

September 23, 2014

**VIA OVERNIGHT MAIL**

Sheri Young, Secretary of the Board  
National Energy Board  
517 – 10<sup>th</sup> Avenue SW  
Calgary, Alberta  
T2R 0A8

RE: *North American Electric Reliability Corporation*

Dear Ms. Young:

The North American Electric Reliability Corporation (“NERC”) hereby submits Notice of Filing of the North American Electric Reliability Corporation of Proposed Reliability Standard PRC-004-3. NERC requests, to the extent necessary, a waiver of any applicable filing requirements with respect to this filing.

Please contact the undersigned if you have any questions.

Respectfully submitted,

/s/ William H. Edwards

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Enclosure

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**BEFORE THE  
NATIONAL ENERGY BOARD**

**NORTH AMERICAN ELECTRIC )  
RELIABILITY CORPORATION )**

**NOTICE OF FILING OF THE  
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION  
OF PROPOSED RELIABILITY STANDARD  
PRC-004-3**

The North American Electric Reliability Corporation (“NERC”) hereby submits proposed Reliability Standard PRC-004-3 (Protection System Misoperation Identification and Correction) (Exhibit A). The proposed Reliability Standard is just, reasonable, not unduly discriminatory or preferential, and in the public interest.<sup>1</sup> NERC also provides notice of: (i) a revised definition of “Misoperation” and a new definition of “Composite Protection System” for inclusion in the NERC Glossary of Terms; (ii) the Implementation Plan for the proposed Reliability Standard (Exhibit B); (iii) the associated Violation Risk Factors (“VRFs”) and Violation Severity Levels (“VSLs”) (Exhibits A and F); and (iv) the retirement of Reliability Standards PRC-004-2.1a (Analysis and Mitigation of Transmission and Generation Protection System Misoperations) and PRC-003-1 (Regional Procedure for Analysis of Misoperations of Transmission and Generation Protection System) as listed in the Implementation Plan.

This filing presents the technical basis and purpose of proposed Reliability Standard PRC-004-3, a summary of the development history (Exhibit G), and a demonstration that the

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<sup>1</sup> Unless otherwise designated, capitalized terms shall have the meaning set forth in the *Glossary of Terms Used in NERC Reliability Standards* (“NERC Glossary of Terms”), available at [http://www.nerc.com/files/Glossary\\_of\\_Terms.pdf](http://www.nerc.com/files/Glossary_of_Terms.pdf).

proposed Reliability Standard meets the Reliability Standards criteria (Exhibit D). The NERC Board of Trustees adopted proposed Reliability Standard PRC-004-3 on August 14, 2014.

## **I. EXECUTIVE SUMMARY**

Reducing the risk to reliability from Protection System misoperations will require consistent collection of Misoperation information along with systematic analysis and correction of the underlying causes of preventable Misoperations. Proposed PRC-004-3 and the separate Request for Data or Information prepared pursuant to Section 1600 of NERC's Rules of Procedure ("Misoperations Data Request"), provide the means to accomplish this systematic analysis and correction. Proposed Reliability Standard PRC-004-3 replaces Reliability Standards PRC-004-2.1a and PRC-003-1 to create a single Reliability Standard requiring Transmission Owners, Generator Owners, and Distribution Providers to identify and correct causes of Misoperations of certain Protection Systems for Bulk Electric System Elements. Proposed Reliability Standard PRC-004-3 requires the applicable entities to review Protection System operations to identify Misoperations, including those where there is a shared responsibility for the review, and correct the causes of Misoperations to avoid reoccurrence. In developing PRC-004-3, NERC has addressed outstanding Federal Energy Regulatory Commission ("FERC") concerns and directives related to PRC-004-2.1a and PRC-003-1 as well as made other improvements to the standard. For the reasons discussed in this filing, the proposed Reliability Standard PRC-004-3, including its associated new and revised defined terms, is just, reasonable, not unduly discriminatory or preferential, and in the public interest.

## **II. NOTICES AND COMMUNICATIONS**

Notices and communications with respect to this filing may be addressed to the following:

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## **III. BACKGROUND**

### **A. NERC Reliability Standards Development Procedure**

The proposed Reliability Standard was developed in an open and fair manner and in accordance with the Reliability Standard development process. NERC develops Reliability Standards in accordance with Section 300 (Reliability Standards Development) of its Rules of Procedure and the NERC Standard Processes Manual.<sup>2</sup> NERC's proposed rules provide for reasonable notice and opportunity for public comment, due process, openness, and a balance of interests in developing Reliability Standards and thus satisfies certain of the criteria for approving Reliability Standards. The development process is open to any person or entity with a

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<sup>2</sup> The NERC *Rules of Procedure* are available at <http://www.nerc.com/AboutNERC/Pages/Rules-of-Procedure.aspx>. The NERC *Standard Processes Manual* is available at [http://www.nerc.com/comm/SC/Documents/Appendix\\_3A\\_StandardsProcessesManual.pdf](http://www.nerc.com/comm/SC/Documents/Appendix_3A_StandardsProcessesManual.pdf).

legitimate interest in the reliability of the Bulk-Power System. NERC considers the comments of all stakeholders, and stakeholders must approve, and the NERC Board of Trustees must adopt a Reliability Standard before the Reliability Standard is submitted to the applicable governmental authorities for approval.

**B. History of PRC-004 and PRC-003**

PRC-003 requires the Regional Reliability Organizations to establish, document and maintain regional procedures for, review, analysis, reporting and mitigation of transmission and generation Protection System Misoperations, and PRC-004 requires entities to analyze their Protection System Misoperations and develop and implement a Corrective Action Plan to avoid future Misoperations of a similar nature according to the regional procedures.

