

WECC Standard PRC-STD-003-1 – Protective Relay and Remedial Action Scheme Misoperation

A. Introduction

- 1. Title:** Protective Relay and Remedial Action Scheme Misoperation
- 2. Number:** PRC-STD-003-1
- 3. Purpose:** Regional Reliability Standard to ensure all transmission and generation Protection System Misoperations affecting the reliability of the Bulk Electric System (BES) are analyzed and mitigated. PRC-STD-003-1 is a Regional Reliability Standard that meets Requirement 1 of the NERC Standard PRC-003-1.

4. Applicability

4.1. This criterion applies to each Transmission Operator or Transmission Owner (as specified in Section B) of a transmission path in the Attachment A – WECC Table 2 and owners of Remedial Action Schemes listed in Table 3, Attachment B, Existing WECC Remedial Action Schemes (Source: Participants Subject to Criterion).

5. Effective Date: This Western Electricity Coordinating Council Regional Reliability Standard will be effective when approved by the Federal Energy Regulatory Commission under Section 215 of the Federal Power Act. This Regional Reliability Standard shall be in effect for one year from the date of Commission approval or until a North American Standard or a revised Western Electricity Coordinating Council Regional Reliability Standard goes into place, whichever occurs first. At no time shall this regional Standard be enforced in addition to a similar North American Standard.

B. Requirements

WR1.

Owners of protective relays and Remedial Action Schemes (RAS) applied to path elements of selected WECC major transmission path facilities (listed in Attachment A – Table 2) and RAS (listed in Attachment B – Table 3) must take the following action for each known or probable relay misoperation:

- a. If functionally equivalent protective relaying or RAS remains in service to ensure bulk transmission system reliability; the relay or RAS that misoperated is to be removed from service for repair or modification within 22 hours of the relay or RAS misoperation. The relay or RAS shall be replaced, repaired, or modified such that the incorrect operation will not be repeated.
- b. If functionally equivalent protective relaying or RAS does not remain in service that will ensure bulk transmission system reliability, and the relay or RAS that misoperated cannot be repaired and placed back in service within 22 hours, the associated transmission path facility must be removed from service. The remaining path facilities, if any, must be de-rated to a reliable operating level.
- c. If the relay or RAS misoperates and there is some protection but not entirely functionally equivalent, the relay or RAS must be repaired or removed from service within 22 hours. The associated transmission may remain in service; however, system operation must fully comply with WECC and NERC operating standards. This may require an adjustment of operating levels.

WECC Standard PRC-STD-003-1 – Protective Relay and Remedial Action Scheme Misoperation

- d. Protective relays or RAS removed from service must be repaired or replaced with functionally equivalent protective relays or RAS within 20 Business Days of removal, or the system shall be operated at levels that meet WECC Standards and NERC Standards or the associated transmission path elements shall be removed from service.

It is not intended that the above requirements apply to system protection and/or RAS actions that appear to be entirely reasonable and correct at the time of occurrence and associated system performance is fully compliant with WECC and NERC standards, and the protective relaying or RAS operation is later found to be incorrect. In such cases, upon determination of the incorrect operation, the requirements of (a) through (d) above will become applicable at the time the incorrect operation is identified. (Source: WECC Criterion)

C. Measures

WM1. A Transmission Operator and/or owners of Remedial Action Schemes identified in Section A.4.1 shall submit to the WECC office the completed Protective Relay and Remedial Action Scheme Misoperation Reporting Form. (Source: Data Reporting Requirement)

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

Compliance Monitor – British Columbia Utilities Commission

Compliance Monitor's Administrator – Western Electricity Coordinating Council

1.2 Compliance Monitoring Period

At Occurrence

With respect to requirements (a) through (c) of Section B, by no later than 5 Business Days following the occurrence of a known or probable relay misoperation and/or a known or probable RAS misoperation, a Responsible Entity identified in Section A.4.1 shall submit to the WECC office the completed Protective Relay and Remedial Action Scheme Misoperation Reporting Form(s) as specified in Form A.9 (available on the WECC web site).

