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**BEFORE THE  
ALBERTA ELECTRIC SYSTEM OPERATOR**

**NORTH AMERICAN ELECTRIC )  
RELIABILITY CORPORATION )**

**NOTICE OF FILING OF THE  
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION  
OF PROPOSED RELIABILITY STANDARD  
PRC-005-2 (PROTECTION SYSTEM MAINTENANCE)**

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PRC-005-2 (PROTECTION SYSTEM MAINTENANCE)**

The North American Electric Reliability Corporation (“NERC”) hereby submits:

- proposed Reliability Standard PRC-005-2 – Protection System<sup>1</sup> Maintenance (**Exhibit B**);
- six new definitions (Protection System Maintenance Program, Unresolved Maintenance Issue, Segment, Component Type, Component, and Countable Event);
- the implementation plan for proposed PRC-005-2 (“Implementation Plan”) (**Exhibit C**);
- the Violation Risk Factors (“VRFs”) and Violation Severity Levels (“VSLs”) for proposed PRC-005-2 (**Exhibit B and Exhibit I**);

NERC also provides notice of the retirement of the following Reliability Standards, effective in accordance with the Implementation Plan:

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<sup>1</sup> Capitalized terms used but not defined in this Petition are intended to have the same meaning given to such terms in the *Glossary of Terms Used in NERC Reliability Standards*, available at: [http://www.nerc.com/files/Glossary\\_of\\_Terms.pdf](http://www.nerc.com/files/Glossary_of_Terms.pdf). (“NERC Glossary”)

- PRC-005-1.1b (Transmission and Generation Protection System Maintenance and Testing);
- PRC-008-0 (Implementation and Documentation of Underfrequency Load Shedding Equipment Maintenance Program);
- PRC-011-0 (Undervoltage Load Shedding System Maintenance and Testing); and
- PRC-017-0 (Special Protection System Maintenance and Testing).

This filing presents the technical basis and purpose of the proposed Reliability Standard, a summary of the development proceedings conducted by NERC for proposed PRC-005-2, and a demonstration that the proposed Reliability Standard meets the Reliability Standards criteria.

## **I. EXECUTIVE SUMMARY**

NERC currently has four Reliability Standards that are mandatory and enforceable in the United States and Canada that address various aspects of maintenance and testing of protection and control systems. These Reliability Standards are PRC-005-1.1b, PRC-008-0, PRC-011-0, and PRC-017-0. Proposed Reliability Standard PRC-005-2 consolidates these Reliability Standards into a single proposed Reliability Standard. Proposed PRC-005-2 also addresses the directives related to those Reliability Standards issued by the Federal Energy Regulatory Commission (“FERC”) in Order No. 693.<sup>2</sup> The primary purpose of proposed Reliability Standard PRC-005-2 is “[t]o document and implement programs for the maintenance of all Protection Systems affecting the reliability of the Bulk Electric System [], so that these Protection Systems are kept in working order.”<sup>3</sup> Proposed PRC-005-2 also:

(i) establishes minimum acceptable maintenance activities and accompanying maximum allowable maintenance intervals, reflecting various technologies of the components being addressed;

<sup>2</sup> *Mandatory Reliability Standards for the Bulk-Power System*, Order No. 693, FERC Stats. & Regs. ¶ 31,242 (“Order No. 693”), *order on reh’g*, Order No. 693-A, 120 FERC ¶ 61,053 (2007).

<sup>3</sup> See Exhibit B, proposed Reliability Standard PRC-005-2 “Purpose” statement.

(ii) provides Transmission Owners, Generator Owners, and Distribution Providers (together, “Functional Entities”) the flexibility to implement condition-based maintenance, by adjusting the minimum acceptable maintenance activities and maximum allowable maintenance intervals to reflect condition monitoring of the various Protection System Components; and

(iii) establishes requirements for effective implementation of performance-based maintenance programs.

The proposed Reliability Standard will improve reliability by: (i) defining and establishing minimum criteria for a Protection System Maintenance Program; (ii) reducing the risk of Protection System Misoperations;<sup>4</sup> (iii) clearly stating the applicability of the Requirements in proposed PRC-005-2 to certain Functional Entities and Facilities; (iv) establishing Requirements for time-based maintenance programs that include maximum allowable maintenance intervals for all relevant devices; and (v) establishing Requirements for condition-based and performance-based maintenance programs where hands-on maintenance intervals are adjusted to reflect the known and reported condition or the historical performance, respectively, of the relevant devices.

Proposed Reliability Standard PRC-005-2 was approved by the NERC Board of Trustees on November 7, 2012. Implementation for proposed PRC-005-2, as fully explained in **Exhibit A** and in the Implementation Plan attached as **Exhibit C**, will be phased to appropriately balance the reliability benefits to be achieved with the efforts, expense, and requirements associated with implementation of and compliance with the improved proposed Reliability Standard. The

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<sup>4</sup> “Misoperations” are (i) 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; (ii) 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); or (iii) any unintentional Protection System operation when no fault or other abnormal condition has occurred unrelated to on-site maintenance and testing activity. *See* NERC Glossary at 37.

Effective Date of proposed PRC-005-2 (*i.e.*, the Implementation Plan) reflects the importance of having in place an improved, unified, and clarified Protection System maintenance Reliability Standard.

