

February 25, 2015

**VIA ELECTRONIC FILING**

Ms. Erica Hamilton, Commission Secretary  
British Columbia Utilities Commission  
Box 250, 900 Howe Street  
Sixth Floor  
Vancouver, B.C.  
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RE: *North American Electric Reliability Corporation*

Dear Ms. Hamilton:

The North American Electric Reliability Corporation (“NERC”) hereby submits Notice of Filing of the North American Electric Reliability Corporation of Revisions to the Definition of “Remedial Action Scheme” and Proposed Reliability Standards. 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/ Holly A. Hawkins

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Enclosure

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**BEFORE THE  
BRITISH COLUMBIA UTILITIES COMMISSION  
OF THE PROVINCE OF BRITISH COLUMBIA**

**NORTH AMERICAN ELECTRIC )  
RELIABILITY CORPORATION )**

**NOTICE OF FILING OF THE  
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION  
OF REVISIONS TO THE DEFINITION OF “REMEDIAL ACTION SCHEME” AND  
PROPOSED RELIABILITY STANDARDS**

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February 25, 2015

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Exhibit A	Proposed Definition of “Remedial Action Scheme”
Exhibit B	Revised Reliability Standards Incorporating the Definition of Remedial Action Scheme
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Exhibit E	<i>Uses of “Special Protection System” and “Remedial Action Scheme” in Reliability Standards</i>
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Exhibit H	Summary of Development History and Complete Record of Development
Exhibit I	Standard Drafting Team Roster

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**NORTH AMERICAN ELECTRIC )  
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OF REVISIONS TO THE DEFINITION OF “REMEDIAL ACTION SCHEME” AND  
PROPOSED RELIABILITY STANDARDS**

The North American Electric Reliability Corporation (“NERC”) hereby submits proposed revisions to the definition of the term “Remedial Action Scheme” (“RAS”) (Exhibit A) in the *NERC Glossary of Terms Used in Reliability Standards* (“NERC Glossary”).<sup>1</sup> NERC is also beginning transition to the use of the term “Remedial Action Scheme” to replace the occurrences of “Special Protection System” (“SPS”) throughout the NERC Reliability Standards. Currently, the terms Special Protection System and Remedial Action Scheme are used interchangeably throughout the NERC Regions and in various Reliability Standards. As a result, NERC also provides notice of the following proposed Reliability Standards (“Proposed Reliability Standards”), which have been modified to incorporate the proposed definition of “Remedial Action Scheme” and eliminate use of the term “Special Protection System”:

EOP-004-3	PRC-005-3(ii) <sup>2</sup>	PRC-023-4
FAC-010-3	PRC-012-1 <sup>3</sup>	TPL-001-0.1(i)

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

<sup>2</sup> NERC notes that PRC-005-3(i) is proposed in a separate filing of proposed standards developed in Project 2014-01 - Standards Applicability for Dispersed Generation Resources. NERC has included PRC-005-3(ii) for modification in this filing because NERC anticipates action on PRC-005-3(i) on a faster timeline. If action is taken on the proposed Reliability Standard versions in a different order, NERC will modify numbering accordingly. The changes proposed to the applicability in proposed PRC-005-3(i) are separate and distinct from the changes proposed here to use the single defined term “Remedial Action Scheme” in place of references to “Special Protection System.” NERC also notes that the same change to use the term Remedial Action Scheme is already reflected in the proposed Reliability Standard PRC-005-4 filed on January 22, 2015.

FAC-011-3	PRC-013-1 <sup>4</sup>	TPL-002-0(i)b
MOD-030-3	PRC-014-1 <sup>5</sup>	TPL-003-0(i)b
MOD-029-2a	PRC-015-1	TPL-004-0(i)a
PRC-004-WECC-2	PRC-016-1	PRC-001-1.1(i)
PRC-005-2(ii) <sup>6</sup>	PRC-017-1	

The proposed definition of Remedial Action Scheme and the Proposed Reliability Standards each are just, reasonable, not unduly discriminatory or preferential, and in the public interest. There are no changes to the Violation Risk Factors or Violation Severity Levels for any of the Proposed Reliability Standards. NERC also provides notice of the associated Implementation Plan (Exhibit C), noting the explanation below regarding the status of certain of the developed Reliability Standards.

Certain draft Reliability Standards developed by NERC in conjunction with the proposed definition of Remedial Action Scheme have not been submitted in this filing. A complete list of draft Reliability Standards developed in the Project is included in the Implementation Plan. NERC is only providing notice of the proposed Reliability Standards found in Exhibit B and

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<sup>3</sup> The Federal Energy Regulatory Commission (“FERC”) identified PRC-012-0 as a fill-in-the-blank standard in Order No. 693. *See Mandatory Reliability Standards for the Bulk-Power System*, Order No. 693, 72 Fed. Reg. 16416, FERC Stats. & Regs. ¶ 31,242, at P 1517, *order on reh’g*, Order No. 693-A, 120 FERC ¶ 61,053 (2007). NERC understands that FERC will not approve or remand the revised version in the filing submitted to FERC, but the standard has been modified for completeness and so the posted version on NERC’s website reflects the improved definition.

<sup>4</sup> FERC identified PRC-013-0 as a fill-in-the-blank standard in Order No. 693. *See Order No. 693 at P 1524*. NERC understands that FERC will not approve or remand the revised version in the filing submitted to FERC, but the standard has been modified for completeness and so the posted version on NERC’s website reflects the improved definition.

