

Mapping Document

Project 2010-05.1 Protection Systems: Phase 1 (Misoperations)

Revisions or Retirements to Already Approved Standards

This mapping document shows the translation of PRC-003-1 – Regional Procedure for Analysis of Misoperations of Transmission and Generation Protection Systems and PRC-004-2.1a – Analysis and Mitigation of Transmission and Generation Protection System Misoperations into the proposed PRC-004-3 – Protection System Misoperation Identification and Correction Reliability Standard. The following table identifies the sections of the approved standard that shall be added, retired, or revised when this standard is implemented. If the drafting team is recommending revisions to the standard, those changes are identified in the “Proposed Replacement” column.

Standard: PRC-003-1 - Regional Procedure for Analysis of Misoperations of Transmission and Generation Protection Systems		
Requirement in Approved Standard	Translation to PRC-004-3 or Other Action	Comments
4. Applicability: 4.1. Regional Reliability Organization	4. Applicability: 4.1. Functional Entities: 4.1.1 Transmission Owner 4.1.2 Generator Owner 4.1.3 Distribution Provider	The proposed standard properly assigns responsibility to the registered functions that are responsible for Protection System Misoperation identification and correction. The Transmission Owner, Generator Owner, and Distribution Provider, by function, are Protection System asset owners and are in the best position be aware of and apply resources to review Protection System operations.

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<p>R1. Each Regional Reliability Organization shall establish, document and maintain its procedures for, review, analysis, reporting and mitigation of transmission and generation Protection System Misoperations. These procedures shall include the following elements:</p>		<p>The Requirements in the proposed PRC-004-3 standard by their results-based construction requires performance that is implicit of having procedures for the analysis of Protection System operations (R1, R2, R3, and R4) and mitigation of identified Misoperations (R5 and R6). The proposed requirements also direct focus to areas most important to reliability.</p> <p>For example, Requirement R1 requires the applicable entity to initiate a review upon a Bulk Electric System (BES) interrupting device operation and identify any Misoperation. Requirement R2 requires the applicable entity to notify all other owners of the Composite Protection System when it determines (or is unsure) its Protection System components did not cause the BES interrupting device operation or it cannot rule out a Misoperation. Requirement R3 requires the notified entity to identify any Misoperation of its Protection System component(s) similar to Requirement R1. Requirement R4 directs the applicable entity to continue its investigative work to determine the cause(s) of an identified Misoperation until the cause is determined or</p>

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		<p>the entity concludes that it is unable to determine the cause.</p> <p>Requirements R5 and R6 for developing and implementing a Corrective Action Plan (CAP) are also implicit of having a documented procedure. The implicit performance required by Requirements R1 through R6 necessitate that an entity have procedures to accomplish the objectives of the proposed standard. Requiring the applicable entities to have procedures is an activity or task that does little, if anything, to benefit or protect the reliable operation of the BES.</p>
<p>R1.1. The Protection Systems to be reviewed and analyzed for Misoperations (due to their potential impact on BES reliability).</p>	<p>4.2. Facilities:</p> <p>4.2.1 Protection Systems for BES Elements. Non-protective functions that are embedded within a Protection System are excluded. Protective functions intended to operate as a control function during switching are excluded.</p> <p>4.2.2 Underfrequency load shedding</p>	<p>The previous PRC-003-1, Requirement R1.1 required the Regional Reliability Organization (RRO) to identify the Protection Systems to be reviewed and analyzed for Misoperation.</p> <p>The applicable Facilities have been clarified in the proposed PRC-004-3 to include Protection Systems for BES Elements. Additional language is provided for clarity that non-protective functions are not applicable and</p>