## **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. History of PRC-005 and Project 2007-17**

With the development of the proposed PRC-005-2 Reliability Standard, the standard drafting team for Project 2007-17 – Protection System Maintenance has followed the observations and recommendations of the NERC System Protection and Control Task Force (“SPCTF”) in its assessment of PRC-005-1, PRC-008-0, PRC-011-0, and PRC-017-0

(“Assessment”).<sup>5</sup> As discussed below, Project 2007-17 – Protection System Maintenance and Testing also addresses FERC’s directives from Order No. 693 related to PRC-005-1, PRC-008-0, PRC-011-0, and PRC-017-0. To provide context for the approval of proposed PRC-005-2, this section includes a brief summary of the history of PRC-005 and the Reliability Standards proposed for retirement and a summary of the observations of the NERC SPCTF.

## 1. PRC-005 and Related Reliability Standards

FERC approved Reliability Standard PRC-005-1 in Order No. 693<sup>6</sup> and directed NERC “to develop a modification ... through the Reliability Standards development process that includes a requirement that maintenance and testing of a protection system must be carried out within a maximum allowable interval that is appropriate to the type of the protection system and its impact on the reliability of the Bulk-Power System.”<sup>7</sup> FERC also directed NERC to consider suggestions made by commenters to “combine PRC-005, PRC-008, PRC-011, and PRC-017 into a single Reliability Standard.”<sup>8</sup>

Since Order No. 693, and during the time in which PRC-005-2 has been under development, two interpretations of PRC-005-1 have been filed with the applicable governmental authorities. In September 2011, FERC approved NERC’s interpretation of “transmission Protection System” as it appears in PRC-005-1, Requirements R1 and R2 (PRC-

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<sup>5</sup> NERC, *NERC SPCTF Assessment of Standards: PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing, PRC-008-0 — Underfrequency Load Shedding Equipment Maintenance Programs, PRC-011-0 — UVLS System Maintenance and Testing, PRC-017-0 — Special Protection System Maintenance and Testing*, Mar. 8, 2007, available at [http://www.nerc.com/docs/standards/sar/PRC-005-008-011-017\\_Report\\_Approved\\_by\\_PC.pdf](http://www.nerc.com/docs/standards/sar/PRC-005-008-011-017_Report_Approved_by_PC.pdf). (“SPCTF Assessment”). A supplement to the Assessment was also considered. NERC, *NERC SPCTF Supplemental Assessment Addressing FERC Order 693 Relative to PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing, PRC-008-0 — Underfrequency Load Shedding Equipment Maintenance Programs, PRC-011-0 — UVLS System Maintenance and Testing, PRC-017-0 — Special Protection System Maintenance and Testing*, May 17, 2007, available at [http://www.nerc.com/docs/pc/spctf/Supplemental\\_Report\\_on\\_PRC-005-008-011-017\\_Approved\\_by\\_PC\\_2.pdf](http://www.nerc.com/docs/pc/spctf/Supplemental_Report_on_PRC-005-008-011-017_Approved_by_PC_2.pdf).

<sup>6</sup> Order No. 693 at P 1475.

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

<sup>8</sup> *Id.* (“We further direct the ERO to consider FirstEnergy’s and ISO-NE’s suggestion to combine PRC-005-1, PRC-008-0, PRC-011-0 and PRC-017-0 into a single Reliability Standard through the Reliability Standards development process.”).

005-1a).<sup>9</sup> A second interpretation of Requirement R1 was accepted in Order No. 758<sup>10</sup> (PRC-005-1b). The second interpretation included five questions, each with a NERC response. As part of its acceptance of the interpretation in Order No. 758, FERC accepted NERC's commitments to address through the Reliability Standards development process concerns raised with respect to the Protection System maintenance and testing Reliability Standard during the Order No. 758 rulemaking process. FERC also directed that concerns raised with respect to reclosing relays be addressed within the reinitiated PRC-005 revisions.<sup>11</sup>

On April 13, 2011, NERC submitted a filing of a proposed modification to the definition of "Protection System" to close a reliability gap created by an omission in the currently definition. FERC approved the modified definition, which is referenced in proposed PRC-005-2.<sup>12</sup> On July 30, 2012, and in response to a directive in Order No. 758, NERC submitted an informational filing to report to FERC that proposed PRC-005-2 was in the final stages of the development process, and revisions to address the issues around the maintenance and testing of reclosing relays identified in the Order No. 758 proceeding had been authorized for development and would be addressed in a subsequent submission.<sup>13</sup>

In Order No. 693, FERC also approved PRC-008-0 (Implementation and Documentation of Underfrequency Load Shedding Equipment Maintenance Program), PRC-011-0 (Undervoltage Load Shedding System Maintenance and Testing), and PRC-017-0 (Special

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<sup>9</sup> *N. Am. Elec. Reliability Corp.*, 136 FERC ¶ 61,208, P 11 (2011). The interpretation interpreted "transmission Protection System" to mean "any Protection System that is installed for the purpose of detecting faults on transmission elements (lines, buses, transformers, etc.) identified as being included in the Bulk Electric System [] and trips an interrupting device that interrupts current supplied directly from the [Bulk Electric System]."

<sup>10</sup> *Interpretation of Protection System Reliability Standard*, Order No. 758, 138 FERC ¶ 61,094 (2012).

<sup>11</sup> *Id.* at P 11, 27.

<sup>12</sup> *See N. Am. Elec. Reliability Corp.*, 138 FERC ¶ 61,095 (2012).