PRC-004-1 was submitted on April 3, 2006. Since the submission of version 1 of PRC-004, NERC submitted PRC-004-2 on March 2, 2011, PRC-004-1a on June 8, 2011, and PRC-004-2.1a on August 27, 2012.

In Order No. 693, FERC identified PRC-003-1 as a “fill-in-the-blank”<sup>3</sup> standard because the standard included references to regional procedures that had not been submitted by NERC.<sup>4</sup> As a result, FERC decided to not approve or remand PRC-003-1 until NERC submitted the additional information. Since PRC-003-1 is not mandatory and enforceable, there is not a standard for Regional procedures to support the requirements of PRC-004.<sup>5</sup>

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<sup>3</sup> In Order No. 693, certain Reliability Standards were classified as “fill-in-the-blank” standards because they contained provisions that required the regional reliability organizations to develop criteria for use by users, owners or operators within each region. Order No. 693 at PP 287-88, 297.

<sup>4</sup> Order No. 693 at PP 1458, 1460.

<sup>5</sup> Although PRC-003-1 is not approved, NERC still uses the standard to support efforts related to PRC-004-2.

### **C. History of Project 2010-05.1 Protection System (Misoperations)**

When the original scope for the NERC System Protection and Control Task Force (now the System Protection and Control Subcommittee “SPCS”) was developed, one of the assigned items was to review all of the existing PRC-series of Reliability Standards, to advise the NERC Planning Committee on their status, and to develop Standards Authorization Requests (“SARs”), as appropriate, to address any perceived deficiencies.<sup>6</sup> In May of 2009, the SPCS released an assessment of Reliability Standards PRC-003-1, PRC-004-1, and PRC-016-1. The assessment acted as a precursor for a SAR to be submitted by the SPCS that would recommend revision of the definition of Misoperation, modification of PRC-003, PRC-004, and PRC-012, and retirement of PRC-016. The approach in proposed PRC-004-3 and the separate data request prepared by NERC is consistent with the reliability objectives in the SPCS report. NERC has modified PRC-004 and proposed to retire PRC-003, opting instead to reflect the objectives in PRC-003 in the PRC-004 revisions. The second phase of the Project, as described below, will address the SPS/RAS aspects of the SPCS report including changes to PRC-012 and PRC-016.

Project 2010-05 – Protection Systems was established to improve monitoring of Bulk Electric System Protection System events, as well as identify and correct the causes of Misoperations to improve Protection System performance. In 2011, the work in the Project 2010-05 was subdivided into two phases, Project 2010-05.1 and Project 2010-05.2, in order to address the work associated with Misoperations of Protection Systems ahead of the work associated with Special Protection Systems and Remedial Action Schemes.<sup>7</sup> Phase I - Project 2010-05.1 Protection System (Misoperations), which is the subject of this Petition, includes the

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<sup>6</sup> *NERC SPCS Assessment of Standards*, System Protection and Control Subcommittee at ii (May 22, 2009).

<sup>7</sup> See NERC Standards Committee Meeting Minutes (Jun. 9, 2011), available at [http://www.nerc.com/docs/standards/sc/sc\\_060911m\\_package.pdf](http://www.nerc.com/docs/standards/sc/sc_060911m_package.pdf).



modification of the definition of “Misoperation”, modification of PRC-004-2.1a, and the retirement of both PRC-004-2.1a and PRC-003-1.<sup>8,9</sup>

#### **IV. JUSTIFICATION**

As discussed in Exhibit D and below, the proposed Reliability Standard PRC-004-3 and associated new and revised definitions, satisfy the Reliability Standards criteria and are just, reasonable, not unduly discriminatory or preferential, and in the public interest. The following section provides background information from NERC’s *State of Reliability 2014* report<sup>10</sup> on NERC’s analysis of misoperations. It also explains the purpose of PRC-004-3, provides a description of and the technical basis for the requirements, and describes how the proposed Reliability Standard and associated definitions improve reliability as compared to prior versions. This section also provides a brief summary of how the proposed Reliability Standards satisfy the outstanding FERC directives from Order No. 693 related to PRC-004 and PRC-003. Finally, this section includes a discussion of the enforceability of the proposed Reliability Standard.

##### **A. Misoperations**

Nearly all major system failures, excluding those caused by severe weather, include Misoperations as a factor contributing to the propagation of the events. As noted in the *State of Reliability 2014* report, Bulk-Power System reliability and performance remains high; however,

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<sup>8</sup> The standard development page for Project 2010-05.1 is available here: [http://www.nerc.com/pa/Stand/Pages/Project2010-05\\_Protection\\_System\\_Misoperations.aspx](http://www.nerc.com/pa/Stand/Pages/Project2010-05_Protection_System_Misoperations.aspx).

<sup>9</sup> Phase II, Project 2010-05.2 Special Protection Systems is addressing all aspects of Special Protection Systems and Remedial Action Schemes including Misoperations of Special Protection Systems. Project 2010-05.2 will consider retirement of or modifications to Reliability Standards PRC-012-0 (Special Protection System Review Procedure), PRC-013-0 (Special Protection System Database), PRC-014-0 (Special Protection System Assessment), PRC-015-0 (Special Protection System data and Documentation), PRC-016-0.1 (Special Protection System Misoperations), and PRC-017-0 (Special Protection System Maintenance and Testing). The standard development page for Project 2010-05.2 is available here: [http://www.nerc.com/pa/Stand/Pages/Project-2010-05\\_2-Special-Protection-Systems.aspx](http://www.nerc.com/pa/Stand/Pages/Project-2010-05_2-Special-Protection-Systems.aspx).

<sup>10</sup> *State of Reliability 2014*, NERC (May 2014), available at [http://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/2014\\_SOR\\_Final.pdf](http://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/2014_SOR_Final.pdf).