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	(UFLS) that is intended to trip one or more BES Elements.	those protective functions that are intended to operate as a control function (e.g., a reverse power relay operated to remove a generating unit from service). The Applicability is further clarified to include underfrequency load shedding (UFLS) to be more precise. Protection Systems associated with Special Protection Systems (SPS) and Remedial Action Schemes (RAS) are addressed in phase two of this project.
(Continued) R1.1. The Protection Systems to be reviewed and analyzed for Misoperations (due to their potential impact on BES reliability).	R1. Each Transmission Owner, Generator Owner, and Distribution Provider that owns a BES interrupting device that operated shall, within 120 calendar days of the BES interrupting device operation, identify whether its Protection System component(s) caused a Misoperation when: 1.1 The BES interrupting device operation was caused by a Protection System or by manual intervention in response to a Protection System failure to	The applicable entities will be required to identify whether a Misoperation occurred for each BES interrupting device operation which meet criteria 1.1 through 1.3. Requirement R1 is most clearly the direct carryover from the PRC-003-1 Reliability Standard which involves the “owner” of the Protection System. The previous standard was silent on the responsibilities of other Protection System owners and had no provision for ensuring that other owners had a responsibility to be involved in the review and analysis.

Standard: PRC-003-1 - Regional Procedure for Analysis of Misoperations of Transmission and Generation Protection Systems

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	<p>operate; and</p> <p>1.2 The BES interrupting device owner owns all or part of the Composite Protection System; and</p> <p>1.3 The BES interrupting device owner identified that its Protection System component(s) caused the BES interrupting device(s) operation.</p>	
<p>(Continued)</p> <p>R1.1. The Protection Systems to be reviewed and analyzed for Misoperations (due to their potential impact on BES reliability).</p>	<p>R2. Each Transmission Owner, Generator Owner, and Distribution Provider that owns a BES interrupting device that operated shall, within 120 calendar days of the BES interrupting device operation, notify the other owner(s) of the Protection System of the operation when:</p> <p>2.1 The BES interrupting device owner shares the Composite Protection System ownership with any other entity; and</p>	<p>Requirement R2 now asserts a responsibility on the initiating entity (i.e., BES interrupting device owner) to notify other owners of the Composite Protection System when the cause of a Protection System operation was not caused (or is undetermined) by the BES interrupting device owner and a Misoperation occurred (or cannot be ruled out) in accordance with criteria 2.1 through 2.3.</p>

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	<p>2.2 The BES interrupting device owner determined that a Misoperation occurred or cannot rule out a Misoperation; and</p> <p>2.3 The BES interrupting device owner determined that its Protection System component(s) did not cause the BES interrupting device(s) operation or cannot determine whether its Protection System components caused the BES interrupting device(s) operation.</p>	
<p>(Continued)</p> <p>R1.1. The Protection Systems to be reviewed and analyzed for Misoperations (due to their potential impact on BES reliability).</p>	<p>R3. Each Transmission Owner, Generator Owner, and Distribution Provider that receives notification, pursuant to Requirement R2, within the later of 60 calendar days of notification or 120 calendar days of the BES interrupting device(s) operation, shall identify whether its Protection System component(s) caused a Misoperation.</p>	<p>Requirement R3 places responsibility on the applicable entity that receives notification to review its Protection System component(s) for Misoperations similar to Requirement R1. It is common practice for the BES interrupting device owner that initiates the review to be in communication and collaboration with other Protection System component owners during its review with the 120 calendar day period. The shorter 60 calendar day period for the notified entity assures that in</p>

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		the rare case where the notifying entity takes the majority of its allotted time (120 days) to review an operation, the receiving entity will always have a minimum and reasonable time (60 days) to conduct its review.
<p>(Continued)</p> <p>R1.1. The Protection Systems to be reviewed and analyzed for Misoperations (due to their potential impact on BES reliability).</p>	<p>R4. Each Transmission Owner, Generator Owner, and Distribution Provider that has not determined the cause(s) of a Misoperation identified in accordance with Requirement R1 or R3 shall perform investigative action(s) to determine the cause of the Misoperation at least once every two full calendar quarters after the Misoperation was first identified, until one of the following completes the investigation:</p> <ul style="list-style-type: none"> • The identification of the cause(s) of the Misoperation; or • A declaration that no cause was identified. 	<p>Requirement R4 is essentially a new requirement to determine the cause(s) of a Misoperation where the previous requirements (i.e., R1 or R3) failed to reveal the cause of a Misoperation. In most cases, the cause of a Misoperation will be revealed during the course of review and when a cause is not readily apparent, the applicable entity is required in Requirement R4 to conduct at least one investigative action every two calendar quarters until the entity determines the cause or declares that it has taken reasonable action and could not determine the cause.</p>