<sup>13</sup> NERC Jul. 30, 2012 Informational Filing in Compliance with Order No. 758, Docket No. RM10-5. *See also* NERC Project 2007-17 Protection System Maintenance - Phase 2 (Reclosing Relays), *available at* [http://www.nerc.com/filez/standards/Project\\_2007-17.2\\_Protection\\_System\\_Maintenance\\_and\\_Testing\\_Phase\\_2\\_Reclosing\\_Relays.html](http://www.nerc.com/filez/standards/Project_2007-17.2_Protection_System_Maintenance_and_Testing_Phase_2_Reclosing_Relays.html).



Protection System Maintenance and Testing). Similar directives to those for PRC-005-1 were issued for PRC-008,<sup>14</sup> PRC-011,<sup>15</sup> and PRC-017.<sup>16</sup> No changes to, or interpretations of these Version 0 Reliability Standards have been submitted since approval.

## **2. NERC System Protection and Control Task Force**

In a March 8, 2007 Assessment, the NERC SPCTF determined that the existing PRC-005-1, PRC-008-0, PRC-011-0, and PRC-017-0 Reliability Standards contain several fundamental flaws. In its Assessment, the group recommended that these four Reliability Standards be reduced to one Reliability Standard. The SPCTF concluded that for all four Reliability Standards: (1) the Requirements do not provide clear and sufficient guidance concerning the maintenance and testing of the Protection Systems to achieve the commonly stated purpose “[t]o ensure all transmission and generation Protection Systems affecting the reliability of the Bulk Electric System [] are maintained and tested”; (2) the Standards should clearly state which power system elements are being addressed; and (3) the Requirements should reflect the inherent differences between different technologies of Protection Systems.<sup>17</sup>

## **IV. JUSTIFICATION**

### **A. Basis and Purpose of Proposed PRC-005-2**

As discussed in detail in **Exhibit A**, proposed Reliability Standard PRC-005-2 satisfies the criteria for proposed Reliability Standards and is just, reasonable, not unduly discriminatory or preferential, and in the public interest. Proposed PRC-005-2 meets FERC’s directives related to PRC-005-1 and the directives for the Reliability Standards proposed for retirement from Order

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<sup>14</sup> Order No. 693 at P 1492.

<sup>15</sup> *Id.* at P 1516.

<sup>16</sup> *Id.* at P 1546.

<sup>17</sup> SPCTF Assessment at 2.

No. 693.<sup>18</sup> The proposed Reliability Standard also effectively combines the reliability objectives of PRC-005, PRC-008, PRC-011, and PRC-017, into one Reliability Standard. The improved proposed Reliability Standard protects reliability and creates increased efficiency within the PRC-series of Reliability Standards by combining Reliability Standards with similar reliability objectives.

The proposed PRC-005-2 Reliability Standard establishes Requirements for a time-based maintenance program, where all relevant devices are maintained according to prescribed maximum intervals. It also establishes Requirements for a condition-based maintenance program, where the hands-on maintenance intervals are adjusted to reflect the known and reported condition of the relevant devices. For a performance-based maintenance program, the hands-on maintenance intervals are adjusted to reflect the historical performance of the relevant devices. Proposed PRC-005-2 also provides a comprehensive set of Requirements that define a strong Protection Systems Maintenance Program. As a complement to the Requirements, the proposed PRC-005-2 Reliability Standard also includes detailed tables of minimum maintenance activities and maximum maintenance intervals for all five component types addressed within the NERC definition of Protection System. Functional Entities that monitor the actual condition of their Protection System components are further empowered to utilize monitoring to improve the efficiency and effectiveness of their Protection Systems Maintenance Program, and, with the benefit of extensive Protection System performance data, to utilize that performance data to further improve the efficiency and effectiveness of their Protection Systems Maintenance Program.

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<sup>18</sup> FERC directives issued subsequent to Order No. 693 address additional requirements for maintenance and testing of reclosing relays and of sudden-pressure relays in addition to other mechanical protective devices. NERC plans to address these directives in subsequent phases or projects.

The standard drafting team authored a number of technical documents included as Exhibits to this petition, which provide detailed analysis of the proposed Reliability Standard and answers to frequently asked questions regarding Protection Systems. A technical justification document addressing the Requirements for proposed PRC-005-2 is included as **Exhibit D**, a “Supplementary Reference and FAQ” document is included as **Exhibit E**, and finally a technical justification document explaining the maintenance intervals in Tables 1, 2 & 3 of proposed PRC-005-2 is included as **Exhibit F**, and finally, which contains descriptive, technical information supporting the standard drafting team’s rationale and decisions for the Requirements and associated tables. The “Supplementary Reference and FAQ” document was posted concurrently with the Reliability Standard during each posting and will be linked with the proposed PRC-005-2 Reliability Standard following approval. A mapping document is also included as **Exhibit G** explaining the translation of objectives from the proposed Reliability Standards for retirement into proposed PRC-005-2.

### **1. Improvements Reflected in Proposed PRC-005-2**

Proposed PRC-005-2 includes five Requirements, discussed below, which present a comprehensive approach to documenting and implementing programs for the maintenance of all Protection Systems affecting the reliability of the Bulk Electric System so that these Protection Systems are kept in working order. The proposed Reliability Standard applies to Transmission Owners, Generator Owners, and Distribution Providers<sup>19</sup> and to certain Facilities.<sup>20</sup> It also centralizes and defines in one Reliability Standard, a Protection System Maintenance Program that includes Transmission and Generation Protection Systems, Underfrequency Load Shedding systems, Undervoltage Load Shedding systems, and Special Protection Systems, and also

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<sup>19</sup> Proposed Reliability Standard PRC-005-2, section A.4, part 4.1.