Protection System Misoperation was identified as having a significant probability of occurrence and is positively correlated with transmission severity when outages do occur.<sup>11</sup> The report made three additional findings from analyses of misoperations from 2011 through 2013:

- Misoperation occurrences have been consistent over the past three years, with approximately 2,000 misoperations per year.
- The rate of misoperations, as a percentage of total operations, has remained consistent during this period at approximately 10 percent (i.e., roughly one in 10 operations is a misoperation).
- The three most common causes of misoperations remain the same (approximately 65 percent of misoperations are caused by settings/logic/design errors, communication failures, and relay failures).<sup>12</sup>

The report concluded that understanding and reducing misoperations should remain a focus of NERC and industry participants. The report recommends completion of the development of proposed Reliability Standard PRC-004-3 as a means to address the reliability risks posed by misoperations.<sup>13</sup> Reducing the risk to reliability from Protection System misoperations will require consistent collection of Misoperation information along with systematic analysis and correction of the underlying causes of preventable Misoperations. Proposed PRC-004-3, and the parallel Section 1600 Data Request provide means to accomplish this systematic analysis and correction.

## **B. Proposed Reliability Standard PRC-004-3**

### **1. Purpose and Applicability of PRC-004-3**

Proposed Reliability Standard PRC-004-3 revises the currently effective PRC-004-2.1a Reliability Standard. PRC-004-2.1a ensures that all transmission and generation Protection

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<sup>11</sup> One dataset used to assess risk associated with misoperations is the data collected by the Regions and NERC through periodic reporting pursuant to PRC-004-2.1a.

<sup>12</sup> *State of Reliability 2014* at 16.

<sup>13</sup> Other NERC activities aimed at reducing misoperations are detailed in the *State of Reliability 2014* report.

System Misoperations affecting the reliability of the Bulk Electric System are analyzed and mitigated. Similarly, the purpose of the proposed Reliability Standard is to identify and correct the causes of Misoperations of Protection Systems for Bulk Electric System Elements. The proposed standard also takes into account the reliability objective of PRC-003-1, which is to establish, document and maintain regional procedures for, review, analysis, reporting and mitigation of transmission and generation Protection System Misoperations. PRC-004-3 eliminates the need for regional procedures by providing continent-wide parameters for investigating Protection System operations and identifying Misoperations. Proposed PRC-004-3 applies to Transmission Owners, Generator Owners, and Distribution Providers. It also applies to underfrequency load shedding that is intended to trip one or more Bulk Electric System Elements. Underfrequency load shedding was added to PRC-004-3 to close a gap in reliability as Misoperations of these relays are not currently covered by a Reliability Standard.<sup>14</sup> The standard further specifies that the requirements apply to Protection Systems for Bulk Electric System Elements, with four exclusions as described below.

During development of the proposed standard, the standard drafting team determined that specific exclusions were needed to provide clarity on what facilities are included within the scope of proposed PRC-004-3. The exclusions do not change the applicability of the standard; rather, they clarify the existing applicability and provide certainty to entities regarding the facilities subject to the standard. First, BES interrupting device operations initiated by non-protective functions are not Protection System operations. Because the definition of

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<sup>14</sup> Undervoltage load shedding has not been included in the proposed Reliability Standard because Misoperations of undervoltage load shedding relays are currently addressed by Requirement R1 of Reliability Standard PRC-022-1 (Under-Voltage Load Shedding Program Performance). See PRC-022-1, available at <http://www.nerc.com/layers/PrintStandard.aspx?standardnumber=PRC-022-1&title=Under-Voltage Load Shedding Program Performance&jurisdiction=United States>.

Misoperation, as described more fully below, is tailored to cover “the failure of a Composite Protection System to operate as intended *for protection purposes*”<sup>15</sup> (emphasis added), these operations initiated by non-protective functions would not fall within the scope of the standard. Second, the standard drafting team included an explicit exclusion in Section 4.2.1.1 of the Applicability of the proposed standard for “[n]on-protective functions that are embedded within a Protection System.” The standard drafting team also recognized that entities use Protection Systems as part of a routine practice to control BES Elements. As a result, the standard drafting team in Section 4.1.1.2 excluded “[p]rotective functions intended to operate as a control function during switching.” Finally, the standard drafting team separately excluded Special Protection Systems and Remedial Action Schemes. Misoperations of Special Protection Systems and Remedial Action Schemes are currently addressed in Reliability Standard PRC-016-0.1. Requirements related to Special Protection Systems and Remedial Action Schemes, as noted above, will be addressed in the second phase of this Project.

## 2. Proposed Defined Terms and Requirements

### a) **Proposed Defined Terms**

In order to improve the clarity of the definition of Misoperation and the coverage of Protection Systems in the requirements, two new or revised defined terms were developed by the standard drafting team and are proposed for use with the requirements in PRC-004-3. The proposed defined terms and an explanation of each are included below.

#### (1) Definition of Composite Protection System

A new defined term, “Composite Protection System” has been introduced in the proposed standard and incorporated into the proposed definition of Misoperation to clarify that the overall

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<sup>15</sup> See *infra* proposed definition of Misoperation in Section IV.B.2.a.

performance of an Element's total complement of protection should be considered while evaluating an operation of that Element's Protection System. The Composite Protection System definition is based on the principle that an Element's multiple layers of protection are intended to function collectively. Five examples of a Composite Protection System are included in the proposed PRC-004-3 Application Guidelines.

## (2) Definition of Misoperation

The standard drafting team determined that the existing definition of Misoperation lacked sufficient clarity and specificity to achieve consistent application on a continent-wide basis. The current definition reads:

- 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.

