

ARC Technical Work Group and Operations Work Group Assessment and Conversion of WECC PRC-004-WECC-1 – Protection System and Remedial Action Scheme Misoperation to Alberta PRC-004-WECC-AB-1 – Protection System and Remedial Action Scheme Misoperation

Section	WECC PRC-004-WECC-1	Alberta PRC-004-WECC-AB-1	Reason for Difference ¹
Purpose	Regional Reliability Standard to ensure all transmission and generation Protection System and Remedial Action Scheme (RAS) Misoperations on Transmission Paths and RAS defined in section 4 are analyzed and/or mitigated.	The purpose of this reliability standard is to ensure all misoperations of transmission and generation protection systems and RASs on transmission paths are analyzed and mitigated.	Align the purpose with the contents of the reliability standard.

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¹ The following revisions have been made throughout this proposed reliability standard:

- Identified the responsible entities in Alberta.
- Applied a consistent writing style and added clarity.
- Changed passive terms such as “shall” to “must”.
- Developed measures specific to the requirements.

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Applicability	<p>4.1. Transmission Owners of selected WECC major transmission path facilities and RAS listed in tables titled “Major WECC Transfer Paths in the Bulk Electric System” provided at (http://www.wecc.biz/documents/library ...) and “Major WECC Remedial Action Schemes (RAS)” provided at (http://www.wecc.biz/documents/library ...)</p> <p>4.2. Generator Owners that own RAS listed in the Table titled “Major WECC Remedial Action Schemes (RAS)” provided at (http://www.wecc.biz/documents/library ...)</p> <p>4.3. Transmission Operators that operate major transmission path facilities and RAS listed in Tables titled “Major WECC Transfer Paths in the Bulk Electric System” provided at (http://www.wecc.biz/documents/library ...) and “Major WECC Remedial Action Schemes (RAS)” provided at (http://www.wecc.biz/documents/library ...)</p>	<p><u>This reliability standard applies to:</u></p> <p>- <u>TFOs</u> of selected WECC major transmission path facilities and RAS listed in the tables titled “Major WECC Transfer Paths in the Bulk Electric System” provided at (http://www.wecc.biz/documents/library) and “Major WECC Remedial Action Schemes (RAS)” provided at (http://www.wecc.biz/documents/library)</p> <p>- <u>GFOs</u> that own components of RASs listed in the table titled “Major WECC Remedial Action Schemes (RAS)” provided at (http://www.wecc.biz/documents/library)</p> <p>- <u>GOPs that operate</u> RASs listed in the table titled “Major WECC Remedial Action Schemes (RAS)” provided at (http://www.wecc.biz/documents/library)</p> <p>- <u>ISO</u></p>	<p>Deleted: Transmission Owners</p> <p>Deleted: Generator Owners</p> <p>Deleted: T</p> <p>Deleted: T</p> <p>Deleted: 4.3.</p> <p>Deleted: Transmission Operators</p> <p>Deleted: TFOs that operate major transmission path facilities and RAS listed in Tables titled “Major WECC Transfer Paths in the Bulk Electric System” provided at (http://www.wecc.biz/documents/library ...) and “Major WECC Remedial Action Schemes (RAS)” provided at (http://www.wecc.biz/documents/library ...)</p> <p>Deleted: On the first day of the second quarter following applicable regulatory approval.</p>
Effective Date	<p>On the first day of the second quarter following applicable regulatory approval.</p>	<p><u>10 calendar days after the date of approval by the Commission.</u></p>	<p>Deleted: On the first day of the second quarter following applicable regulatory approval.</p>