<sup>20</sup> Proposed Reliability Standard PRC-005-2, section A.4, part 4.2.

establishes minimum criteria for that Protection System Maintenance Program. Further, the proposed Reliability Standard reduces the risk of Protection System Misoperations by applying consistent, best practice maintenance and inspection activities of Protections System Components performed in accordance with the maximum intervals established in the proposed Reliability Standard.

This approach represents an improvement over PRC-005-1 and the three Reliability Standards proposed for retirement because, unlike proposed PRC-005-2, these Reliability Standards do not contain details outlining the technical requirements for Protection System Maintenance Programs. While these Reliability Standards require that applicable entities have a maintenance program for Protection Systems, and that entities must be able to demonstrate they are carrying out such a program, the Reliability Standards do not contain the technical requirements for Protection System Maintenance Programs.

## **2. FERC Directives**

Proposed PRC-005-2 meets the FERC directives from Order No. 693 with respect to: (1) including maximum allowable intervals in PRC-005; (2) combining PRC-005, PRC-008, PRC-011, and PRC-017; and (3) considering whether Load Serving Entities and Transmission Operators should be included in the applicability of the PRC-005 Reliability Standard. While Additional directives related to the PRC-005 Reliability Standard were issued by FERC in a subsequent Order, Order No. 758,<sup>21</sup> these directives are being addressed in future projects related to PRC-005.

### **a) Maximum Allowable Intervals**

In Order No. 693, FERC directed NERC to revise PRC-005-1 to include a Requirement that maintenance and testing of a protection system must be carried out within a maximum

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<sup>21</sup> Order No. 758 at P 11, 27.

allowable interval that is appropriate to the type of the protection system and its impact on the reliability of the Bulk-Power System.<sup>22</sup> In response, proposed PRC-005-2 includes specific maximum allowable intervals within Tables 1-1 through 1-5, Table 2 and Table 3 for time-based programs. Additionally, a Requirement allowing performance-based maintenance intervals was added.

**b) Combining PRC-005, PRC-008, PRC-011, and PRC-017**

In Order No. 693, FERC also directed the ERO to consider FirstEnergy's and ISO-NE's suggestion to combine PRC-005-1, PRC-008-0, PRC-011-0 and PRC-017-0 into a single Reliability Standard through the Reliability Standards development process.<sup>23</sup> The NERC SPCTF's Assessment also suggested combining the Reliability Standards. In response, NERC has combined the Reliability Standards into the proposed PRC-005-2. As noted above, a mapping document is provided as **Exhibit G** explaining the translation of objectives from the proposed Reliability Standards for retirement into proposed PRC-005-2. NERC also notes that similar directives to those for PRC-005-1 in Order No. 693 were issued for PRC-008,<sup>24</sup> PRC-011,<sup>25</sup> and PRC-017<sup>26</sup> and are similarly addressed by the proposed Reliability Standard with the exception of a directive to develop a modification to PRC-017-0 regarding the documentation of the actual Special Protection Systems.<sup>27</sup> This directive is being addressed in an upcoming NERC Project 2010-05.2, which includes in its scope PRC-012-0 and other Special Protection System Reliability Standards.

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<sup>22</sup> Order No. 693 at P 1475.

<sup>23</sup> *Id.*

<sup>24</sup> *Id.* at P 1492.

<sup>25</sup> *Id.* at P 1516.

<sup>26</sup> *Id.* at P 1546.

<sup>27</sup> Order No. 693 at P 1545.

c) **Applicability of Proposed PRC-005-2 to Load Serving Entities and Transmission Operators**

Lastly, FERC directed NERC to consider whether Load Serving Entities and Transmission Operators should be included in the applicability of the PRC-004 Reliability Standard.<sup>28</sup> In a footnote, FERC directed NERC to consider the same directive for other Reliability Standards including PRC-005-1, PRC-008-0, PRC-011-0, and PRC-017-0.<sup>29</sup> NERC considered the suggested changes to the applicability section of the proposed PRC-005-2 Reliability Standard, but determined that proposed PRC-005-2 should be applicable to the equipment owners. While an equipment owner may need to coordinate with the operating entities in order to schedule the actual maintenance, the responsibility resides with the equipment owners to complete the required maintenance.

**3. Requirements in Proposed PRC-005-2**

As noted above, proposed PRC-005-2 establishes Requirements for: (1) time-based maintenance programs that include maximum allowable maintenance intervals for all relevant devices; (2) condition-based maintenance programs where hands-on maintenance intervals are adjusted to reflect the known and reported condition of the relevant devices; and (3) performance-based maintenance programs where hands-on maintenance intervals are adjusted to reflect the historical performance of the relevant devices.

Proposed PRC-005-2 also introduces six new definitions. With the exception of the definition for “Protection System Maintenance Program”, the newly defined terms are intended for use solely in proposed PRC-005-2 and therefore will not be located in the NERC Glossary of Terms. These “local” definitions are found in the proposed PRC-005-2 Reliability Standard in stand-alone text boxes. The definitions proposed for approval are as follows:

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<sup>28</sup> *Id.* at P 1469.

<sup>29</sup> *Id.* at n. 384.