For example, the terms "specified time" and "abnormal condition" used in the existing definition are ambiguous. In the third bullet, more clarification is needed as to whether an unintentional Protection System operation for an atypical, yet explainable, condition is a Misoperation. The proposed definition resolves these issues by simplifying the definition to be any failure of a Composite Protection System to operate as intended for protection purposes and provides six categories of Misoperation. The revised definition improves the use of "specified time" by describing a slow trip as a duration that results in the operation of at least one other Element's Composite Protection System in the two categories for a slow trip of a Protection System (Slow

Trip – During Fault and Slow Trip – Other Than Fault). The revised definition removes the ambiguity of “abnormal condition” by using the phrase “for a non-Fault condition, and specifically for the failure to trip category, by using the phrase “to operate for a non-Fault condition for which it is designed.” The definition of “Misoperation” is further enhanced by incorporating the new proposed term “Composite Protection System” within the definition. The use of Composite Protection System indicates that a single component failure does not constitute a Misoperation if the overall (composite) Protection System operates as intended. Without the reference to Composite Protection System, applicable entities have been left to make a determination as to whether a single component failure would qualify the Protection System operation as a Misoperation and, therefore, has led to inconsistent identification and reporting.

The proposed definition of Misoperation provides additional clarity over the current version. It is based on the principle that an Element’s total complement of protection is intended to operate dependably and securely. For example, the Failure to Trip and Slow Trip categories are associated with Protection System dependability, while the Unnecessary Trip categories are associated with Protection System security. The definition includes six categories, as noted below, which provide further differentiation within the definition of what constitutes a Misoperation. The proposed PRC-004-3 Application Guidelines contain additional detail on these categories. The proposed definition reads:

**Misoperation:** The failure of a Composite Protection System to operate as intended for protection purposes. Any of the following is a Misoperation:

- 1. Failure to Trip – During Fault** – A failure of a Composite Protection System to operate for a Fault condition for which it is designed. The failure of a Protection System component is not a Misoperation as long as the performance of the Composite Protection System is correct.

**2. Failure to Trip – Other Than Fault** – A failure of a Composite Protection System to operate for a non-Fault condition for which it is designed, such as a power swing, undervoltage, overexcitation, or loss of excitation. The failure of a Protection System component is not a Misoperation as long as the performance of the Composite Protection System is correct.

**3. Slow Trip – During Fault** – A Composite Protection System operation that is slower than required for a Fault condition if the duration of its operating time resulted in the operation of at least one other Element's Composite Protection System.

**4. Slow Trip – Other Than Fault** – A Composite Protection System operation that is slower than required for a non-Fault condition, such as a power swing, undervoltage, overexcitation, or loss of excitation, if the duration of its operating time resulted in the operation of at least one other Element's Composite Protection System.

**5. Unnecessary Trip – During Fault** – An unnecessary Composite Protection System operation for a Fault condition on another Element.

**6. Unnecessary Trip – Other Than Fault** – An unnecessary Composite Protection System operation for a non-Fault condition. A Composite Protection System operation that is caused by personnel during on-site maintenance, testing, inspection, construction, or commissioning activities is not a Misoperation.

## **b) Proposed Requirements**

In designing the Requirements<sup>16</sup> in proposed PRC-004-3, the standard drafting team used three objectives as identified in the SAR as a drafting guide to ensure key elements were included in the proposed standard. First, the standard must include the review of all Protection System operations on the Bulk Electric System in order to identify those operations that classify

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<sup>16</sup> A graphical representation demonstrating the relationships between Requirements developed by the standard drafting team can be found on page 42 of proposed PRC-004-3 in the Application Guidelines.

as Misoperations of Protection Systems for Facilities that are part of the Bulk Electric System.<sup>17</sup> Second, the standard must require entities to analyze Misoperations of Protection Systems for Facilities that are part of the Bulk Electric System to identify the cause(s). Third, the standard must require entities to develop and implement Corrective Action Plans to address the cause(s) of Misoperations of Protection Systems for Facilities that are part of the Bulk Electric System.

(1) Requirement R1

***R1. Each Transmission Owner, Generator Owner, and Distribution Provider that owns a BES interrupting device that operated under the circumstances in Parts 1.1 through 1.3 shall, within 120 calendar days of the BES interrupting device operation, identify whether its Protection System component(s) caused a Misoperation: [Violation Risk Factor: Medium][Time Horizon: Operations Assessment, Operations Planning]***

***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***

***1.2 The BES interrupting device owner owns all or part of the Composite Protection System; and***

***1.3 The BES interrupting device owner identified that its Protection System component(s) caused the BES interrupting device(s) operation or was caused by manual intervention in response to its Protection System failure to operate.***

Requirement R1 requires a review of each BES interrupting device<sup>18</sup> operation meeting the circumstances in Parts 1.1, 1.2, and 1.3 to identify whether or not a Misoperation may have occurred. Since the BES interrupting device owner monitors and tracks device operations, the owner is the logical entity to initiate the process of identifying Misoperations of Protection

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<sup>17</sup> NERC will address Misoperations associated with Special Protection Systems and Remedial Action Schemes in the second phase of this project.

<sup>18</sup> A BES interrupting device is a BES Element, e.g. a circuit breaker or circuit switcher that has the capability to interrupt fault current. Although BES interrupting device mechanisms are not part of a Protection System, the standard uses the operation of a BES interrupting device by a Protection System to initiate the review for Misoperation. See PRC-004-3, Application Guidelines at 23.



Systems for BES Elements. A review is required when (1) a BES interrupting device operates that is caused by a Protection System or by manual intervention in response to a Protection System failure to operate, (2) the owner owns all or part of the Protection System component(s), and (3) the owner identified its Protection System component(s) as causing the BES interrupting device operation or the operation was caused by manual intervention in response to its Protection System failure to operate.