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Definitions		Italicized terms used in this reliability standard have the same meanings as set out in the Alberta Reliability Standards Glossary of Terms and Part 1 of the ISO Rules. ²	Added definitions section to the Alberta reliability standard.
Requirement	R.1.1. System Operators and System Protection personnel of the Transmission Owners and Generator Owners shall analyze all Protection System and RAS operations. <i>[Violation Risk Factor: Lower] [Time Horizon: Operations Assessment]</i>	R.1.1. <u>Each TFO, GFO and GOP must ensure that its system operators and protection personnel analyze all protection system and RAS operations as follows:</u>	
Measure	M1.1. Transmission Owners and Generation Owners shall have evidence that they reported and analyzed all Protection System and RAS operations.		No measure required, refer to measures in the sub-requirements.
Requirement	R1.1.1. System Operators shall review all tripping of transmission elements and RAS operations to identify apparent Misoperations within 24 hours.	R1.1.1. <u>Each TFO and GOP must review all tripping of transmission elements and RAS operations to identify apparent misoperations within 24 hours.</u>	
Measure	M1.1.1 Transmission Owners and Generation Owners shall have	<u>M1.1.1 Documentation exists that confirms a review was completed and in the timelines, as per requirement</u>	

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² Defined terms are not italicized in this document, but will appear in the Alberta Reliability Standards document.

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	evidence that System Operating personnel reviewed all operations of Protection System and RAS within 24 hours.	<u>R1.1</u>	
Requirement	R1.2. System Protection personnel shall analyze all operations of Protection Systems and RAS within 20 business days for correctness to characterize whether a Misoperation has occurred that may not have been identified by System Operators.	R1.2. TFO and GFO protection personnel must analyze all operations of protection systems and RAS within 20 business days of the operation of either such system or RAS for correctness to determine whether a misoperation has occurred.	
Measure	M1.2 Transmission Owners and Generation Owners shall have evidence that System Protection personnel analyzed all operations of Protection System and RAS for correctness within 20 business days.	M1.2 Documentation exists that confirms an analysis was completed and in the timelines as per requirement <u>R1.2</u>	
Requirement	R.2. Transmission Owners and Generator Owners shall perform the following actions for each Misoperation of the Protection System or RAS. It is not intended that Requirements R2.1 through R2.4 apply to Protection System and/or RAS actions that appear to be entirely reasonable and correct at the time of occurrence and associated system performance is fully	R.2. TFOs and GFOs must each perform the actions listed in requirements R2.1 to R2.4 inclusive for each misoperation of the protection system or RAS, subject to the following: Requirements R2.1 to R2.4 inclusive do not apply to protection system and/or RAS operations that appear to have operated correctly at the time of occurrence. If the TFO or GFO later finds through system protection personnel analysis that the protection system or RAS	Added Table 1 at the end of this document to provide a simplified summary of the requirements in R2 and its subsections.

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	compliant with NERC Reliability Standards. If the Transmission Owner or Generator Owner later finds the Protection System or RAS operation to be incorrect through System Protection personnel analysis, the requirements of R2.1 through R2.4 become applicable at the time the Transmission Owner or Generator Owner identifies the Misoperation:.	<u>misoperated</u> , the requirements of R2.1 <u>to</u> R2.4 <u>inclusive</u> become applicable at the time the <u>TFO</u> or <u>GFO</u> identifies the <u>misoperation</u> . <u>Table 1 is provided as a simplified summary of the requirements in R2.1 to R2.4 inclusive.</u>	
Measure	M2. Transmission Owners and Generation Owners shall have evidence for the following.	M2.	No measure required, refer to measures in the sub-requirements.
Requirement	R2.1. If the Protection System or RAS has a Security-Based Misoperation and two or more Functionally Equivalent Protection Systems (FEPS) or Functionally Equivalent RAS (FERAS) remain in service to ensure Bulk Electric System (BES) reliability, the Transmission Owners or Generator Owners shall remove from service the Protection System or RAS that misoperated within 22 hours following identification of the Misoperation. Repair or replacement of the failed Protection System or RAS	R2.1. If the <u>protection system</u> or RAS has a <u>security-based misoperation</u> and two or more <u>FEPS</u> or <u>FERAS</u> remain in service to ensure <u>BES</u> reliability, <u>each</u> <u>TFO</u> or <u>GFO</u> <u>must</u> remove from service the <u>protection system</u> or RAS that misoperated <u>within 22 hours</u> following <u>the</u> identification of the <u>misoperation</u> . Repair or replacement of the failed <u>protection system</u> or RAS is at the discretion of the <u>TFO</u> or <u>GFO</u> .	