**Protection System Maintenance Program** – An ongoing program by which Protection System components are kept in working order and proper operation of malfunctioning components is restored. A maintenance program for a specific component includes one or more of the following activities:

- Verify – Determine that the component is functioning correctly.
- Monitor – Observe the routine in-service operation of the component.
- Test – Apply signals to a component to observe functional performance or output behavior, or to diagnose problems.
- Inspect – Examine for signs of component failure, reduced performance or degradation.
- Calibrate – Adjust the operating threshold or measurement accuracy of a measuring element to meet the intended performance requirement.

**Unresolved Maintenance Issue** – A deficiency identified during a maintenance activity that causes the component to not meet the intended performance, cannot be corrected during the maintenance interval, and requires follow-up corrective action.

**Segment** – Protection Systems or components of a consistent design standard, or a particular model or type from a single manufacturer that typically share other common elements. Consistent performance is expected across the entire population of a Segment. A Segment must contain at least sixty (60) individual components.

**Component Type** – Any one of the five specific elements of the Protection System definition.

**Component** – A Component is any individual discrete piece of equipment included in a Protection System, including but not limited to a protective relay or current sensing device. The designation of what constitutes a control circuit Component is dependent upon how an entity performs and tracks the testing of the control circuitry. Some entities test their control circuits on a breaker basis whereas others test their circuitry on a local zone of protection basis. Thus, entities are allowed the latitude to designate their own definitions of control circuit Components. Another example of where the entity has some discretion on determining what constitutes a single Component is the voltage

and current sensing devices, where the entity may choose either to designate a full three-phase set of such devices or a single device as a single Component.

**Countable Event** – A failure of a Component requiring repair or replacement, any condition discovered during the maintenance activities in Tables 1-1 through 1-5 and Table 3 which requires corrective action or a Misoperation attributed to hardware failure or calibration failure. Misoperations due to product design errors, software errors, relay settings different from specified settings, Protection System Component configuration errors, or Protection System application errors are not included in Countable Events.

These new definitions are referenced throughout the Requirements of proposed PRC-005-2.

Proposed PRC-005-2 includes the following Requirements:<sup>30</sup>

**a) Requirement R1**

**R1.** Each Transmission Owner, Generator Owner, and Distribution Provider shall establish a Protection System Maintenance Program (PSMP) for its Protection Systems identified in Section 4.2. [*Violation Risk Factor: Medium*] [*Time Horizon: Operations Planning*]

**R1.1.** Identify which maintenance method (time-based, performance-based per PRC-005 Attachment A, or a combination) is used to address each Protection System Component Type. All batteries associated with the station dc supply Component Type of a Protection System shall be included in a time-based program as described in Table 1-4 and Table 3.

**R1.2.** Include the applicable monitored Component attributes applied to each Protection System Component Type consistent with the maintenance intervals specified in Tables 1-1 through 1-5, Table 2, and Table 3 where monitoring is used to extend the maintenance intervals beyond those specified for unmonitored Protection System Components.

Establishment of a Protection System Maintenance Program, as directed by Requirement R1, is needed to detect and correct plausible age- and service-related degradation of Protection System components. It is important that a Protection System continue to function as designed

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<sup>30</sup> A full technical justification for the Requirements of proposed PRC-005-2 is included in **Exhibit D**.



over its service life to ensure reliability of the Bulk Electric System. Requirement R1 establishes the obligation of a Functional Entity to establish a Protection System Maintenance Program for its Protection Systems. Requirement R1 combines the reliability goals of developing detailed tables of minimum maintenance activities and maximum maintenance intervals for all five Protection System Component Types. These tables include adjustments to those minimum maintenance activities and maximum maintenance intervals to reflect the benefits of any condition monitoring that may be present.

**b) Requirement R2**

**R2.** Each Transmission Owner, Generator Owner, and Distribution Provider that uses performance-based maintenance intervals in its PSMP shall follow the procedure established in PRC-005 Attachment A to establish and maintain its performance-based intervals. *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning]*

Requirement R2 addresses performance-based maintenance intervals. The Requirement includes a reference to Attachment A to proposed PRC-005-2, which contains criteria for a performance-based Protection System Maintenance Program. A technical justification for each of the criteria is included in **Exhibit D**. The criteria within Attachment A are largely based on application of statistical analysis theory. Performance-based maintenance is included in proposed PRC-005-2 to allow utilities to adjust maintenance intervals based on their individual experience with equipment types and manufacturers.

**c) Requirement R3**

**R3.** Each Transmission Owner, Generator Owner, and Distribution Provider that utilizes time-based maintenance program(s) shall maintain its Protection System Components that are included within the time-based maintenance program in accordance with the minimum maintenance activities and maximum maintenance intervals prescribed within Tables 1-1 through 1-5, Table 2, and Table 3. *[Violation Risk Factor: High] [Time Horizon: Operations Planning]*

Requirement R3 requires the implementation of the minimum maintenance activities and maximum allowable maintenance intervals in Requirement R1 and the tables within the proposed Reliability Standard. The proper performance of Protection Systems is fundamental to the reliability of the Bulk Electric System and proper performance of Protection Systems cannot be assured without periodic maintenance of those systems.

**d) Requirement R4**

**R4.** Each Transmission Owner, Generator Owner, and Distribution Provider that utilizes performance-based maintenance program(s) in accordance with Requirement R2 shall implement and follow its PSMP for its Protection System Components that are included within the performance-based program(s).  
*[Violation Risk Factor: High] [Time Horizon: Operations Planning]*

For the same reliability reason as Requirement R3, Requirement R4 requires the implementation of an entity's Protection System Maintenance Program established pursuant to Requirement R2.