<sup>5</sup> FERC identified PRC-014-0 as a fill-in-the-blank standard in Order No. 693. *See Order No. 693 at P 1528*. NERC understands that FERC will not approve or remand the revised version in the filing submitted to FERC, but the standard has been modified for completeness and so the posted version on NERC’s website reflects the improved definition.

<sup>6</sup> NERC notes that PRC-005-2(i) is proposed in a separate filing of proposed standards developed in Project 2014-01 - Standards Applicability for Dispersed Generation Resources. NERC has included PRC-005-2(ii) for modification in this filing because NERC anticipates action on PRC-005-2(i) on a faster timeline. If action is taken on the proposed Reliability Standard versions in a different order, NERC will modify numbering accordingly. The changes proposed to the applicability in proposed PRC-005-2(i) are separate and distinct from the changes proposed here to use the single defined term “Remedial Action Scheme” in place of references to “Special Protection System.”

listed in the filing. The remaining draft Reliability Standards have been marked as “inactive” in accordance with the Implementation Plan language. The Implementation Plan explains that where the standard being modified by the project is replaced by a successor version outside of the project, the proposed Reliability Standard will be marked “inactive” and not become mandatory and enforceable.

This filing presents the technical basis and purpose of the proposed definition of Remedial Action Scheme; an explanation of the adjustments made in the proposed Reliability Standards; a summary of the development proceedings (Exhibit H); and a demonstration that the proposed definition and Proposed Reliability Standards meet the Reliability Standards criteria (Exhibit D). The NERC Board of Trustees approved the proposed definition of Remedial Action Scheme and the Proposed Reliability Standards on November 13, 2014.

Final action should be taken on this filing concurrently with NERC’s filing of PRC-010-1. The proposed definitions of UVLS Program and Remedial Action Scheme in each project have been coordinated to cover centrally controlled UVLS as a Remedial Action Scheme. Final action is needed contemporaneously on both filings to facilitate implementation and avoid a gap in coverage of centrally controlled UVLS.

## **I. EXECUTIVE SUMMARY**

A key element for the reliability of the Bulk-Power System is the correct identification and performance of Special Protection Systems and Remedial Action Schemes. NERC is proposing revisions to the existing definition of Remedial Action Scheme and corresponding changes in the Proposed Reliability Standards to use the proposed definition in order to ensure consistent classification of systems that are Remedial Action Schemes and application of Reliability Standards referencing the defined term. The defined terms “Special Protection

System” and “Remedial Action Scheme” are currently used interchangeably throughout the NERC Regions and in various Reliability Standards, including prior versions of the Proposed Reliability Standards. NERC will gradually modify all of the NERC Reliability Standards to incorporate the use of only a single term Remedial Action Scheme, starting with revisions to the Proposed Reliability Standards. The proposed revisions to the Remedial Action Scheme definition and Proposed Reliability Standards are not expected to result in changes to the scope of systems covered by the Proposed Reliability Standards and other Reliability Standards that already include the term Remedial Action Scheme. However, in the event there is a change in the status of an entity’s system, the Implementation Plan includes additional time to become compliant.

Although these defined terms share a common definition in the NERC Glossary today, their use and application have been inconsistent as a result of a lack of granularity in the definition and varied regional uses of the terms. The proposed revisions add clarity and granularity that will allow for proper identification of Remedial Action Schemes and a more consistent application of related Reliability Standards. Use of only one term in the NERC Reliability Standards will ensure proper identification of these systems and application of related Reliability Standards. NERC will continue to modify the NERC Reliability Standards until all of them reference only the defined term Remedial Action Scheme. At that time, the definition of Special Protection System will be retired.

## **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 definition of Remedial Action Scheme was developed in an open and fair manner and in accordance with the Reliability Standard development process. NERC develops Definition in accordance with Section 300 (Reliability Standards Development) of its Rules of Procedure and the NERC Standard Processes Manual.<sup>7</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 legitimate interest in the reliability of the Bulk-Power System. NERC considers the comments of all stakeholders, and a vote of stakeholders and the NERC Board of Trustees is required to approve a definition before the Reliability Standard is submitted to the applicable governmental

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<sup>7</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).



authorities. The proposed definition of Remedial Action Scheme was developed in accordance with NERC's ANSI-accredited processes for developing and approving definitions. Exhibit G includes a summary of the development history and record of development of for the proposed definition of Remedial Action Scheme and the Proposed Reliability Standards.

## **B. Special Protection System and Remedial Action Scheme Definitions**

On April 4, 2006, NERC submitted a filing that included, among other things, the NERC Glossary, which included NERC's current Special Protection System and Remedial Action Scheme definitions. The NERC Glossary currently defines a Special Protection System as:

An automatic protection system designed to detect abnormal or predetermined system conditions, and take corrective actions other than and/or in addition to the isolation of faulted components to maintain system reliability. Such action may include changes in demand, generation (MW and Mvar), or system configuration to maintain system stability, acceptable voltage, or power flows. An SPS does not include (a) underfrequency or undervoltage load shedding or (b) fault conditions that must be isolated or (c) out-of-step relaying (not designed as an integral part of an SPS). Also called Remedial Action Scheme.