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R1.2. Data reporting requirements (periodicity and format) for Misoperations.	None.	NERC Rules of Procedure, Section 1600 Request for Information or Data will replace the reporting obligations of applicable entities. As such, Regional reporting will end and continent-wide single reporting to the Electric Reliability Organization (ERO) will be required. The ERO will analyze the data to: develop meaningful metrics; identify trends in Protection System performance that negatively impact reliability; identify remediation techniques; and publicize lessons learned for the industry. Metrics will be shared with each Region. The removal of the data collection from the standard does not result in a reduction of reliability.
R1.3. Process for review, analysis follow up, and documentation of Corrective Action Plans for Misoperations.	<p>R5. Each Transmission Owner, Generator Owner, and Distribution Provider that owns the Protection System component that caused the Misoperation shall, within 60 calendar days of first identifying a cause of the Misoperation:</p> <ul style="list-style-type: none"> • Develop a Corrective Action Plan (CAP) for the identified Protection System component(s), and an 	The proposed PRC-004-3, Requirement R5 provides a step not apparent in the previous PRC-003-1 which is the development of a Corrective Action Plan (CAP) within 60 calendar days of first identifying the Misoperation cause. Requirement R5 also requires each applicable entity to perform an evaluation of the CAP's applicability to the entity's other Protection Systems, including those at other locations.

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	<p>evaluation of the CAP's applicability to the entity's other Protection Systems including other locations, or</p> <ul style="list-style-type: none"> • Explain in a declaration why corrective actions are beyond the entity's control or would not improve BES reliability, and that no further corrective actions will be taken. 	<p>Furthermore, Requirement R5 accounts for those cases why corrective actions are beyond the entity's control or would not improve BES reliability and that no further corrective actions will be taken. This could be a result of a cause created by a non-registered third party, such as a communication provider. Also, should implementing the changes not improve BES reliability, the entity may document this as well. In cases where the entity, in its judgment, determines that a CAP is not practical for improving BES reliability, the entity must explain in a declaration its conclusions why no further action will be taken.</p>
<p>(Continued) R1.3. Process for review, analysis follow up, and documentation of Corrective Action Plans for Misoperations.</p>	<p>R6. Each Transmission Owner, Generator Owner, and Distribution Provider shall implement each CAP developed in Requirement R5, and update each CAP if actions or timetables change, until completed.</p>	<p>Requirement R6 requires the implementation of the CAP. The applicable entity must update the CAP if actions or timetables change until the CAP is completed.</p>
<p>R1.4. Identification of the Regional Reliability</p>	<p>None.</p>	<p>The proposed PRC-004-3 now requires the applicable entities (GO, DP, and TO) to individually address</p>

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Organization group responsible for the procedures and the process for approval of the procedures.		Misoperations of its Protection System without regard to the Region or Regions in which it owns Protection Systems for BES Elements. The proposed PRC-004-3 Reliability Standard and revised definition of Misoperation provide sufficient clarity to entities; therefore, there is no reliability benefit to obtain the Regional Entity's (formerly Regional Reliability Organization or RRO) approval. Each applicable entity will be measured on its performance with the proposed PRC-004-3 requirements.
R2. Each Regional Reliability Organization shall maintain and periodically update documentation of its procedures for review, analysis, reporting, and mitigation of transmission and generation Protection System Misoperations.	4. Applicability: 4.1. Functional Entities: 4.1.1 Transmission Owner 4.1.2 Generator Owner 4.1.3 Distribution Provider	The proposed PRC-004-3 implicitly requires each applicable entity to have its own procedures and processes; therefore, there is no need to have a specific requirement for dictating the updating of such procedures or processes by the previous Regional Reliability Organization or applicable entities. Requiring the applicable entities to update procedures is an activity or task that does little, if anything, to benefit or protect the reliable operation of the BES.
R3. Each Regional Reliability	None.	The proposed PRC-004-3 implicitly requires each