**e) Requirement R5**

**R5.** Each Transmission Owner, Generator Owner, and Distribution Provider shall demonstrate efforts to correct identified Unresolved Maintenance Issues.  
*[Violation Risk Factor: Medium] [Time Horizon: Operations Planning]*

The reliability objective of this Requirement is to assure that Protection System components are returned to working order following the discovery of failures or malfunctions during scheduled maintenance. The maintenance activities specified in the Tables 1-1 through 1-5, Table 2, and Table 3 do not present any requirements related to restoration; therefore, Requirement R5 of the proposed Reliability Standard was developed to require the entity to “demonstrate efforts to correct identified Unresolved Maintenance Issues.”

## **B. Enforceability of Proposed PRC-005-2**

The proposed PRC-005-2 Reliability Standard contains Measures that support each Requirement by clearly identifying what is required and how the Requirement will be enforced. The Implementation Plan also discusses the documentation necessary during transition to proposed PRC-005-2. The VSLs provide further guidance on the way that NERC will enforce the Requirements of the proposed Reliability Standard. The VRFs and VSLs for the proposed PRC-005-2 Reliability Standard comport with NERC guidelines related to their assignment. For a detailed review of the VRFs, the VSLs, and the analysis of how the VRFs and VSLs were determined using these guidelines, see **Exhibit I**. The VSLs have been developed based on the situations an auditor may encounter during a compliance audit.

## **V. SUMMARY OF RELIABILITY STANDARD DEVELOPMENT PROCEEDINGS**

The extensive development record for proposed Reliability Standard PRC-005-2 is summarized below. **Exhibit H** contains the Consideration of Comments Reports created during the development of the proposed Reliability Standard. **Exhibit J** contains the complete record of development for the proposed Reliability Standard.

### **A. Overview of the Standard Drafting Team**

The technical expertise of the ERO is derived from the standard drafting team. For this project, the standard drafting team consisted of 24 industry experts with substantial, robust, and distinguished industry experience across North America, including both the continental United States and Canada. Standard drafting team members had, on average, more than 27 years' industry experience, with only five reporting less than 20 years' industry experience. The standard drafting team included experts in all facets of protection systems and Underfrequency Load Shedding and Undervoltage Load Shedding equipment engineering, operations,

maintenance, and compliance. A standard drafting team roster including member biographical information is included in **Exhibit K**.

**B. Proposed PRC-005-2 Development History**

**1. PRC-005-2 Development – Standard Authorization Request**

Project 2007-17 (Protection System Maintenance and Testing) was initiated on May 7, 2007 by a Standard Authorization Request (“SAR”) in response to Order No. 693, stakeholder issues raised during the development of the “Version 0” Reliability Standards, and the SPCTF Assessment. The Project 2007-17 SAR was posted for a 30-day public comment period from June 11 through July 10, 2007. Stakeholders submitted 18 sets of comments, including comments from 85 different individuals representing more than 50 companies covering 8 of the 10 industry segments. Based on the comments received, no changes to the SAR were made by the SAR drafting team, and the SAR was authorized to proceed to the standard drafting stage of the standards development process.

**a) First Posting – Informal Comment Period**

Proposed PRC-005-2 was first posted for a comment period from July 24, 2009 through September 8, 2009. NERC received 57 sets of comments from more than 130 different individuals, including 75 companies and representing all of the 10 industry segments. Commenters provided feedback on the proposed Reliability Standard and on the accompanying “Supplementary Reference” and “Frequently Asked Questions” documents circulated with the proposed Reliability Standard. In response to the comments received, the standard drafting team materially revised the proposed Reliability Standard and the accompanying documents, including:

- the name of the proposed Reliability Standard to its current name – “Protection System Maintenance”;
- the proposed Reliability Standard and tables addressing covered maintenance activities and associated maintenance intervals;
- the tables to improve clarity and address identified administrative concerns with condition-based and performance-based maintenance programs; and
- other clarifying changes to the proposed Reliability Standard, “Frequently Asked Questions” document, the “Supplementary Reference” document, and minor changes to the draft Implementation Plan.

**b) Second Posting – Formal Comment Period and Initial Ballot**

To support the prioritization of this project in response to FERC’s concerns over the lack of progress in meeting the directives from Order No. 693, the NERC Standards Committee approved several deviations from the standards development process.<sup>31</sup> In accordance with the deviations, a second draft of PRC-005-2 was posted for a 35-day public comment period (from June 11 through July 16, 2010) and subject to an initial ballot (from July 8 through July 17, 2010). The second draft reflected the revisions identified in Section B.1.(a) above, as well as VRFs, Time Horizons, Measures, and Compliance elements, including VSLs. NERC received 58 sets of comments from more than 130 different individuals, including 70 companies and representing 8 of the 10 industry segments. Commenters provided feedback on the maximum allowable intervals, the individual activities and intervals within the tables in the proposed Reliability Standard, the VRF and VSL assignments, Measures, Time Horizons, and the

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<sup>31</sup> See Standards Announcement, *available at* [http://www.nerc.com/docs/standards/sar/PSMTinfo\\_document061110.pdf](http://www.nerc.com/docs/standards/sar/PSMTinfo_document061110.pdf) (requiring changes to the proposed standard and definition be posted for 35-day comment periods (rather than 45-day comment periods); ballot pools to be formed during the first 21 days of the 35-day comment periods; and initial ballots be conducted during the last 10 days of the 35-day comment periods).

“Supplementary Reference” and “FAQs” documents. The first ballot was not approved, with 22.91% voting to approve after re-balloting.