With respect to requirement (d) of Section B, by no later than 30 Business Days following the occurrence of a known or probable relay misoperation and/or a known or probable RAS misoperation, a Responsible Entity identified in Section A.4.1 shall submit to the WECC office the completed Protective Relay and Remedial Action Scheme Misoperation Reporting Form(s) as specified in Form A.9 (available on the WECC web site). (Source: Data Reporting Requirement)

1.3 Data Retention

Data will be retained in electronic form for at least one year. The retention period will be evaluated before expiration of one year to determine if a longer retention period is necessary. If the data is being reviewed to address a question of compliance, the data will be saved beyond the normal retention period until the question is formally resolved. (Source: NERC Language)

2. Levels of Non-Compliance

2.1. Level 1: There shall be a Level 1 non-compliance if any of the following conditions exist:

2.1.1 For requirements (a) through (c) of Section B, the relay or RAS that misoperated was removed from service, repaired, or other compliance measures implemented as described in requirements (a) through (c) in > 22 hours but :5 24 hours.

2.1.2 For requirement (d) of Section B, repairs or replacement > 20 business days :5 25 business days and system operation not adjusted to comply with applicable WECC Standards and NERC Standards in the case where there is not redundant relay protection or RAS.

2.2. Level 2: There shall be a Level 2 non-compliance if any of the following conditions exist:

2.2.1 For requirements (a) through (c) of Section B, the relay or RAS that misoperated was removed from service, repaired, or other compliance measures implemented as described in requirements (a) through (c) in > 24 hours but :5 28 hours.

2.2.2 For requirement (d) of Section B, repairs or replacement > 25 business days :5 28 business days and system operation not adjusted to comply with applicable WECC Standards and NERC Standards in the case where there is not redundant relay protection or RAS.

2.3. Level 3: There shall be a Level 3 non-compliance if any of the following conditions exist:

2.3.1 For requirements (a) through (c) of Section B, the relay or RAS that misoperated was removed from service, repaired, or other compliance measures implemented as described in requirements (a) through (c) in > 28 hours but :5 32 hours.

2.3.2 For requirement (d) of Section B, repairs or replacement > 28 business days :5 30 business days and system operation not adjusted to comply with applicable WECC Standards and NERC Standards in the case where there is not redundant relay protection or RAS.

2.4. Level 4: There shall be a Level 4 non-compliance if any of the following conditions exist:

2.4.1 For requirements (a) through (c) of Section B, the relay or RAS that misoperated was removed from service, repaired, or other compliance measures implemented as described in requirements (a) through (c) in < 32 hours.

2.4.2 For requirement (d) of Section B, repairs or replacement < 30 business days and system operation not adjusted to comply with applicable

WECC Standard PRC-STD-003-1 – Protective Relay and Remedial Action Scheme Misoperation

WECC Standards and NERC Standards in the case where there is not redundant relay protection or RAS.

E. Regional Differences

Version History – Shows Approval History and Summary of Changes in the Action Field

Version	Date	Action	Change Tracking
----------------	-------------	---------------	------------------------

References¹:

NERC Standard PRC-016-0 R2 requires corrective action but there is no required timeframe to remove element from service or to derate the path if required.

¹References are provided for informational purposes only and are not a component of WECC Reliability Standards.

**WECC Standard PRC-STD-003-1 – Protective Relay and Remedial Action Scheme
Misoperation**

ATTACHMENT A
Table 2
Existing WECC Transfer Paths (BPTP)
(Revised February 1, 2006)

	PATH NAME*	Path Number	Operating Agent
1.	Alberta – British Columbia	1	BCTC/AESO
2.	Northwest – British Columbia	3	BCTC/BPA
3.	West of Cascades – North	4	BPA
4.	West of Cascades – South	5	BPA
5.	West of Hatwai	6	AVA/BPA
6.	Montana to Northwest	8	NWMT
7.	Idaho to Northwest	14	IPC
8.	South of Los Banos or Midway- Los Banos	15	CISO
9.	Idaho – Sierra	16	SPP
10.	Borah West	17	IPC
11.	Idaho – Montana	18	NWMT
12.	Bridger West	19	PAC
13.	Path C	20	PAC
14.	Southwest of Four Corners	22	APS
15.	PG&E – SPP	24	CISO
16.	Northern – Southern California	26	CISO
17.	Intmntn. Power Project DC Line	27	LADWP
18.	TOT 1A	30	WAPA
19.	TOT 2A	31	WAPA
20.	Pavant – Gonder 230 kV Intermountain – Gonder 230 kV	32	SPP/LADWP
21.	TOT 2B	34	PAC
22.	TOT 2C	35	NEVP
23.	TOT 3	36	WAPA
24.	TOT 5	39	WAPA
25.	SDGE – CFE	45	CISO/CFE
26.	West of Colorado River (WOR)	46	CISO
27.	Southern New Mexico (NM1)	47	EPE
28.	Northern New Mexico (NM2)	48	PNM
29.	East of the Colorado River (EOR)	49	APS
30.	Cholla – Pinnacle Peak	50	APS
31.	Southern Navajo	51	APS
32.	Brownlee East	55	IPC
33.	Lugo – Victorville 500 kV	61	CISO/LDWP
34.	Pacific DC Intertie	65	BPA/LADWP
35.	COI	66	BPA/CISO
36.	North of John Day cutplane	73	BPA
37.	Alturas	76	SPP
38.	Montana Southeast	80	NWMT
39.	SCIT**		CISO
40.	COI/PDCI – North of John Day cutplane**		BPA