The NERC Glossary definition for "Remedial Action Scheme" is a cross-reference to the definition of Special Protection System and reads: "See 'Special Protection System.'" The internal cross-references from Remedial Action Scheme to Special Protection System in lieu of a separate definition ensures that the terms are used interchangeably even where entities or an interconnection uses one term versus the other.<sup>8</sup> As of the date of this filing, many existing Reliability Standards contain references to both Special Protection System and Remedial Action Scheme in the applicability sections, requirements, tables, or attachments. A summary of the

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<sup>8</sup> Where the definition of Special Protection System is referenced in the filing, it also refers to the existing definition of Remedial Action Scheme.

uses of Special Protection System and Remedial Action Scheme in the existing body of Reliability Standards is included in Exhibit E.<sup>9</sup>

### **C. SPCS Technical Report**

On January 9, 2011, the NERC Standards Committee proposed a request for research to address the misoperation of Special Protection Systems and Remedial Action Schemes and the resultant negative impacts to the reliability of the Bulk Electric System.<sup>10</sup> In that request, the Standards Committee solicited technical input from the NERC Planning Committee on the kind and scope of development necessary to address the identified issues. On June 8, 2011, the NERC Planning Committee approved a joint effort by the System Analysis and Modeling Subcommittee (“SAMS”) and the System Protection and Control Subcommittee (“SPCS”) to consider the issues identified in the request for research. Specifically, the project instructed the SPCS and SAMS to:

- assess the Special Protection System-related Protection and Control (“PRC”) Reliability Standards and the definition of Special Protection System;
- conduct an assessment of existing regional practices; and
- document findings on the Special Protection System definition and related Reliability Standards in a report to the Planning Committee.

On March 5, 2013, the SPCS and SAMS issued its report, *Special Protection Systems (SPS) and Remedial Action Schemes (RAS): Assessment of Definition, Regional Practices, and Application of Related Standards* (“SPCS/SAMS Report” or “Report”).<sup>11</sup> A brief summary of the conclusions and recommendations from the Report is provided below.

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<sup>9</sup> NERC notes that this list was posted with draft 1 of the proposed definition and is current as of June 2014.

<sup>10</sup> See Ex. G at 43.

<sup>11</sup> See Ex. G. The SPCS/SAMS Report was updated in April of 2013.

Following a thorough review, the SPCS/SAMS Report concluded that the existing NERC Glossary definition for Special Protection System is not clear and lacks the specificity to provide for consistent identification and classification of Special Protection Systems or Remedial Action Schemes across the eight NERC Regions. The Report suggested that the lack of clarity and specificity in the definition coupled with varied regional practices employed in the Special Protection System/Remedial Action Scheme-related Reliability Standards, may lead to inconsistent application of these Reliability Standards. To correct the recognized shortcomings of the existing definition of Special Protection System, the SPCS/SAMS Report introduced a strawman definition of “Special Protection System” to eliminate ambiguity in the existing definition and identify thirteen types of schemes that are not Special Protection Systems, but that have been misidentified or confused as Special Protection Systems in the past. Additionally, the Report included recommendations for revisions to six Special Protection System-related PRC Reliability Standards to ensure consistency with the strawman Special Protection System definition. The SPCS/SAMS Report suggested implementation of a risk-based classification for Special Protection System, categorizing schemes according to the type of event to which the Special Protection System responds and the consequence of a misoperation of that Special Protection System.

The SPCS/SAMS Report further recommended that NERC reassign requirements of the three “fill-in-the-blank” standards, including PRC-012-0, PRC-013-0, and PRC-014-0, to specific users, owners, and operators. Finally, the SPCS/SAMS Report made a variety of suggestions for revisions to Special Protection System/Remedial Action Scheme-related Reliability Standards, including a proposal to consolidate the requirements pertaining to review, assessment, and documentation of Special Protection System into one standard and to revise

requirements pertaining to analysis and reporting of Special Protection System misoperations in a revision of Reliability Standard PRC-016-0.1.

#### **D. History of Project 2010-05**

Project 2010-05 was formed with the goal of improving the monitoring of Bulk Electric System Protection System events and of identifying and correcting the causes of Misoperations to improve Protection System performance. In early 2011, the work in 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>12</sup> In the first phase of the Project, NERC developed proposed Reliability Standard PRC-004-3 and a revised definition of “Misoperation”, which are currently pending. The second phase of the Project, part of which is the subject of this filing, addresses the Special Protection System/Remedial Action Scheme aspects of the SPCS/SAMS Report including revisions to the Special Protection System and Remedial Action Scheme definitions. The SPCS/SAMS Report served as a starting point and formed the basis for the standard drafting team’s development work regarding the proposed definition of Remedial Action Scheme. Revisions to the six Special Protection System-related Reliability Standards will be addressed by future work in Project 2010-05.2 during 2015 and a separate filing will be submitted to the applicable governmental authorities.

#### **IV. JUSTIFICATION**

As discussed in Exhibit D and below, the proposed definition of Remedial Action Scheme and the Proposed Reliability Standards satisfy the Reliability Standards criteria and are just, reasonable, not unduly discriminatory or preferential, and in the public interest. The

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<sup>12</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).

following section separately provides: (i) an explanation of the need to revise the definition of Remedial Action Scheme; (ii) presentation and discussion of the proposed definition and its elements; (iii) a discussion of the changes to the Proposed Reliability Standards; and (iv) a discussion of the enforceability of the Proposed Reliability Standards.