The applicable entity in Requirement R1 has 120 calendar days<sup>19</sup> to identify whether a BES interrupting device operation was initiated by a Protection System Misoperation. Once the applicable entity has identified a Misoperation, it has completed its performance under Requirement R1. Identified Misoperations without an identified cause become subject to Requirement R4 and any subsequent Requirements as necessary. Identified Misoperations with an identified cause become subject to Requirement R5 and any subsequent Requirements as necessary. While identifying the cause is implicit in the structure of the proposed standard, it is necessary to identify the cause in order to determine whether an entity is responsible for performance under other Requirements.

(2) Requirement R2

***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, provide notification as described in Parts 2.1 and 2.2. [Violation Risk Factor: Medium][Time Horizon: Operations Assessment, Operations Planning]***

***2.1 For a BES interrupting device operation by a Composite Protection System or by manual intervention in response to a Protection System failure to operate, notification of the operation shall be provided to the***

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<sup>19</sup> The time period within each Requirement is distinct and separate from the time periods listed in other Requirements.

*other owner(s) that share Misoperation identification responsibility for the Composite Protection System under the following circumstances:*

*2.1.1 The BES interrupting device owner shares the Composite Protection System ownership with any other owner; and*

*2.1.2 The BES interrupting device owner has determined that a Misoperation occurred or cannot rule out a Misoperation; and*

*2.1.3 The BES interrupting device owner has 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.*

*2.2 For a BES interrupting device operation by a Protection System component intended to operate as backup protection for a condition on another entity's BES Element, notification of the operation shall be provided to the other Protection System owner(s) for which that backup protection was provided.*

Requirement R2 ensures notification occurs to those who must play a role in identifying Misoperations for an applicable BES interrupting device operation. Notification is not accounted for within Requirement R1 to limit each requirement to a single performance category in each requirement. In the case of multi-entity ownership, the entity that owns the BES interrupting device that operated is expected to identify those Protection System operations meeting the circumstances in Parts 2.1.1, 2.1.2, and 2.1.3; however, if the entity that owns a BES interrupting device determines 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, it must notify the other Protection System owner(s) that share Misoperation identification responsibility when the criteria in Requirement R2 are met. Requirement R2 does not preclude the Protection System owners from initially communicating and working together to determine whether a Misoperation occurred and, if so, the cause.

Notification is required when the circumstances in Parts 2.1.1, 2.1.2, and 2.1.3 are met, thus avoiding unnecessary notifications and redirecting of resources by the recipient. The applicable entity has 120 calendar days, based on the date of the BES interrupting device operation, to provide notification to the other Protection System owners that meet the circumstances in Parts 2.1 and 2.2.

Part 2.2 is applicable when a BES interrupting device fails to operate due to a Protection System failure and results in operation of a Protection System intended to operate as backup protection for a condition on another entity's BES Element. In this case, the entity that provided backup protection, upon identifying operation of its Protection System providing backup protection for a condition on another entity's BES Element, must provide notification of the operation to the other. The applicable entity receiving the notification must initiate a review of its Protection System under Requirement R3.

Of particular note, a Composite Protection System owned by different functional entities within the same registered entity does not necessarily satisfy the notification criteria in Part 2.1 of Requirement R2. For example, if the same personnel within a registered entity perform the Misoperation identification for both the Generator Owner and Transmission Owner functions, then the Misoperation identification would be completely covered in Requirement R1, and therefore notification would not be required. However, if the Misoperation identification is handled by different groups, then notification would be required because the Misoperation identification would not necessarily be covered in Requirement R1.

(3) Requirement R3

***R3. Each Transmission Owner, Generator Owner, and Distribution Provider that receives notification, pursuant to Requirement R2 shall, within the later of 60 calendar days of notification or 120 calendar days of the BES interrupting device(s) operation, identify whether its Protection System component(s) caused a***

*Misoperation. [Violation Risk Factor: Medium][Time Horizon: Operations Assessment, Operations Planning]*

For Requirement R3 (i.e., notification received), the entity that also owns a portion of the Composite Protection System is expected to identify whether the Protection System operation is a Misoperation. A combination of available information from resources such as operation counters, relay targets, supervisory control and data acquisition (SCADA), Disturbance Monitoring Equipment (DME), and information from the other owner(s) would typically be used to determine whether or not a Misoperation occurred. The entity that is notified by the BES interrupting device owner is allowed until the later of 60 calendar days from receipt of notification or 120 calendar days from the BES interrupting device operation date to determine if its Protection System components caused a Misoperation. It is expected that in most cases of a jointly owned Protection System, the entity making notification would have been in communication with the other owner(s) early in the process. This means that the “60 calendar days” only comes into play if the notification occurs in the second half of the 120 calendar days allotted to the BES interrupting device owner in Requirement R1. This setup assures that entities will, at a minimum, have 60 calendar days to determine if its Protection System components caused a Misoperation.

(4) Requirement R4

***R4. Each Transmission Owner, Generator Owner, and Distribution Provider that has not determined the cause(s) of a Misoperation, for a Misoperation identified in accordance with Requirement R1 or R3, shall perform investigative action(s) to determine the cause(s) 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: [Violation Risk Factor: Medium] [Time Horizon: Operations Assessment, Operations Planning]***

- *The identification of the cause(s) of the Misoperation; or*

- *A declaration that no cause was identified.*

Requirement R4 requires the entity that owns the BES interrupting device or an entity that was notified to take investigative action(s) to determine the cause(s) of an identified Misoperation for its portion of the Composite Protection System. The standard drafting team included this Requirement because there will be cases where the cause(s) of a Misoperation will not be revealed during the review for Misoperation in Requirements R1 or R3. Requirement R4 provides a mechanism to continue the investigative work to determine the cause(s) of an identified Misoperation when the cause is not known. At least one investigative action must be performed every two full calendar quarters until the investigation is completed. This time period was allocated in recognition of the time needed to schedule and complete certain planned investigative actions. The entity's investigation is complete when it identifies the cause of the Misoperation or makes a declaration that no cause was determined.