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<p>Organization shall distribute procedures in Requirement 1 and any changes to those procedures, to the affected Transmission Owners, Distribution Providers that own transmission Protection Systems, and Generator Owners within 30 calendar days of approval of those procedures.</p>		<p>applicable entity to have its own procedures and processes; therefore, there is no longer a need to distribute such procedures or processes by the previous Regional Reliability Organization or applicable entities. Requiring the applicable entities to distribute procedures is an activity or task that does little, if anything, to benefit or protect the reliable operation of the BES.</p>

Standard: PRC-004-2.1a - Analysis and Mitigation of Transmission and Generation Protection System Misoperations

Requirement in Approved Standard	Translation to PRC-004-3 or Other Action	Comments
<p>4. Applicability:</p> <p>4.1. Transmission Owner</p> <p>4.2. Distribution Provider that owns a transmission Protection System</p> <p>4.3. Generator Owner</p>	<p>4. Applicability:</p> <p>4.1. Functional Entities:</p> <p>4.1.1 Transmission Owner</p> <p>4.1.2 Generator Owner</p> <p>4.1.3 Distribution Provider</p> <p>4.2 Facilities:</p> <p>4.2.1 Protection Systems for BES Elements. Non-protective functions that are embedded within a Protection System are excluded. Protective functions intended to operate as a control function during switching are excluded.</p> <p>4.2.2 Underfrequency load shedding (UFLS) that is intended to trip one or more BES Elements.</p>	<p>The same applicable entities will transition to the new standard. The clause about the Distribution Provider <i>“that owns a transmission Protection System”</i> has been removed because it was ambiguous. This clause is replaced by <i>“Protection Systems for BES Elements”</i> found in Section 4.2, Facilities and applies to all the applicable entities. Having the Applicability section address Facilities specifically removes the ambiguity of what a <i>“transmission Protection System”</i> includes. The proposed PRC-004-3 standard is specific that it includes those Protection Systems for BES Elements, including UFLS that is intended to trip one or more BES Elements.</p> <p>Additional language is provided for clarity that non-protective functions are not applicable and those protective functions that are intended to operate as a control function (e.g., a reverse power relay operated to remove a generating unit from service). Protection Systems associated with Special Protection Systems (SPS) and Remedial Action Schemes (RAS) are addressed in phase two of this project.</p>

Standard: PRC-004-2.1a - Analysis and Mitigation of Transmission and Generation Protection System Misoperations

Requirement in Approved Standard	Translation to PRC-004-3 or Other Action	Comments
<p>R1. The Transmission Owner and any Distribution Provider that owns a transmission Protection System shall each analyze its transmission Protection System Misoperations and shall develop and implement a Corrective Action Plan to avoid future Misoperations of a similar nature according to the Regional Entity's procedures.</p> <p>R2. The Generator Owner shall analyze its generator and generator interconnection Facility Protection System Misoperations, and shall develop and implement a</p>	<p>R1. Each Transmission Owner, Generator Owner, and Distribution Provider that owns a BES interrupting device that operated shall, within 120 calendar days of the BES interrupting device operation, identify whether its Protection System component(s) caused a Misoperation when:</p> <p>1.1 The BES interrupting device operation was caused by a Protection System or by manual intervention in response to a Protection System failure to operate; and</p> <p>1.2 The BES interrupting device owner owns all or part of the Composite Protection System; and</p> <p>1.3 The BES interrupting device owner identified that its Protection System component(s) caused the BES interrupting device(s) operation.</p> <p>R2. Each Transmission Owner, Generator Owner, and Distribution Provider that owns</p>	<p>The already approved standard PRC-004-2.1a, Requirements R1 and R2 include three levels of performance which is analyze (Protection System operations), develop (CAP), and implement (CAP). The proposed standard, which includes the same three applicable entities (DP, GO, and TO), divides the three levels of performance into six discrete Requirements. Requirement R1 provides the "analyze" portion, requiring the initiating BES interrupting device owner to review its Protection System for each BES interrupting device operation that meets the three criteria (i.e., 1.1 thorough 1.3).</p> <p>The "analyze" portion is further clarified in the proposed Requirement R2 by ensuring that any other owners of the Composite Protection System are notified when the cause of a Protection System operation was not caused (or is undetermined) by the BES interrupting device owner and a Misoperation occurred (or cannot be ruled out) in accordance with criteria 2.1 through 2.3.</p>