**A. Need for a Revised Definition of Remedial Action Scheme**

As noted by the SPCS/SAMS Report and a reference document prepared by the standard drafting team (“Remedial Action Scheme FAQ”),<sup>13</sup> the existing definition of Special Protection System lacks sufficient clarity for consistent identification of what equipment, or schemes qualify as a Special Protection System or Remedial Action Scheme across the eight NERC Regions.<sup>14</sup> According to the Report, the deference to regional practices for classifying Special Protection Systems, coupled with this lack of clarity in the definition, preclude consistent application of NERC Reliability Standard requirements pertaining to Special Protection Systems. In addition, NERC identified that improvements in the classification of protective schemes would result in the use of a single term in place of two terms that share a definition. Both terms are used across the NERC Regions in regional Reliability Standards and in classifications of systems. For example, the term “Remedial Action Scheme” is used in regional Reliability Standards and regional classifications of Special Protection Systems in the Western Interconnection, but both “Remedial Action Scheme” and “Special Protection System” are used in continent-wide Reliability Standards and across other Regions. The use of both terms offers an opportunity for improvement through revision of the definition and eventual use of a single term.

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<sup>13</sup> See Ex. F, *Remedial Action Scheme Definition Development Background and Frequently Asked Questions* (“RAS FAQ”) at 1.

<sup>14</sup> See Ex. F at 1 and Ex. G at 6.

An explanation of the issues identified by the SPCS/SAMS Report and the Remedial Action Scheme FAQ that justify revising the definition are explained below along with an explanation of the role of regional practices employed to classify Special Protection Systems and Remedial Action Schemes under the current definition.

1. Confusion of a Special Protection System as a Subset of a “Protection System”

Inclusion of the words “Protection System” in the definition of “Special Protection System” has raised questions whether this is an intentional reference such that Special Protection Systems are a subset of Protection Systems.<sup>15</sup> While *Special* Protection Systems may include the same types of components as Protection Systems, Special Protection Systems are not limited to detecting faults or abnormal conditions and tripping affected equipment. For example, a Special Protection System may effect a change to the operating state of power system elements to preserve system stability or to avoid unacceptable voltages or overloads in response to system events. There are many reasons for implementing a Special Protection System.<sup>16</sup> A Special Protection System can be implemented to ensure compliance with the TPL Reliability Standards, to mitigate temporary operating conditions or abnormal configurations (e.g., during construction or maintenance activities), or in instances where system operators would not be able to respond quickly enough to avoid adverse system conditions.<sup>17</sup> As a result, identifying a Special Protection System as a *subset* of Protection Systems introduces opportunity for misidentification.

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<sup>15</sup> See *id.*.

<sup>16</sup> Ex. G at 6.

<sup>17</sup> *Id.*

## 2. Lack of Clarity in Actions Stipulated as Characteristics of a SPS

The Special Protection System definition also lacks clarity in the actions stipulated as characteristics of a Special Protection System. The actions listed in the Special Protection System definition are broad and the definition may unintentionally include schemes whose purpose is not expressly related to preserving system reliability in response to predetermined system conditions.<sup>18</sup> Inclusion of *any* scheme taking “corrective actions other than isolation of faulted components to maintain system reliability”<sup>19</sup> could be interpreted to include voltage regulators and switching controls for shunt capacitors. NERC notes that these individual devices provide local area monitoring and control functions to maintain the local system at its nominal state; consequently, they are not Remedial Action Schemes. Inclusion as a Remedial Action Scheme would unintentionally make these devices subject to single component failure considerations (sometimes referred to as redundancy considerations), coordination, reporting, and maintenance and testing requirements that may be required in the NERC Reliability Standards.<sup>20</sup>

Additionally, “Protection Systems” include components such as “protective relays which respond to electrical quantities” as the building blocks of a Protection System. While all protective schemes include some combination of the building blocks of a Protection System, many protective schemes do not have all of the building blocks. For example, many protective schemes do not have the “communications systems...” component, which is included in the NERC Glossary definition of Protection System. In other cases, protective schemes like

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<sup>18</sup> *Id.* at 7.

<sup>19</sup> *See* definition of Special Protection System.

<sup>20</sup> Ex. G at 7.

Remedial Action Schemes may have all of the components of a Protection System as well as other pieces of equipment such as programmable logic controllers.

**B. Proposed Definition of “Remedial Action Scheme” and Related Changes**

NERC’s proposed definition of “Remedial Action Scheme” includes a higher level of specificity and, as a result, will provide more consistent, proper identification of Remedial Action Schemes across the NERC Regions. The proposed definition of Remedial Action Scheme recasts the existing definition of Special Protection System to:

- more precisely describe the objectives of the schemes;
- more precisely describe exclusions;
- state the relationship between Protection Systems and Remedial Action Schemes; and
- clarify that centrally controlled undervoltage-based load shedding is included in the definition.

NERC proposes the following revised definition of Remedial Action Scheme:

A scheme designed to detect predetermined System conditions and automatically take corrective actions that may include, but are not limited to, adjusting or tripping generation (MW and Mvar), tripping load, or reconfiguring a System(s). RAS accomplish objectives such as:

- Meet requirements identified in the NERC Reliability Standards;
- Maintain Bulk Electric System (BES) stability;
- Maintain acceptable BES voltages;
- Maintain acceptable BES power flows;
- Limit the impact of Cascading or extreme events.