(5) Requirement R5

***R5. Each Transmission Owner, Generator Owner, and Distribution Provider that owns the Protection System component(s) that caused the Misoperation shall, within 60 calendar days of first identifying a cause of the Misoperation: [Violation Risk Factor: Medium] [Time Horizon: Operations Planning, Long-Term Planning]***

- *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.*

Resolving the causes of Protection System Misoperations benefits BES reliability by preventing recurrence. A formal Corrective Action Plan ("CAP") is a proven tool for

resolving and reducing the possibility of recurrence of operational problems. When the Misoperation cause is identified in Requirement R1, R3 or R4, Requirement R5 requires Protection System owner(s), within 60 calendar days of first determining a cause, to develop a CAP, or explain why corrective actions are beyond the entity's control or would not improve BES reliability. The 60 calendar day period for developing a CAP (or declaration) is established based on industry experience, which includes operational coordination timeframes, time to consider alternative solutions, coordination of resources, and development of a schedule. The development of a CAP is intended to document the specific corrective actions needed to prevent Misoperation recurrence, the timetable for executing such actions, and an evaluation of the CAP's applicability to the entity's other Protection Systems including other locations. The evaluation of these other Protection Systems aims to reduce the risk and likelihood of similar Misoperations of other Protection Systems. The PRC-004-3 Application Guidelines contain examples of CAPs and other declarations to assist applicable entities.

(6) Requirement R6

***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. [Violation Risk Factor: Medium][Time Horizon: Operations Planning, Long-Term Planning]***

To achieve the stated purpose of this standard, which is to identify and correct the causes of Misoperations of Protection Systems for BES Elements, the responsible entity is required to implement a CAP that addresses the specific problem (i.e., cause(s) of the Misoperation) through completion. Protection System owners are required in the implementation of a CAP to update it when actions or timetables change, until completed. Accomplishing this objective is intended to reduce the occurrence of future

Misoperations of a similar nature, thereby improving reliability and minimizing risk to the Bulk-Power System.

3. Improvements Reflected in Proposed PRC-004-3

Proposed PRC-004-3 and its associated new and revised definitions improve upon the currently effective Reliability Standard and the current method of collecting Misoperation data. First, the proposed standard takes the three reliability activities co-mingled in the Requirements of PRC-004-2.1a and separates them into individual Requirements. Second, the Requirements now also include additional specificity for notifying other owners and requiring other owners that receive notification to review its Protection System components for Misoperations. Third, the revised definition of Misoperation and the revised Applicability section of proposed PRC-004-3 provide necessary clarity regarding the components, conditions, and categories that are within scope of the review for Misoperations. Fourth, as noted below in NERC's response to FERC's directives, the results-based Requirements in proposed PRC-004-3 require performance based on uniform, continent-wide criteria for the analysis of Protection System operations through Requirements R1, R2, R3, and R4 and mitigation of identified Misoperations (Requirements R5 and R6). As a result, NERC is able to streamline the body of Reliability Standards and eliminate PRC-003-1, allowing NERC to increase uniformity in the approach to addressing Misoperations. Finally, moving the periodic reporting of Misoperations from the standard and into a separate data request pursuant to Section 1600 of NERC's Rules of Procedure will permit NERC's data analysis to continue separately from compliance with the standard and continue reporting, using a standardized template, for all entities subject to the data request. All of these improvements will result in improved and more consistent review, reporting, and analysis of Protection System operations for Misoperation.

### **C. Consideration of FERC's Directives**

In Order No. 693, FERC issued directives related to both PRC-004-3 and PRC-003-1, leaving unresolved issues for NERC to address. With respect to PRC-003-1, FERC did not approve or remand PRC-003-1, instead choosing to wait to act until NERC submitted additional information.<sup>20</sup> As explained in the Tables of Issues and Directives (Exhibit E) and the Mapping Document (Exhibit C), PRC-003-1 will be retired by proposed PRC-004-3. The results-based Requirements in proposed PRC-004-3 require performance based on uniform, continent-wide criteria for the analysis of Protection System operations through Requirements R1, R2, R3, and R4 and mitigation of identified Misoperations (Requirements R5 and R6). Thus, it is not necessary to maintain a separate standard for process alone. Therefore, NERC will not submit the additional information needed to obtain approval of PRC-003-1. The standard drafting team has considered the additional directive from Order No. 693 related to PRC-003-1 in its construction of PRC-004-3. In P 1461, FERC directed NERC to consider whether greater consistency can be achieved. This is achieved, as noted above, through the uniform, continent-wide criteria for analyzing Protection System operations and identifying Misoperations and by maintaining the reporting requirements for periodic Misoperations based on a continent-wide template. All reporting of Misoperations will be done through the separate Misoperations Data Request instead of having PRC-004-3 specify an administrative reporting requirement as a compliance element. The Misoperations Data Request has been included for informational purposes as Exhibit H.

With respect to PRC-004, FERC directed NERC in Order No. 693 to “consider ISO-NE’s suggestion that LSEs and transmission operators should be included in the applicability section,

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<sup>20</sup> Order No. 693 at P 1460.



in the Reliability Standards development process as it modifies PRC-004-1.”<sup>21</sup> The standard drafting team took ISO-NE’s comments under advisement and determined that the proper functional entities to include in the applicability are the Transmission Owner, Generator Owner, and Distribution Provider who own the BES Protection Systems. Owners of Protection Systems have personnel with subject matter expertise, Protection System design and setting information, and disturbance monitoring data, necessary to identify whether Protection System components cause a Misoperation, identify causes, and develop and implement CAPs. As owners of Protection Systems, the Transmission Owner, Generator Owner, and Distribution Provider have the responsibility to assure proper operation and implement corrective actions as needed. It therefore would be inappropriate to assign responsibility to entities that do not own Protection Systems, such as Load Serving Entities and Transmission Operators.