In response to the comments received, the standard drafting team made a number of changes to the proposed Reliability Standard. The standard drafting team rearranged and revised the tables, to create one table for each of the five Protection System component types, as well as a sixth table to address monitoring and alarming requirements to support extended intervals for monitored Protection System components. The standard drafting team made several modifications to the VRFs and VSLs, and revised the Time Horizons for both R3 and R4 from “Long-Term Planning” to “Operations Planning”. All four Measures were changed in response to commenters’ suggestions. Last, a number of definitions, previously included only in the Reference Documents, were added to the proposed Reliability Standard.

**c) Third Posting – Formal Comment Period and Successive Ballot**

A third draft of proposed PRC-005-2 was posted for a public 30-day formal comment period (from November 17 through December 17, 2010) and subject to a successive ballot (from December 10 through December 20, 2010). The third draft reflected the revisions identified in Section B.1.(b). NERC received 44 sets of comments from more than 80 different individuals, including 82 companies and representing 9 of the 10 industry segments. Commenters provided feedback on the various Requirements in the proposed Reliability Standard, with feedback on the rearrangement of the table generally positive, and objections raised with respect to the percentage steps in several VSLs, notwithstanding their consistency with NERC’s VSL guidelines. The ballot was not approved, with 44.65% voting to approve.

In response to the comments received, the standard drafting team made extensive changes to the proposed Reliability Standard’s Requirements, including: removing a Requirement that

addressed calibration tolerances and a Requirement determined to be redundant; combined the “Frequently Asked Questions” and “Supplementary Reference” documents; split Table 1-4; addressed maintenance of station DC supply; and revised the Implementation Plan.

**d) Fourth Posting – Formal Comment Period and Successive Ballot**

A fourth draft of proposed PRC-005-2 was posted for a public 30-day formal comment period (from April 12 through May 13, 2011) and subject to a successive ballot (from May 3 through May 13, 2011). The fourth draft reflected the revisions identified in Section B.1.(c). NERC received 55 sets of comments from more than 176 different individuals, including 103 companies and representing all of the 10 industry segments. The ballot achieved 67% and moved to recirculation ballot. In response to the comments received on the fourth draft, the standard drafting team clarified Requirement R1 and the tables, lengthened certain implementation periods for Functional Entities not subject to regulatory approvals, revised the VSLs, addressed comments regarding the definition of “Maintenance Correctable Issues,” and supplemented the “Supplementary Reference and FAQ” document.

**e) Fifth Posting and Ballot**

A fifth draft of PRC-005-2 was posted for a recirculation ballot and non-binding poll from June 20 through June 30, 2011. The ballot was not approved, with only 64.76% voting to approve.

**2. PRC-005-2 Development – Reauthorization**

On August 11, 2011, with a revised SAR, the NERC Standards Committee re-authorized Project 2007-17 and substantially modified the proposed PRC-005-2 Reliability Standard

(“Reauthorization”).<sup>32</sup> The second SAR included several changes made by the standard drafting team to the original SAR. The title of the proposed Reliability Standard was changed to “Protection System Maintenance”; reliability principle item #4 was deemed inapplicable and removed; and the “Transmission and Generation” descriptor of Protection Systems was removed from the “Detailed Description” area of the second SAR.

**a) First Posting – Formal Comment Period and Initial Ballot**

A first draft of proposed PRC-005-2 following the Reauthorization was posted for a public 45-day formal comment period (from August 15 through September 29, 2011) and subject to an initial ballot (from September 19 through September 29, 2011). The first draft reflected revisions made since the fifth posting described in Section B.1.(e), including:

- renaming “Maintenance Correctable Issue” to “Unresolved Maintenance Issue”;
- revising the interval for various station dc supply and communications system maintenance activities from three to four calendar months;
- moving the maintenance activities and intervals for distributed Underfrequency Load Shedding and Undervoltage Load Shedding systems from Tables 1-1 through 1-5 into a new Table 3, to separately illustrate the requirements related to these systems;
- revising the Implementation Plan; and
- modifying the VSLs, VRFs, and “Supplementary Reference and FAQ” document to reflect the listed changes and to respond to additional stakeholder comments received.

NERC received 48 sets of comments from more than 147 different individuals, including 98 companies and representing 9 of the 10 industry segments. The first ballot was not approved, with only 61.10% voting to approve. In response to the comments received, the standard

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<sup>32</sup> See NERC, Standards Committee Meeting Minutes, Aug. 11, 2011, *available at* [http://www.nerc.com/docs/standards/sc/sc\\_081111\\_approved\\_package.pdf](http://www.nerc.com/docs/standards/sc/sc_081111_approved_package.pdf).



drafting team revised the applicability of the proposed Reliability Standard to indicate that, for generator-connected station service transformers, only the Protection Systems that trip the generator, either directly or via a lockout relay, are included in the proposed Reliability Standard. The standard drafting team also revised the Requirements and Measures associated with those Requirements, clarified the Tables and the Implementation Plan, and modified the VSLs.