The following do not individually constitute a RAS:

- a. Protection Systems installed for the purpose of detecting Faults on BES Elements and isolating the faulted Elements
- b. Schemes for automatic underfrequency load shedding (UFLS) and automatic undervoltage load shedding (UVLS) comprised of only distributed relays
- c. Out-of-step tripping and power swing blocking



- d. Automatic reclosing schemes
- e. Schemes applied on an Element for non-Fault conditions, such as, but not limited to, generator loss-of-field, transformer top-oil temperature, overvoltage, or overload to protect the Element against damage by removing it from service
- f. Controllers that switch or regulate one or more of the following: series or shunt reactive devices, flexible alternating current transmission system (FACTS) devices, phase-shifting transformers, variable-frequency transformers, or tap-changing transformers; and, that are located at and monitor quantities solely at the same station as the Element being switched or regulated
- g. FACTS controllers that remotely switch static shunt reactive devices located at other stations to regulate the output of a single FACTS device
- h. Schemes or controllers that remotely switch shunt reactors and shunt capacitors for voltage regulation that would otherwise be manually switched
- i. Schemes that automatically de-energize a line for a non-Fault operation when one end of the line is open
- j. Schemes that provide anti-islanding protection (e.g., protect load from effects of being isolated with generation that may not be capable of maintaining acceptable frequency and voltage)
- k. Automatic sequences that proceed when manually initiated solely by a System Operator
- l. Modulation of HVdc or FACTS via supplementary controls, such as angle damping or frequency damping applied to damp local or inter-area oscillations
- m. Sub-synchronous resonance (SSR) protection schemes that directly detect sub-synchronous quantities (e.g., currents or torsional oscillations)
- n. Generator controls such as, but not limited to, automatic generation control (AGC), generation excitation [e.g. automatic voltage regulation (AVR) and power system stabilizers (PSS)], fast valving, and speed governing

The definition consists of a “core” definition, which includes a list of objectives (in bullet points) accomplished by a Remedial Action Scheme. It also includes a separate list of exclusions for certain schemes or systems that are not by themselves classified as a Remedial Action

Scheme. For each exclusion, the scheme or system could still classify as a Remedial Action Scheme if employed in a broader scheme that meets the definition of Remedial Action Scheme.

NERC is also proposing to move to the use of a single defined term, Remedial Action Scheme, which will eliminate the use of the two terms, SPS and RAS, both within single standards and throughout the NERC Reliability Standards where the terms are used separately. Changes to the Proposed Reliability Standards in this filing are described separately in Section IV.B below. Use of the term “Remedial Action Scheme” instead of “Special Protection System” eliminates the opportunity to misinterpret Special Protection Systems as a subset of Protection Systems, as noted above, within the Proposed Reliability Standards. Over time, as the references to Special Protection System are converted, the potential for confusion will be eliminated in the Reliability Standards.

A detailed explanation of the proposed definition and its elements along with a summary of the changes in the Proposed Reliability Standards is included below.

1. Definition of Remedial Action Scheme

a) *“Core” Definition with Objectives*

A scheme designed to detect predetermined System conditions and automatically take corrective actions that may include, but are not limited to, adjusting or tripping generation (MW and Mvar), tripping load, or reconfiguring a System(s). RAS accomplish objectives such as:

- Meet requirements identified in the NERC Reliability Standards;
- Maintain Bulk Electric System (BES) stability;
- Maintain acceptable BES voltages;
- Maintain acceptable BES power flows;
- Limit the impact of Cascading or extreme events.

The revised definition of Remedial Action Scheme addresses ambiguities within the existing definition and provides clarity to promote consistency in the application of the standards

by the responsible entities. The definition is not designed to very narrowly define what is considered a Remedial Action Scheme because there are a multitude of reasons that an entity may design a scheme and a narrow definition cannot adequately define all of the possible scenarios an entity may develop and employ a Remedial Action Scheme. A very specific, narrow definition may unintentionally exclude schemes that should be covered. As a result, the standard drafting team designed the definition to be broad enough to include the variety of system conditions monitored and corrective actions taken by Remedial Action Schemes.

Because of the diversity of Remedial Action Schemes, in both action and objective, the practical approach to the definition is to begin with a wide scope, further define objectives that would serve to focus the scope to the desired schemes, and then list specific exclusions to ultimately arrive at what schemes are properly classified as Remedial Action Schemes. The list of corrective actions in the “core” definition and the objectives are not limited because there may be another corrective action or objective a scheme is designed for that would justify its treatment as a Remedial Action Scheme. The items included by the standard drafting team represent an exhaustive list of the commonly applied corrective actions and objectives that would classify the scheme as a Remedial Action Scheme. The exclusion list assures that commonly applied protection and control systems are not unintentionally included as Remedial Action Schemes.

b) *Exclusions*

The proposed “core” definition is broad enough to include the variety of System conditions monitored and corrective actions taken by Remedial Action Schemes. However, NERC proposes an exclusion list as an addition to the Remedial Action Scheme definition to assure that commonly applied protection and control systems are not unintentionally included as Remedial Action Schemes. Without these exclusions, equipment and schemes that should not be

considered a Remedial Action Scheme could be subject to the requirements of the Remedial Action Scheme-related NERC Reliability Standards. Each of the exclusions contains a scenario that does not *individually* constitute a Remedial Action Scheme. The language of each exclusion is provided for ease of reference. The exclusions below should not, taken alone, be considered a Remedial Action Scheme because each is either a protective function (e.g., Exclusions a, b, c, e, m, i, and j), a control function (e.g. Exclusions f, g, h, l, n, and k), a combination of both or used for system reconfiguration (e.g., Exclusions d, i, j, and k). These systems generally protect or control an individual piece of equipment or Element or focus on more local action. Remedial Action Schemes are designed to monitor and respond to the larger overall system. Individually, the focus of a protective function is on the Element that it is designed to protect; whereas, a RAS focuses on mitigating unacceptable impacts on the System resulting from the predetermined conditions for which the Remedial Action Scheme was designed.