#### **D. Enforceability of Proposed Reliability Standards**

The proposed Reliability Standard PRC-004-3 includes Measures that support each requirement to help ensure that the requirements will be enforced in a clear, consistent, non-preferential manner and without prejudice to any party. The proposed Reliability Standard also includes VRFs and VSLs for each requirement. The VRFs and VSLs for the proposed Reliability Standard comport with NERC and FERC guidelines related to their assignment. A detailed analysis of the assignment of VRFs and the VSLs for proposed PRC-004-3 is included as Exhibit F.

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<sup>21</sup> *Id.* at P 1469.

Respectfully submitted,

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## **EXHIBITS A – C and E – I**

(Available on the NERC Website at

<http://www.nerc.com/FilingsOrders/ca/Canadian%20Filings%20and%20Orders%20DL/PRC-004-3%20Exhibits.pdf>)

## Exhibit D

### Reliability Standards Criteria

The discussion below explains how the proposed Reliability Standard has met or exceeded the Reliability Standards criteria:

**1. Proposed Reliability Standards must be designed to achieve a specified reliability goal and must contain a technically sound means to achieve that goal.**

Proposed Reliability Standard PRC-004-3 achieves the specific reliability goal of identifying and correcting the causes of Misoperations of Protection Systems for Bulk Electric System (BES) Elements. Proposed Reliability Standard PRC-004-3 revises the currently effective PRC-004-2.1a Reliability Standard, which ensures that all transmission and generation Protection System Misoperations affecting the reliability of the Bulk Electric System are analyzed and mitigated. The proposed standard also takes into account the reliability objective of PRC-003-1 (Regional Procedure for Analysis of Misoperations of Transmission and Generation Protection Systems), which is to establish, document and maintain regional procedures for, review, analysis, reporting and mitigation of transmission and generation Protection System Misoperations. PRC-004-3 eliminates the need for regional procedures by providing continent-wide parameters for investigating Protection System operations and identifying Misoperations.

**2. Proposed Reliability Standards must be applicable only to users, owners and operators of the bulk power system, and must be clear and unambiguous as to what is required and who is required to comply.**

The proposed Reliability Standard applies to Transmission Owners, Generator Owners, and Distribution Providers. It also applies to underfrequency load shedding that is intended to

trip one or more Bulk Electric System Elements.. The proposed Reliability Standard is clear and unambiguous as to what is required and who is required to comply. For a complete description of each requirement and the language in each, please refer to Section IV.B.2.b of NERC's filing. The proposed Reliability Standard separates each performance element required to identify and correct Misoperations into a separate requirement to improve clarity and remove the comingling of performance elements found in the requirements of PRC-004-2.1a. The proposed standard also includes clear timing elements, which are supported by detailed explanation in the application guidelines developed by the standard drafting team.

**3. A proposed Reliability Standard must include clear and understandable consequences and a range of penalties (monetary and/or non-monetary) for a violation.**

The Violation Risk Factor (“VRF”) and Violation Severity Level (“VSL”) for the proposed Reliability Standard comport with NERC and FERC guidelines related to their assignment. The assignment of the severity levels for the VSLs is consistent with the corresponding Requirement and will ensure uniformity and consistency in the determination of penalties. The VSLs do not use any ambiguous terminology, and support uniformity and consistency in the determination of similar penalties for similar violations. For these reasons, the proposed Reliability Standard includes clear and understandable consequences.

**4. A proposed Reliability Standard must identify clear and objective criterion or measure for compliance, so that it can be enforced in a consistent and non-preferential manner.**

The proposed Reliability Standard contains Measures that support the requirements by clearly identifying what is required and how the requirements will be measured for compliance.

The Measures, contained in Section C of the proposed PRC-004-3 Reliability Standard are as follows:

**M1.** Each Transmission Owner, Generator Owner, and Distribution Provider shall have dated evidence that demonstrates it identified the Misoperation of its Protection System component(s), if any, that meet the circumstances in Requirement R1, Parts 1.1, 1.2, and 1.3 within the allotted time period. Acceptable evidence for Requirement R1, including Parts 1.1, 1.2, and 1.3 may include, but is not limited to the following dated documentation (electronic or hardcopy format): reports, databases, spreadsheets, emails, facsimiles, lists, logs, records, declarations, analyses of sequence of events, relay targets, Disturbance Monitoring Equipment (DME) records, test results, or transmittals.

**M2.** Each Transmission Owner, Generator Owner, and Distribution Provider shall have dated evidence that demonstrates notification to the other owner(s), within the allotted time period for either Requirement R2, Part 2.1, including subparts 2.1.1, 2.1.2, and 2.1.3 and Requirement R2, Part 2.2. Acceptable evidence for Requirement R2, including Parts 2.1 and 2.2 may include, but is not limited to the following dated documentation (electronic or hardcopy format): emails, facsimiles, or transmittals.

**M3.** Each Transmission Owner, Generator Owner, and Distribution Provider shall have dated evidence that demonstrates it identified whether its Protection System component(s) caused a Misoperation within the allotted time period. Acceptable evidence for Requirement R3 may include, but is not limited to the following dated documentation (electronic or hardcopy format): reports, databases, spreadsheets, emails, facsimiles, lists, logs, records, declarations, analyses of sequence of events, relay targets, Disturbance Monitoring Equipment (DME) records, test results, or transmittals.