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	is at the Transmission Owners' and Generator Owners' discretion. <i>[Violation Risk Factor: High] [Time Horizon: Same-day Operations]</i>		
Measure	M2.1 Transmission Owners and Generation Owners shall have evidence that they removed the Protection System or RAS that misoperated from service within 22 hours following identification of the Protection System or RAS Misoperation.	M2.1 Evidence exists and shows that required actions were taken in the timelines, specified in requirement <u>R2.1</u>	

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Requirement	R2.2. If the Protection System or RAS has a Security-Based Misoperation and only one FEPS or FERAS remains in service to ensure BES reliability, the Transmission Owner or Generator Owner shall perform the following. <i>[Violation Risk Factor: High] [Time Horizon: Same-day Operations]</i>	R2.2. If the <u>protection system</u> or RAS has a <u>security-based misoperation</u> and only one FEPS or FERAS remains in service to ensure BES reliability, the <u>TFO or GFO responsible for the protection system or RAS, as the case may be, must</u> perform the following:	
Measure	M2.2 Transmission Owners and Generation Owners shall have evidence that they removed from service and repaired the Protection System or RAS that misoperated per measurements M2.2.1 through M2.2.2.		
Requirement	R2.2.1. Following identification of the Protection System or RAS Misoperation, Transmission Owners and Generator Owners shall remove from service within 22 hours for repair or modification the Protection System or RAS that misoperated.	R2.2.1. <u>Remove</u> from service, within 22 hours for repair or modification, the <u>protection system</u> or RAS that misoperated.	
Measure	M2.2.1 Transmission Owners and Generation Owners shall have evidence that they removed the Protection System or RAS that misoperated from service within 22	M2.2.1 <u>Evidence exists and shows that required actions were taken in the timelines, specified in requirement R2.2.1.</u>	

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	hours following identification of the Protection System or RAS Misoperation.		
Requirement	R2.2.2. The Transmission Owner or Generator Owner shall repair or replace any Protection System or RAS that misoperated with a FEPS or FERAS within 20 business days of the date of removal. The Transmission Owner or Generator Owner shall remove the Element from service or disable the RAS if repair or replacement is not completed within 20 business days	R2.2.2. <u>Repair</u> or replace any <u>protection system</u> or RAS that misoperated with a FEPS or FERAS within 20 business days of the date of removal. R 2.2.3. <u>Remove the element from service or disable the RAS if repair or replacement is not completed within 20 business days.</u>	
Measure	M2.2.2 Transmission Owners and Generation Owners shall have evidence that they repaired or replaced the Protection System or RAS that misoperated within 20 business days or either removed the Element from service or disabled the RAS.	M2.2.2 <u>Evidence exists and shows that required actions were taken in the timelines, specified in requirement R2.2.2</u> M2.2.3 <u>Evidence exists and shows that required actions were taken in the timelines, specified in requirement R2.2.3</u>	
Requirement	R2.3. If the Protection System or RAS has a Security-Based or Dependability-Based Misoperation and a FEPS and FERAS is not in service to ensure BES reliability, Transmission Owners or	R2.3. If the <u>protection system</u> or RAS has a <u>security-based or dependability-based misoperation</u> and a <u>FEPS, or FERAS</u> is not in service to ensure BES reliability, <u>the TFO or GFO responsible for the protection system or RAS, as the case may be, must</u>	