*a. Protection Systems installed for the purpose of detecting faults on BES Elements and isolating the faulted Elements*

The standard drafting team has maintained this exclusion in the proposed definition as it is consistent with industry practice of excluding it from consideration as a Special Protection System or Remedial Action Scheme. The existing definition of SPS/RAS excludes the isolation of faulted components because that is a protective function and focuses on a specific Element. For the remaining Protection Systems installed for the purpose of detecting Faults on non-BES Elements, the standard drafting team explains that these are not Remedial Action Schemes, and are not subject to NERC Reliability Standards.

*b. Schemes for automatic underfrequency load shedding (UFLS) and automatic undervoltage load shedding (UVLS) comprised of only distributed relays*

The standard drafting team also carried forward the exclusion of underfrequency load shedding (“UFLS”) and undervoltage load shedding (“UVLS”) found in the definition of Special Protection System as consistent with industry practice. UFLS and UVLS are excluded because they are protective functions that have unique design and implementation considerations covered by NERC Reliability Standards PRC-006-1 and proposed PRC-010-1. The proposed exclusion language emphasizes “distributed relays” to convey that the exclusion covers “UVLS Programs.” The defined term “UVLS Programs” is proposed in NERC’s filing of proposed Reliability Standard PRC-010-1. The proposed definition of “UVLS Program” is “[a]n automatic load shedding program, consisting of distributed relays and controls, used to mitigate undervoltage conditions impacting the Bulk Electric System (BES), leading to voltage instability, voltage collapse, or Cascading. Centrally controlled undervoltage-based load shedding is not included.” By excluding distributed UVLS relays in the definition of Remedial Action Scheme and because the proposed UVLS Program definition specifically excludes centrally controlled undervoltage-based load shedding, these centrally controlled undervoltage-based load shedding schemes are classified as a Remedial Action Scheme via the “core” definition. A centrally controlled scheme allows for a wide-area view. The characteristics of a centrally controlled system make it susceptible to a single point of failure if not properly designed and maintained. Whereas, the UVLS/UFLS programs by their distributed nature have inherent redundancy. While both RAS and UVLS programs can be designed to target severe events, a Remedial Action Scheme can be more selective in its action. A UVLS program is generally based upon individually acting undervoltage relays that take local action. Design for a Remedial Action Scheme can be extremely complex, have greatly varying inputs, and output can result in actions anywhere on the System to mitigate the adverse conditions.

As a result, centrally controlled undervoltage-based load shedding is classified as a Remedial Action Scheme. Both standard drafting teams for the respective projects developing the proposed definitions of Remedial Action Scheme and UVLS Programs agreed that the design and characteristics of centrally controlled undervoltage-based load shedding are appropriately categorized as Remedial Action Scheme.

*c. Out-of-step tripping and power swing blocking*

The existing definition of SPS/RAS excludes out-of-step relaying because it is a protective function. The standard drafting team maintained the exclusion for the same reasons, but changed the wording from “out-of-step relaying” to “out-of-step tripping and power swing blocking” to reflect current industry terminology. Out-of-step tripping is used for controlled system islanding during severe System disturbances resulting in power swings. It is also used to isolate generators that have lost synchronization with System to prevent significant damage. Out-of-step blocking used to prevent unwanted tripping of phased protection relay Elements during either stable or unstable power system swings.

*d. Automatic reclosing schemes*

Automatic reclosing schemes, whether single-pole or three-pole, are used to minimize both system impacts and restoration efforts by System Operators. Automatic reclosing, in itself, is not a Remedial Action Scheme; however, if integrated into a larger scheme that performs additional corrective actions to accomplish the objective(s) listed in the Remedial Action Scheme definition, then it would fall within the definition of Remedial Action Scheme. For example, a scheme that rejects or runs back generation to avoid instability or thermal overloads in addition to initiating automatic reclosing would constitute a Remedial Action Scheme. The standard drafting team contends that auto-sectionalizing for restoration following a Fault would typically

fall under exclusion (d) automatic reclosing schemes. Automatic reclosing schemes that restore load to an alternate source would typically not be a Remedial Action Scheme; however, system reconfiguration which transfers the load to another source for purposes other than load restoration typically would be a Remedial Action Scheme.

- e. Schemes applied on an Element for non-Fault conditions, such as, but not limited to, generator loss-of-field, transformer top-oil temperature, overvoltage, or overload to protect the Element against damage by removing it from service*

Schemes applied on a single element to protect it from damage from non-Fault conditions perform protective functions and are not Remedial Action Schemes. These schemes are designed to protect a single Element when certain non-Fault conditions are present. Examples of these types of schemes are reverse power, volts/hertz, winding temperature, and loss of cooling.