• For an explanation of terms, path numbers, and definition for the paths refer to WECC’s Path Rating Catalog.

** The SCIT and COI/PDCI-North of John Day Cutplane are paths that are operated in accordance with nomograms identified in WECC’s Path Rating Catalog.

WECC Standard PRC-STD-003-1 – Protective Relay and Remedial Action Scheme Misoperation

ATTACHMENT B
Table 3
Existing WECC Remedial Action Schemes
(Revised March 1, 2006)

	Path Name*	Path	RAS	Involved Parties
1.	Alberta – British Columbia	Path 1	Remedial actions are required to achieve the rated transfer capability. Most involve tripping tie lines for outages in the BCTC system. East to West: For high transfers, generation tripping is required north of the SOK cutplane in Alberta.	BCTC/AESO
2.	Northwest – British Columbia	Path 3	Generator and reactive tripping in the BCTC system to protect against the impact caused by various contingencies during transfers between British Columbia and the Northwest.	BCTC/BPA
3.	West of Hatwai	Path 6	Generator dropping (Libby, Noxon, Lancaster, Dworshak); Reactor tripping (Garrison); Tripping of Miles City DC link.	AVA/BPA
4.	Montana to Northwest	Path 8	Tripping Colstrip by ATR (NWMT); Switching shunt reactors at Garrison 500 kV; Tripping the back-to-back DC tie at Miles City; Tripping Libby, and Noxon generation by WM-RAS (BPA).	NWMT/BPA
5.	Idaho to Northwest	Path 14	Generator Runback at Hells Canyon; Jim Bridger tripping for loss of Midpoint – Summer Lake 500 kV line.	IPC
6.	Midway-Los Banos	Path 15	CDWR and PG&E pump load dropping north of Path 15. PG&E service area load dropping north of Path 15. PG&E service area generation dropping south of Path 15.	CISO
7.	Idaho Sierra	Path 16	Automatic load shedding is required when the Alturas line is open for loss of the Midpoint-Humbolt 345 kV line during high Sierra system imports.	SPP
8.	Bridger West	Path 19	Jim Bridger tripping for delayed clearing and multi-line faults; Addition of shunt capacitors at Jim Bridger, Kinport and Goshen and series capacitor bypassing at Burns.	IPC
9.	IPP DC Line	Path 27	IPP Contingency Arming System trips one or two IPP generating units.	LDWP
10.	TOT1A	Path 30	Bonanza and Flaming Gorge generation is tripped for loss of the Bonanza-Mona 345 kV line to achieve rating on TOT1A.	WAPA

WECC Standard PRC-STD-003-1 – Protective Relay and Remedial Action Scheme Misoperation

11.	TOT2A	Path 31	For the Montrose-Hesperus 345 kV line outage with Nucla generation above 60 MW, the parallel Montrose-Nucla 115 kV line is automatically transfer tripped.	WAPA
12.	TOT2B	Path 34	Trip Huntington generation for loss of the Huntington-Pinto + Four Corners lines when parallel lines are heavily loaded.	PAC
13.	TOT5	Path 39	For an outage of the Hayden-Gore Pass 230 kV line, the lower voltage parallel path is tripped.	WAPA
14.	SDGE RAS	Path 44	RAS used to meet reactive margin criteria for loss of both San Onofre units.	SDGE
15.	SDGE – CFE	Path 45	The purpose of the RAS is to automatically cross-trip (transfer trip) the Miguel – Tijuana 230kV following the outage of Imperial Valley – Miguel 500kV line.	SDGE/CFE
16.	Southern New Mexico	Path 47	For double contingencies on the 345 kV lines defined in the path, WECC Operating Procedure EPE-1 is implemented.	EPE
17.	Pacific DC Intertie	Path 65	Northwest generator tripping; Series capacitor fast insertion; mechanically switched shunt capacitors	BPA/LDWP
18.	California – Oregon Intertie	Path 66	Northwest generator tripping; Chief Jo Brake insertion; Fort Rock Series Capacitor insertion; Northern California generator and pump load tripping; N. California series capacitor bypassing, shunt reactor or capacitor insertion; Initiation of NE\SE Separation Scheme at Four Corners.	BPA/CISO/APS
19.	Meridian 500/230 kV Transformers**		Following the loss of the Meridian 500/230kV transformers, RAS is used to comply with WECC Standards under high load conditions.	PAC
20.	Northern-Southern California	Path 26	Remedial action required to achieve the rated transfer capability. Midway area generation tripped for loss of any two of three Midway-Vincent 500 kV lines.	CISO
21.	PNM Import Contingency Load Shedding Scheme (ICLSS)	Path 48	ICLSS is a centralized load shedding scheme for low probability events such as simultaneous outage of the Four Corners-West Mesa (FW) 345 kV and San Juan-B-A (WW) 345 kV lines, as well as any unplanned disturbance affecting voltage in the Northern New Mexico transmission system.	PNM