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Section	WECC PRC-004-WECC-1	Alberta PRC-004-WECC-AB-1	Reason for Difference ¹
	Generator Owners shall repair and place back in service within 22 hours the Protection System or RAS that misoperated. If this cannot be done, then Transmission Owners and Generator Owners shall perform the following. <i>[Violation Risk Factor: High] [Time Horizon: Same-day Operations]</i>	repair and place back in service within 22 hours the <u>protection system</u> or RAS that misoperated. If this cannot be done, <u>the responsible TFO or GFO must</u> perform the following;	
Measure	M2.3 The Transmission Owners and Generation Owners shall have evidence that they repaired the Protection System or RAS that misoperated within 22 hours following identification of the Protection System or RAS Misoperation.	M2.3 Evidence exists and shows that required actions were taken in the timelines specified in requirement R2.3 .	
Requirement	R2.3.1. When a FEPS is not available, the Transmission Owners shall remove the associated Element from service.	R2.3.1. When a FEPS is not available, remove the associated element from service.	
Measure	M2.3.1 The Transmission Owner shall have evidence that it removed the associated Element from service.	M2.3.1 Evidence exists and shows that required actions were taken in the timelines specified in requirement R2.3.1 .	
Requirement	R2.3.2. When FERAS is not available, then	R2.3.2. When FERAS is not available, <u>meet one of the following requirements</u> ;	No measure required, refer to measures in the sub-requirements.

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Measure	M2.3.2 The Generator Owners and Transmission Operators shall have documentation describing all actions taken that adjusted generation or SOLs and operated facilities within established limits.		
Requirement	R2.3.2.1. The Generator Owners shall adjust generation to a reliable operating level, or	R2.3.2.1 <u>If the responsible entity is a GFO, it must advise the ISO and adjust generation to a reliable operating level as directed by the ISO.</u>	Deleted: . Deleted: The Deleted: Deleted: Generator Owners Deleted: s Deleted: shall Deleted: , or Deleted: , Deleted: . Deleted: Transmission Operators Deleted: The Deleted: s Deleted: shall Deleted: established Deleted: limits
Measure		M2.3.2.1 Evidence exists and shows that required actions were taken in the timelines specified in requirement R2.3.2.1.	
Requirement	R2.3.2.2. Transmission Operators shall adjust the SOL and operate the facilities within established limits.	R2.3.2.2 <u>If the responsible entity is a TFO, it must advise the ISO and operate the facilities within the adjusted SOL as determined and directed by the ISO.</u>	Deleted: . Deleted: . Deleted: Protection Deleted: System Deleted: Deleted: Dependability Deleted: Based Deleted: Misoperation Deleted: Element Deleted: Protection Deleted: System
Measure		M2.3.2.2 Evidence exists and shows that required actions were taken in the timelines specified in requirement R2.3.2.2.	
Requirement	R2.4. If the Protection System or RAS has a Dependability-Based Misoperation but has one or more FEPS or FERAS that operated correctly, the associated Element or transmission path may remain in	R2.4 If the <u>protection system</u> or RAS has a <u>dependability-based misoperation</u> but has one or more FEPS or FERAS that operated correctly, the associated <u>element</u> or transmission path may remain in service without removing from service the <u>protection system</u> or RAS that failed, provided one of	