- f. Controllers that switch or regulate one or more of the following: series or shunt reactive devices, flexible alternating current transmission system (FACTS) devices, phase-shifting transformers, variable-frequency transformers, or tap-changing transformers; and, that are located at and monitor quantities solely at the same station as the Element being switched or regulated*
- g. FACTS controllers that remotely switch static shunt reactive devices located at other stations to regulate the output of a single FACTS device*

Consistent with industry practice, controllers that switch or regulate certain devices do not qualify as a Remedial Action Scheme. These controllers monitor local conditions and take local action. In the case of exclusion (g), the purpose of these controllers is to switch shunt devices to restore an acceptable operating range of a single FACTS device. Exclusions (f) and (g) are complementary in that (f) provides a broad exception for local controls at the same station

while (g) provides a specific exclusion for FACTS control of shunt devices at one or more other stations. The standard drafting team included these exclusions consistent with industry practice.

- h. Schemes or controllers that remotely switch shunt reactors and shunt capacitors for voltage regulation that would otherwise be manually switched*

Schemes or controllers that assist a System Operator in coordinating the switching of shunt reactors and shunt capacitors that would otherwise be manually switched are not remedial in the sense of being mitigations in response to predetermined System conditions, but are for general application to all System conditions, e.g. optimizing voltage profiles or minimizing losses. The standard drafting team included this exclusion consistent with industry practice.

- i. Schemes that automatically de-energize a line for a non-Fault operation when one end of the line is open*

When one end of a line is open, unacceptable voltage levels can occur. Opening the remote terminal(s) to de-energize the transmission line removes this voltage rise. Alternatively, restoration conditions may require energization or synchronizing at a specific terminal. These schemes have not historically been regarded as Remedial Action Scheme, and the standard drafting team included this exclusion consistent with industry practice.

- j. Schemes that provide anti-islanding protection (e.g., protect load from effects of being isolated with generation that may not be capable of maintaining acceptable frequency and voltage)*

These schemes are designed to protect load in an electrical island that might otherwise operate at an off-nominal frequency or voltage, or facilitate restoration. Actions taken on islanded facilities will not impact the interconnected Bulk Electric System because the facilities are isolated. The standard drafting team included this exclusion consistent with industry practice.



*k. Automatic sequences that proceed when manually initiated solely by a System Operator*

Automated sequences created to simplify the actions of a System Operator are not a Remedial Action Scheme because the decision to activate a specific sequence is left to the System Operator. If the automated sequence fails to execute correctly, the System Operator has the option to manually set those actions in motion. The standard drafting team included this exclusion consistent with industry practice. The arming of a Remedial Action Scheme by a System Operator is not the same as manual initiation of an automatic sequence. Arming enables the scheme, but the Remedial Action Scheme must still detect the critical conditions it was designed to mitigate and then take action.

*l. Modulation of HVdc or FACTS via supplementary controls such as angle damping or frequency damping applied to damp local or inter-area oscillations*

Modulation of HVdc and FACTS via supplementary controls is occasionally used for damping local or inter-area oscillations. It is similar in function to a Power System Stabilizer, which is a component of excitation controls in a generating unit. Power System Stabilizers are also not classified as Remedial Action Schemes. The standard drafting team included these HVdc and FACTS exclusions consistent with industry practice.

*m. Sub-synchronous resonance (SSR) protection schemes that directly detect sub-synchronous quantities (e.g., currents or torsional oscillations)*

Historically, sub-synchronous resonance (“SSR”) protection schemes that directly detect sub-synchronous quantities and the related mitigation are not Remedial Action Schemes. These schemes are designed to detect and mitigate a local area issue. The standard drafting team maintained this exclusion, consistent with industry practice. However, SSR protection schemes installed to detect distinct System configurations and loading conditions (that studies have shown

may make a generator vulnerable to SSR), and take action to trip the generator or bypass the series capacitor, are classified as Remedial Action Schemes.

- n. Generator controls such as, but not limited to, automatic generation control (AGC), generation excitation (e.g. automatic voltage regulation (AVR) and power system stabilizers (PSS)], fast valving, and speed governing*

These traditional generator and turbine controls are not Remedial Action Schemes. With the exception of automatic generation control, all of these controls involve local monitoring and local control of a specific generator. Automatic generation control is not used for system preservation, but is used for continuous fine-tuning of frequency and to provide balance for load/generation under normal conditions. The standard drafting team included this exclusion consistent with industry practice.

## 2. Proposed Reliability Standards and Implementation

The standard drafting team evaluated all occurrences of Remedial Action Scheme and Special Protection System as part of its scope of work. Exhibit E includes a summary of the occurrences of “Special Protection System” and “Remedial Action Scheme” in the NERC Reliability Standards (as of May 16, 2014). This document has been included with the filing as a tool to assist in reviewing occurrences of the two defined terms. The standard drafting team modified certain Reliability Standards that are currently subject to enforcement and certain others in implementation, where the modification would not impact other ongoing standard development work. The Proposed Reliability Standards, as noted above, reflect the use of the single term “Remedial Action Scheme” and have been revised to remove any reference to Special Protection System in place of references to Special Protection System. For example, in instances where only the term Special Protection System occurs, NERC proposes striking that reference and replacing it with Remedial Action Scheme. Where both terms, Special Protection

System and Remedial Action Scheme, occur, NERC proposes deleting only the reference to Special Protection System. Where only the term Remedial Action Scheme occurs, a change is not necessary to the language of the Reliability Standard.

The standard drafting team thoroughly reviewed each of the Proposed Reliability Standards in light of the proposed definition of Remedial Action Scheme and determined that the changes do not affect the scope, intent, or meaning of those Reliability Standards. However, in the event that entities do have schemes that become newly classified as Remedial Action Schemes under the proposed definition, the Implementation Plan includes additional time (within twenty-four months (24) from the Effective Date of the proposed definition) to become compliant with the Reliability Standards during the transition to the proposed definition.