WECC Standard PRC-STD-003-1 – Protective Relay and Remedial Action Scheme Misoperation

22.	Valley Direct Load Trip (DLT)		RAS is required for the loss of the Serrano-Valley 500 kV line. About 200 MW of Valley load is tripped.	SCE
23.	South of Lugo N-2 RAS		RAS is required for the simultaneous double line outage of any combination of the Lugo-Mira Loma 1 (when looped), 2, and 3 500 kV lines and the Lugo-Serrano (when de-looped) 500 kV line.	SCE
24.	Lower Snake RAS		The RAS is required to protect for the double line outage of the Lower Monumental-Little Goose 500-kV lines. Generation is dropped at Little Goose and Lower Granite Powerhouses as well as key the WM RAS. An outage of the Little Goose – Lower Granite 500 kV lines will drop generation at Lower Granite Powerhouse and key the Western Montana RAS.	BPA
25.	Palo Verde – COI Mitigation Scheme	Path 66	Required to provide for safe operation of the COI for the loss of two units at Palo Verde Nuclear Generating Station (PVNGS). The RAS protects the PVNGS and Palo Verde Transmission System (PVTS) for faults at Palo Verde and subsequent outage of the Palo Verde – Westwing 500 kV lines.	SRP
26.	Palo Verde/Hassayampa RAS		Provides protection to the PVNGS and the PVTS for faults at Palo Verde and subsequent double line outage of the Palo Verde to Westwing 500 kV lines.***	SRP
27.	Sierra Pacific – PacifiCorp RAS	Path 76	Needed for loss of the 230 kV Malin-Hilltop line when heavily loaded unless automatic reclose is successful. The scheme closes the Hilltop 345 kV line reactor if pre-outage northbound flow is greater than 150 MW. For pre-outage southbound flow greater than 235 MW the Hilltop 345 kV line trips and the Hilltop 345 kV line reactors closes.	SPPC

* For an explanation of terms, path numbers, and definition for the paths refer to WECC’s Path Rating Catalog.

** The Meridian 500/230 kV transformers are not included in the Path Rating Catalog. The RAS associated with the Meridian transformers is included in Table 3 because the failure of the RAS may result in cascading.

***The Palo Verde/Hassayampa RAS is designed to prevent cascading problems throughout the WECC region. This scheme is not Path related and is not used to protect any specific WECC Path.

DEFINITIONS

Unless the context requires otherwise, all capitalized terms shall have the meanings assigned in this Standard and as set out below:

WECC Standard PRC-STD-003-1 – Protective Relay and Remedial Action Scheme Misoperation

Business Day means any day other than Saturday, Sunday, or a legal public holiday as designated in section 6103 of title 5, U.S. Code.

Disturbance means (i) any perturbation to the electric system, or (ii) the unexpected change in ACE that is caused by the sudden loss of generation or interruption of load.

Extraordinary Contingency shall have the meaning set out in Excuse of Performance, section B.4.c.

Normal Path Rating is the maximum path rating in MW that has been demonstrated to WECC through study results or actual operation, whichever is greater. For a path with transfer capability limits that vary seasonally, it is the maximum of all the seasonal values.

WECC Table 2 means the table maintained by the WECC identifying those transfer paths monitored by the WECC regional Reliability coordinators. As of the date set out therein, the transmission paths identified in Table 2 are as listed in Attachment A to this Reliability Agreement.

EXCUSE OF PERFORMANCE

A. Excused Non-Compliance

Non-compliance with any of the reliability criteria contained in this Standard shall be excused and no sanction applied if such non-compliance results directly from one or more of the actions or events listed below.