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Section	WECC PRC-004-WECC-1	Alberta PRC-004-WECC-AB-1	Reason for Difference ¹
	service without removing from service the Protection System or RAS that failed, provided one of the following is performed.	the following is performed:	Deleted: .
Measure	M2.4 Transmission Owners and Generation Owners shall have evidence that they repaired or replaced the Protection System or RAS that misoperated including documentation that describes the actions taken.		No measure required, refer to measures in the sub-requirements. Deleted: .
Requirement	R2.4.1. Transmission Owners or Generator Owners shall repair or replace any Protection System or RAS that misoperated with FEPS and FERAS within 20 business days of the date of the Misoperation identification, or	R2.4.1. Each TFO or GFO must repair or replace any protection system or RAS that misoperated with FEPS and FERAS within 20 business days of the date of the misoperation identification, or	Deleted: Transmission Owners Deleted: s Deleted: Generator Owners Deleted: s Deleted: shall Deleted: Protection Deleted: System Deleted: Misoperation
Measure	M2.4.1 Transmission Owners and Generation Owners shall have evidence that they repaired or replaced the Protection System or RAS that misoperated within 20 business days of the misoperation identification.	M2.4.1 Evidence exists and shows that required actions were taken in the timelines, specified in requirement R2.4.1.	Deleted: . Deleted: Transmission Owners Deleted: s Deleted: Generator Owners Deleted: s
Requirement	R2.4.2. Transmission Owners or Generator Owners shall remove from service the associated Element or	R2.4.2. Each TFO or GFO must remove from service the associated element or RAS.	Deleted: shall Deleted: Element Deleted: [Violation Risk Factor: Lower] [Time Horizon: Operations Assessment]

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	RAS. [Violation Risk Factor: Lower] [Time Horizon: Operations Assessment]		
Measure	M2.4.2 Transmission Owners and Generation Owners shall have evidence that they removed the associated Element or RAS from service.	M2.4.2 Evidence exists and shows that required actions were taken in the timelines, specified in requirement R2.4.2.	
Requirement	R.3. Transmission Owners and Generation Owners shall submit Misoperation incident reports to WECC within 10 business days for the following. [Violation Risk Factor: Lower] [Time Horizon: Operations Assessment]	R.3. TFOs and GFOs must submit a misoperation incident report to the ISO within six business days of identifying the misoperation for the following.	
Measure	M3. Transmission Owners and Generation Owners shall have evidence that they reported the following within 10 business days.	MR3. Misoperation incident reports containing content specified in requirements R3.1 and R3.2. Misoperation incident report is submitted within timelines specified in R3.	
Requirement	R3.1. Identification of a Misoperation of a Protection System and/or RAS,	R3.1. Identification of a misoperation of a protection system and/or RAS,	

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Measure	M3.1 Identification of all Protection System and RAS Misoperations and corrective actions taken or planned.	Refer to MR3.	
Requirement	R3.2. Completion of repairs or the replacement of Protection System and/or RAS that misoperated.	R3.2. Completion of repairs or the replacement of <u>the protection system</u> and/or RAS that misoperated.	
Measure	M3.2 Completion of repair or replacement of Protection System and/or RAS that misoperated.	Refer to MR3.	
Requirement		R4 The <u>ISO</u> must submit misoperation incident reports to WECC within 10 business days <u>of identifying the misoperation.</u>	
Measure		MR4 Confirmation exists that incident reports as specified in requirement R4 were received within the timelines specified or evidence that requests for confirmation were made for the incident reports provided as specified in requirement R4.	
Procedures	None identified	None identified	
Compliance	To view the compliance section D of the NERC reliability standard follow this link: http://www.nerc.com/files/PRC-004-WECC-1.pdf		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

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- Deleted: system and/or RAS that misoperated.
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ARC Technical Work Group and Operations Work Group Assessment and Conversion of WECC PRC-004-WECC-1 – Protection System and Remedial Action Scheme Misoperation to Alberta PRC-004-WECC-AB-1 – Protection System and Remedial Action Scheme Misoperation

Section	WECC PRC-004-WECC-1	Alberta PRC-004-WECC-AB-1	Reason for Difference ¹
			<p>recognizes the compliance monitoring and enforcement structure in Alberta.</p> <p>This approach is deemed consistent with the existing ISO Rules.</p>
Regional Differences	None identified	None identified	Not applicable in Alberta