**M4.** Each Transmission Owner, Generator Owner, and Distribution Provider shall have dated evidence that demonstrates it performed at least one investigative action according to Requirement R4 every two full calendar quarters until a cause is identified or a declaration is made. Acceptable evidence for Requirement R4 may include, but is not limited to the following dated documentation (electronic or hardcopy format): reports, databases, spreadsheets, emails, facsimiles, lists, logs, records, declarations, analyses of sequence of events, relay targets, Disturbance Monitoring Equipment (DME) records, test results, or transmittals.

**M5.** Each Transmission Owner, Generator Owner, and Distribution Provider shall have dated evidence that demonstrates it developed a CAP and an evaluation of the CAP's applicability to other Protection Systems and locations, or a declaration in accordance with Requirement R5. Acceptable evidence for Requirement R5 may include, but is not limited to the following dated documentation (electronic or hardcopy format): CAP and evaluation, or declaration.

**M6.** Each Transmission Owner, Generator Owner, and Distribution Provider shall have dated evidence that demonstrates it implemented each CAP, including updating actions or timetables. Acceptable evidence for Requirement R6 may include, but is not limited to the following dated documentation (electronic or hardcopy format): records that document the implementation of each CAP and the completion of actions for each CAP including revision history of each CAP. Evidence may also include work management program records, work orders, and maintenance records.

**5. Proposed Reliability Standards should achieve a reliability goal effectively and efficiently — but do not necessarily have to reflect “best practices” without regard to implementation cost or historical regional infrastructure design.**

The proposed Reliability Standard achieves the reliability goal effectively and efficiently.

The proposed Reliability Standard continues to employ a similar process to identify and correct Misoperations of Protection Systems as that utilized in the currently effective Reliability Standard, thereby using the most efficient means to maintain the effective identification and correction of these occurrences. NERC has also moved the periodic reporting of Misoperations from the standard and into a separate data request pursuant to Section 1600 of NERC's Rules of Procedure. This will permit NERC's data analysis to continue separately from compliance with the standard and continue reporting, using a standardized template, for all entities subject to the data request. This separation promotes efficiency in implementing and monitoring compliance of the Reliability Standard by moving the reporting burden into NERC's data collection program rather than as part of the standard.

- 6. Proposed Reliability Standards cannot be “lowest common denominator,” *i.e.*, cannot reflect a compromise that does not adequately protect Bulk-Power System reliability. Proposed Reliability Standards can consider costs to implement for smaller entities, but not at consequences of less than excellence in operating system reliability.**

The proposed Reliability Standard does not reflect a “lowest common denominator” approach. This proposed Reliability Standard is the result of multiple industry ballots and revisions that reflect an active comment and response process between industry and the standard drafting team. The result of these efforts was a stronger final proposed Reliability Standard that protects the reliability of the Bulk-Power System. The standard also reflects direction and input through an assessment of NERC’s System Protection and Control Subcommittee. Further, NERC’s current data collection efforts related to Misoperations of Protection Systems and NERC’s *State of Reliability* reports provided additional information to develop the proposed Reliability Standard.

- 7. Proposed Reliability Standards must be designed to apply throughout North America to the maximum extent achievable with a single Reliability Standard while not favoring one geographic area or regional model. It should take into account regional variations in the organization and corporate structures of transmission owners and operators, variations in generation fuel type and ownership patterns, and regional variations in market design if these affect the proposed Reliability Standard.**

The proposed Reliability Standard applies throughout North America and does not favor one geographic area or regional model. The proposed standard also does not conflict with any existing regional differences, such as regional Reliability Standard PRC-004-WECC-1 (Protection System and Remedial Action Scheme Misoperation).

- 8. Proposed Reliability Standards should cause no undue negative effect on competition or restriction of the grid beyond any restriction necessary for reliability.**



Proposed Reliability Standard PRC-004-3 has no undue negative effect on competition and does not unreasonably restrict transmission or generation operation on the Bulk-Power System.

**9. The implementation time for the proposed Reliability Standard is reasonable.**

The effective date for the proposed Reliability Standard appropriately balances the urgency to implement the standard against the time needed by those who must comply to develop necessary adjustments to procedures in support of the proposed Reliability Standard. To allow covered Entities adequate and reasonable time to comply with the proposed Reliability Standard, the effective date is twelve (12) months following the date that the proposed standard is approved by the applicable governmental authority or as otherwise provided for in a jurisdiction where approval by an applicable governmental authority is required for a standard to go into effect. Where approval by an applicable governmental authority is not required, the standard, the revised definition of “Misoperation,” and the new definition of “Composite Protection System” shall become effective on the first day of the first calendar quarter that is twelve (12) months after the date the standard is adopted by the NERC Board of Trustees or as otherwise provided for in that jurisdiction.

**10. The Reliability Standard was developed in an open and fair manner and in accordance with the Reliability Standard development process.**

The proposed Reliability Standard was developed in accordance with NERC’s ANSI-accredited processes for developing and approving Reliability Standards. Exhibit G includes a summary of the standard development proceedings, and details the processes followed to develop the Reliability Standard. These processes included, among other things, multiple

comment periods, pre-ballot review periods, and balloting periods. Additionally, all meetings of the standard drafting team were properly noticed and open to the public.

**11. NERC must explain any balancing of vital public interests in the development of proposed Reliability Standards.**

NERC has not identified competing public interests regarding the request for approval of the proposed Reliability Standard. No comments were received that indicated the proposed Reliability Standard conflicts with other vital public interests.

**12. Proposed Reliability Standards must consider any other appropriate factors.**

No other factors relevant to whether the proposed Reliability Standard is just and reasonable were identified.