B. Specific Excuses

1. Governmental Order

The Reliability Entity's compliance with or action under any applicable law or regulation or other legal obligation related thereto or any curtailment, order, regulation or restriction imposed by any governmental authority (other than the Reliability Entity, if the Reliability Entity is a municipal corporation or a federal, state, or provincial governmental entity or subdivision thereof).

2. Order of Reliability Coordinator

The Reliability Entity's compliance or reasonable effort to comply with any instruction, directive, order or suggested action ("Security Order") by the WECC Reliability Coordinator for the WECC sub-region within which the Reliability Entity is operating, provided that the need for such Security Order was not due to the Reliability

WECC Standard PRC-STD-003-1 – Protective Relay and Remedial Action Scheme Misoperation

Entity's non-compliance with (a) the WECC Reliability Criteria for Transmission System Planning, (b) the WECC Power Supply Design Criteria, (c) the WECC Minimum Operating Reliability Criteria, or (d) any other WECC reliability criterion, policy or procedure then in effect (collectively, "WECC Reliability Standards"), and provided further that the Reliability Entity in complying or attempting to comply with such Security Order has taken all reasonable measures to minimize Reliability Entity's noncompliance with the reliability criteria.

3. Protection of Facilities

Any action taken or not taken by the Reliability Entity which, in the reasonable judgment of the Reliability Entity, was necessary to protect the operation, performance, integrity, reliability or stability of the Reliability Entity's computer system, electric system (including transmission and generating facilities), or any electric system with which the Reliability Entity's electric system is interconnected, whether such action occurs automatically or manually; provided that the need for such action or inaction was not due to Reliability Entity's non-compliance with any WECC Reliability Standard and provided further that Reliability Entity could not have avoided the need for such action or inaction through reasonable efforts taken in a timely manner. Reasonable efforts shall include shedding load, disconnecting facilities, altering generation patterns or schedules on the transmission system, or purchasing energy or capacity, except to the extent that the Reliability Entity demonstrates to the WECC Staff and/or the RCC that in the particular circumstances such action would have been unreasonable.

4. Extraordinary Contingency

- a.** Any Extraordinary Contingency (as defined in subsection c); provided that this provision shall apply only to the extent and for the duration that the Extraordinary Contingency actually and reasonably prevented the Reliability Entity from complying with any applicable reliability criteria; and provided further that Reliability Entity took all reasonable efforts in a timely manner to mitigate the effects of the Extraordinary Contingency and to resume full compliance with all applicable reliability criteria contained in this Reliability Agreement. Reasonable efforts shall include shedding load, disconnecting facilities, altering generation patterns or schedules on the transmission system, or purchasing energy

WECC Standard PRC-STD-003-1 – Protective Relay and Remedial Action Scheme Misoperation

or capacity, except to the extent that the Reliability Entity demonstrates to the WECC Staff and/or the RCC that in the particular circumstances such action would have been unreasonable. Reasonable efforts shall not include the settlement of any strike, lockout or labor dispute.

- b. Any Reliability Entity whose compliance is prevented by an Extraordinary Contingency shall immediately notify the WECC of such contingency and shall report daily or at such other interval prescribed by the WECC the efforts being undertaken to mitigate the effects of such contingency and to bring the Reliability Entity back into full compliance.
- c. An Extraordinary Contingency means any act of God, actions by a non-affiliated third party, labor disturbance, act of the public enemy, war, insurrection, riot, fire, storm or flood, earthquake, explosion, accident to or breakage, failure or malfunction of machinery or equipment, or any other cause beyond the Reliability Entity's reasonable control; provided that prudent industry standards (e.g., maintenance, design, operation) have been employed; and provided further that no act or cause shall be considered an Extraordinary Contingency if such act or cause results in any contingency contemplated in any WECC Reliability Standard (e.g., the "Most Severe Single Contingency" as defined in the WECC Reliability Criteria or any lesser contingency).

5. Participation in Field Testing

Any action taken or not taken by the Reliability Entity in conjunction with the Reliability Entity's involvement in the field testing (as approved by either the WECC Operating Committee or the WECC Planning Coordination Committee) of a new reliability criterion or a revision to an existing reliability criterion where such action or non-action causes the Reliability Entity's non-compliance with the reliability criterion to be replaced or revised by the criterion being field tested; provided that Reliability Entity's noncompliance is the result of Reliability Entity's reasonable efforts to participate in the field testing.