Table 1

<u>PRC - 004 - WECC - 1 Requirement R2 - Table of Required Actions for Protection System or RAS Misoperation</u>					
<u>Protective System/RAS Situation</u>			<u>Required Mitigating Actions</u>		
<u>Protection Basis:</u>	<u>Number of FEPS or RAS in place after misoperation</u>	<u>Misoperating protection system is :</u>	<u>Protection System/RAS Removal Requirement</u>	<u>Protection System/RAS Repair or Replacement Requirement</u>	<u>Element Removal Requirement</u>
<u>Security</u>	<u>2 or more</u>	<u>PS</u>	<u>Remove within 22h.</u>	<u>At owners discretion.</u>	
	<u>1</u>	<u>PS</u>	<u>Remove within 22h.</u>	<u>Repair within 20 days.</u>	<u>Remove element from service.</u>
	<u>0</u>	<u>PS</u>	<u>None.</u>	<u>Repair within 22 hours.</u>	<u>If not repaired in 22 hours then remove element from service.</u>
	<u>2 or more</u>	<u>RAS</u>	<u>Remove within 22h.</u>	<u>At owners discretion.</u>	
	<u>1</u>	<u>RAS</u>	<u>Remove within 22h.</u>	<u>Repair within 20 days.</u>	<u>If not repaired in 20 days then disable RAS or remove element from service.</u>
	<u>0</u>	<u>RAS</u>	<u>None.</u>	<u>Repair within 22 hours.</u>	<u>Either the TFO or GFO must advise the ISO and adjust generating operating levels to a reliable operating level as directed by the ISO or the ISO will adjust the SOL and the TFOs will operate the facilities within established limits.</u>
<u>Dependability</u>	<u>1 or more that operated correctly</u>	<u>PS</u>	<u>Can leave in service.</u>	<u>Repair in 20 days or remove element from service.</u>	
	<u>0</u>	<u>PS</u>	<u>None.</u>	<u>Repair within 22 hours.</u>	<u>If not repaired in 22 hours then remove element from service.</u>
	<u>1 or more that operated correctly</u>	<u>RAS</u>	<u>Can leave in service.</u>	<u>Repair in 20 days or remove RAS or element from service.</u>	
	<u>0</u>	<u>RAS</u>	<u>None.</u>	<u>Repair within 22 hours.</u>	<u>Either the TFO or GFO must advise the ISO and adjust generating operating levels to a reliable operating level as directed by the ISO or the ISO will adjust the SOL and the TFOs will operate the facilities within established limits.</u>

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Proposed Terms for the ARS Glossary:

“functionally equivalent protection system or “FEPS” means a protection system that provides performance as follows:

- Each *protection system* can detect the same faults within the zone of protection and provide the clearing times and coordination needed to comply with all *reliability standards*.
- Each *protection system* may have different components and operating characteristics.

“functionally equivalent RAS” or “FERAS” means a RAS that provides the same performance as follows:

- Each RAS can detect the same conditions and provide mitigation to comply with all *reliability standards*.
- Each RAS may have different components and operating characteristics.

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“security-based misoperation” means a *misoperation* caused by the incorrect operation of a protection system or RAS. Security is a component of reliability and is the measure of a device’s certainty not to operate falsely.

“dependability-based misoperation” means the absence of a *protection system* or RAS operation when intended. Dependability is a component of reliability and is the measure of a device’s certainty to operate when required.

Defined Terms Used in this Standard:

(As included in the ISO Rules Definitions or Alberta Reliability Standards Glossary)

- *bulk electric system (BES)**
- *day*
- *element**
- *facility*
- *generation facility owner (GFO)*
- *Independent System Operator (ISO)*
- *misoperation**
- *protection system**
- *reliability standard*
- *remedial action scheme (RAS)*
- *system**
- *system operating limit (SOL)▼*
- *transmission facility owner (TFO)*
- *Western Electricity Coordinating Council (WECC)*

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

* Term appears in the Alberta Reliability Standards Glossary of Terms – July 2009 rules cycle

▼ “system operating limit” is being amended to include its acronym “SOL”. There is no further change to the definition.