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/Attachments\\_RAS\\_Definition.pdf](http://www.nerc.com/FilingsOrders/ca/Canadian%20Filings%20and%20Orders%20DL/Attachments_RAS_Definition.pdf))

## EXHIBIT D

### **Reliability Standards** **Criteria**

The discussion below explains how the proposed definition for “Remedial Action Scheme” (Exhibit A) and the Proposed Reliability Standards (Exhibit B) have 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.**

The proposed definition of Remedial Action Scheme and the associated changes in the Proposed Reliability Standard from use of “Special Protection System” to “Remedial Action Scheme” achieve the specific reliability goal of providing specificity and clarity needed to consistently identify and classify Remedial Action Schemes. The revisions reduce confusion over use of both Special Protection System and Remedial Action Scheme and will reduce regional differences in how various Regions classify Remedial Action Schemes. Further, the revisions include the addition of technical objectives and classification criteria for consistent identification of Remedial Action Schemes. The design of the definition of Remedial Action Schemes is technically sound because it has been structured to capture systems at a broad level, further refine the list through application of specific objectives a Remedial Action Scheme is intended to meet, and even further refined through the explicit inclusion of systems that do not individually constitute a Remedial Action Scheme. By taking this approach to the proposed definition, the standard drafting team avoided the possibility of missing classification of a system by use of a narrow and targeted definition.

- 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 Standards continue to apply to the same applicable entities as the prior versions. By improving the definition of Remedial Action Scheme and replacing uses of Special Protection System with Remedial Action Scheme, NERC has improved the clarity in each of the Proposed Reliability Standards on what is required with respect to Remedial Action Schemes.

- 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 VRFs and VSLs for the proposed Reliability Standard did not change as a result of the proposed revisions to the definition and the associated changes to the Proposed Reliability Standards. Accordingly, the VRFs and VSLs for each of the standards continue to comport with NERC and FERC guidelines related to their assignment and include 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.**

Revisions to the Proposed Reliability Standards did not include any substantive revisions to the Measures in any of the Reliability Standards. The existing Measures continue to help provide clarity regarding how the requirements will be enforced, and they continue to help ensure that the requirements will be enforced in a clear, consistent, and non-preferential manner and without prejudice to any party.

**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 definition and revisions to the Proposed Reliability Standards achieve the reliability goal of providing clarity and specificity to the identification and classification of protective schemes effectively and efficiently. As a result, the proposed definition will reduce or eliminate misapplication of Reliability Standards that reference Remedial Action Scheme. Also, by changing or removing references to Special Protection System and replacing them with Remedial Action Scheme, the proposed revisions will provide consistency in identification and classification of Remedial Action Schemes continent-wide. This will create efficiency in the application and of the Reliability Standards that utilize the phrase Remedial Action Scheme.

**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 definition and revisions to the Proposed Reliability Standards do not reflect a “lowest common denominator” approach. To the contrary, the proposed definition of Remedial Action Scheme represents an improvement over the current definitions of Special Protection System and Remedial Action Scheme, which lack clarity and specificity. The proposed definition was informed by a comprehensive review by NERC’s System Protection and Control Subcommittee of the definition of Special Protection System and related Reliability Standards that use the term. The standard drafting team fully evaluated this input and posted the strawman definition for industry comment. The standard drafting team also



provided analysis in the RAS FAQ document on any differences between the standard drafting team's approach and the recommendations in the SPCS Technical Report.

- 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 RAS definition and Proposed Reliability Standards continue to apply in the same manner as the currently effective Reliability Standards.

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

The proposed RAS definition and the revisions to the SPS/RAS Standards will not cause undue negative effect on competition or result in any unnecessary restrictions.

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

The suggested effective dates for the proposed definition and Reliability Standards are just and reasonable. NERC proposes an effective date of the first day of the first calendar quarter that is twelve (12) months after the date that the standards and definition are approved by an 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 standards and the definition shall become effective on the first day of the first calendar quarter that is twelve (12) months after the date the standards and definition are adopted by the NERC Board of Trustees or as otherwise provided for in that jurisdiction. . This period will allow time for entities to review current systems and make any necessary adjustments in their internal processes necessary to

implement the proposed the new definition and related Reliability Standards based on the increased granularity of the proposed definition. For entities with newly classified Remedial Action Schemes resulting from the application of the revised definition as explained in this filing NERC proposes an effective date of twenty-four months (24) from the Effective Date of the revised definition. While NERC does not anticipate any such changes, the standard drafting team included the additional time in the event a system did encounter a change in status based on the proposed definition. The proposed implementation plan is attached as **Exhibit C**.

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

The proposed definition and Reliability Standards were developed in accordance with NERC's ANSI- accredited processes for developing and approving Reliability Standards.<sup>21</sup> Exhibit H includes a summary of the development proceedings and details the processes followed to develop the proposed definition and Reliability Standards. These processes included, among other things, comment and balloting periods. Additionally, all meetings of the 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 identified no competing public interests regarding the request for approval of the proposed RAS definition and the SPS/RAS Standards. No comments were received that indicated the proposed Reliability Standard conflicts with other vital public interests.

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<sup>21</sup> See NERC *Rules of Procedure*, Section 300 (Reliability Standards Development) and Appendix 3A (Standard Processes Manual).

**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.