Standard: PRC-004-2.1a - Analysis and Mitigation of Transmission and Generation Protection System Misoperations

Requirement in Approved Standard	Translation to PRC-004-3 or Other Action	Comments
<p>Corrective Action Plan to avoid future Misoperations of a similar nature according to the Regional Entity's procedures.</p>	<p>a BES interrupting device that operated shall, within 120 calendar days of the BES interrupting device operation, notify the other owner(s) of the Protection System of the operation when:</p> <ul style="list-style-type: none"> 2.1 The BES interrupting device owner shares the Composite Protection System ownership with any other entity; and 2.2 The BES interrupting device owner determined that a Misoperation occurred or cannot rule out a Misoperation; and 2.3 The BES interrupting device owner determined that its Protection System component(s) did not cause the BES interrupting device(s) operation or cannot determine whether its Protection System components caused the BES interrupting device(s) operation. 	<p>Requirement R3 provides the necessary performance for the notified Protection System owner to review its component(s) for Misoperation.</p> <p>Last, Requirement R4 requires the applicable entity to conduct investigative actions until it determines the cause(s) or declares that it has been unable to determine the cause(s).</p> <p>Requirement R5 addresses the “develop” a Corrective Action Plan (CAP)” portion, and Requirement R6 addresses the “implement” portion of the CAP.</p>

Standard: PRC-004-2.1a - Analysis and Mitigation of Transmission and Generation Protection System Misoperations

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	<p>R3. Each Transmission Owner, Generator Owner, and Distribution Provider that receives notification, pursuant to Requirement R2, within the later of 60 calendar days of notification or 120 calendar days of the BES interrupting device(s) operation, shall identify whether its Protection System component(s) caused a Misoperation.</p> <p>R4. Each Transmission Owner, Generator Owner, and Distribution Provider that has not determined the cause(s) of a Misoperation identified in accordance with Requirement R1 or R3 shall perform investigative action(s) to determine the cause of the Misoperation at least once every two full calendar quarters after the Misoperation was first identified, until one of the following completes the investigation:</p> <ul style="list-style-type: none"> • The identification of the cause(s) of 	

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Requirement in Approved Standard	Translation to PRC-004-3 or Other Action	Comments
	<p>the Misoperation; or</p> <ul style="list-style-type: none"> • A declaration that no cause was identified. <p>R5. Each Transmission Owner, Generator Owner, and Distribution Provider that owns the Protection System component that caused the Misoperation shall, within 60 calendar days of first identifying a cause of the Misoperation:</p> <ul style="list-style-type: none"> • Develop a Corrective Action Plan (CAP) for the identified Protection System component(s), and an evaluation of the CAP’s applicability to the entity’s other Protection Systems including other locations, or • Explain in a declaration why corrective actions are beyond the entity’s control or would not improve BES reliability, and that no further corrective actions will be taken. <p>R6. Each Transmission Owner, Generator</p>	

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	<p>Owner, and Distribution Provider shall implement each CAP developed in Requirement R5, and update each CAP if actions or timetables change, until completed.</p>	
<p>R3. The Transmission Owner, any Distribution Provider that owns a transmission Protection System, and the Generator Owner shall each provide to its Regional Entity, documentation of its Misoperations analyses and Corrective Action Plans according to the Regional Entity's procedures.</p>	<p>None.</p>	<p>Since the NERC Rules of Procedure, Section 1600 Request for Information or Data will replace the reporting obligations. NERC will receive the data on a periodic basis, analyze, establish metrics, and share results accordingly with the Regional Entities as well as industry. Having reporting obligations as a Requirement is an activity or task that does little, if anything, to benefit or protect the reliable operation of the BES.</p>