the protection system operates as designed and the fault is cleared in the time normally expected with proper functioning of the installed protection systems. Delayed clearing of a fault is due to failure of any protection system component such as a relay, circuit breaker, or current transformer, and not because of an intentional design delay.

f) System assessments may exclude these events where multiple circuit towers are used over short distances (i.e., station entrance, river crossings) in accordance with exemption criteria.

Proposed Terms for the ARS Glossary:

demand" – means:

- The rate at which electric energy is delivered to or by a system or part of a system, generally expressed in kilowatts or megawatts, at a given instant or averaged over any designated interval of time.
- The rate at which energy is being used by the customer.

"element" - means any electrical device with terminals that may be connected to other electrical devices such as a generator, transformer, circuit breaker, bus section, or transmission line. An element may be comprised of one or more components.

"facility" - means a set of electrical equipment that operates as a single bulk electric system element (i.e., a line, a generator, a shunt compensator, transformer, etc.).

"misoperation" means:

- Any failure of a protection system element to operate within the specified time when a fault or abnormal condition occurs within a zone of protection.
- Any operation for a fault not within a zone of protection (other than operation as backup protection for a fault in an adjacent zone that is not cleared within a specified time for the protection for that zone).
- Any unintentional protection system operation when no fault or other abnormal condition has occurred unrelated to on-site maintenance and testing activity.

"normal clearing" - means a protection system operates as designed and the *fault* is cleared in the time normally expected with proper functioning of the installed protection systems.

"planning assessment" - means protective relays, associated communication systems, voltage and current sensing devices, station batteries and DC control circuitry.

"protection system" - means protective relays, associated communication systems, voltage and current sensing devices, station batteries and DC control circuitry.

Existing Defined Terms Used in this Standard:
(As included in the ISO Rules Definitions or Alberta Reliability Standards Glossary)

- cascading♦
- contingency♦
- ISO
- load
- outage
- remedial action scheme (RAS)
- rating♦
- reliability
- reliability standard
- Western Electricity Coordinating Council (WECC)

♦ Term appears in the Alberta Reliability Standards Glossary of Terms – April 2009 rules cycle.