**b) Second Posting – Formal Comment Period and Successive Ballot**

A second draft of proposed PRC-005-2 was posted for a public 30-day formal comment period (from February 28 through March 28, 2012) and subject to a successive ballot and non-binding poll (from March 19 through March 28, 2012). The second draft reflected a Revised Requirement R1, which stated that a Functional Entity's Protection System Maintenance Program must include for each Protection System component type an identification of the maintenance method(s) used, and the identification of the relevant monitoring attributes applied. In addition, Requirement R3 was split into three Requirements (a revised R3 and new R4 and R5), and the VSLs and the "Supplementary Reference and FAQ" document was revised to reflect the changes and additional stakeholder comments. NERC received 56 sets of comments from more than 118 different individuals, including 98 companies and representing 9 of the 10 industry segments. The successive ballot received a 73.93% weighted segment vote and the standard drafting team indicated it would consider the stakeholder comments submitted.

In response to the comments received, the standard drafting team revised the "Inspect" element of the definition of Protection System Maintenance Program, clarified the definitions of "Unresolved Maintenance Issue" and "Countable Event," revised the "Applicability" section of the proposed Reliability Standard in part 4.2.5.4, revised the first and last rows of Table 1-2, and, with the assistance of the IEEE stationary battery committee, revised several other Tables with

respect to the verification that a station battery can perform properly. Clarifying, conforming, and correcting changes were also made to the Requirements, Measures, VSLs, and the Supplementary Reference Document.

**c) Third Posting – Formal Comment Period and Successive Ballot**

A third draft of proposed PRC-005-2 was posted for a public 30-day formal comment period (from May 29 through June 27, 2012) and subject to a successive ballot (from June 18 through June 27, 2012). The third draft reflected the revisions identified in Section B.2.(b). NERC received 51 sets of comments from more than 170 different individuals, including 110 companies and representing all 10 industry segments. The successive ballot received a 79% weighted segment vote and the standard drafting team indicated it would consider the stakeholder comments submitted.

In response to the comments received on the third draft, the standard drafting team made minimal changes to the proposed Reliability Standard. Those changes included: changes to the Tables, Implementation Plan; “Supplementary Reference and FAQ” document; and clarifying changes to the mapping document.

**d) Fourth Posting – Formal Comment Period and Successive Ballot**

A fourth draft of proposed PRC-005-2 was posted for a public 30-day formal comment period (from July 27 through August 27, 2012) and subject to a successive ballot (from August 17 through August 27, 2012). As noted in Section B.2.(b), the fourth draft reflects minor changes to the Tables, along with changes to the Implementation Plan, mapping document and “Supplementary Reference and FAQ” document. NERC received 36 sets of comments from more than 102 different individuals, including 65 companies and representing 9 of the 10

industry segments. The successive ballot received an 80.31% weighted segment vote and the standard drafting team indicated it would consider the stakeholder comments submitted.

In response to the comments received on the fourth draft, the standard drafting team made editorial changes to the proposed Reliability Standard. For example, Table 1-2 was revised such that “communications” would be plural in all occurrences of “communications systems,” “identify” was added to the VSLs for Requirement R5, and grammatical and punctuation corrections were made to the “Supplementary Reference and FAQ” document.

**e) Final Posting – Recirculation Ballot**

Because the comments on the fourth draft did not require substantive revisions, proposed PRC-005-2 proceeded to a recirculation ballot (from October 15 through October 24, 2012). The recirculation ballot was ultimately approved, with 80.51% of the weighted segment vote voting to approve proposed PRC-005-2.

**f) Board of Trustees Approval**

NERC presented the final draft of the proposed PRC-005-2 Reliability Standard to NERC’s Board of Trustees for approval on November 7, 2012. The Board of Trustees approved the proposed Reliability Standard, and NERC staff recommended that it be filed with Applicable Governmental Authorities.

Respectfully submitted,

*/s/ William H. Edwards*

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March 11, 2013

## **EXHIBIT A**

### **Criteria for Reliability Standard PRC-005-2**

#### **1. Proposed Reliability Standard is designed to achieve a specified reliability goal and contains a technically sound means to achieve that goal.**

Proposed PRC-005-2 achieves the specific reliability goal of maintaining the proper working order of Protection Systems. The proposed Standard achieves this goal by requiring that applicable entities establish, implement, and document comprehensive Protection System Maintenance Programs in accordance with the Requirements, Tables, and Attachment included in the proposed Standard. By outlining the documentation and implementation of programs for the maintenance of all Protection Systems affecting the reliability of the Bulk Electric System, Protection Systems are kept in working order. Performance of these programs, applied consistently throughout the North American Bulk-Power System and assured through the compliance process, will produce well-maintained Protection Systems on a continent-wide basis. Improved overall reliability of the Bulk Electric System will be a direct result of dependable Protection Systems.

Protection Systems are comprised of components whose purpose is to monitor the “health” of the Bulk Electric System and take immediate, corrective action when power system conditions degrade to a point at which safety, stability, and reliability are at risk. Enacting a proposed Standard which requires entities to assure the dependable performance of Protection Systems guarding the Bulk Electric System —thus promoting reliable operation of the Bulk Electric System — is a crucial element in maintaining Bulk-Power System reliability. It is, therefore, imperative that entities conduct the kind of periodic verifications specified in these Protection System Maintenance Programs to ensure Protection Systems will function properly when called upon.

The proposed PRC-005-2 Reliability Standard also establishes a technically sound basis for assuring that Protection Systems have maximum allowable time intervals applied on specified maintenance activities that are appropriate for the types of technology employed in Protection Systems. Specifically, the proposed Standard utilizes different types of maintenance programs, requires minimum activities for Protection Systems, and creates criteria for a statistical performance-based maintenance approach.

First, the proposed Reliability Standard contains three different types of maintenance programs to provide Functional Entities with options to achieve the reliability goal. These include traditional time-based methods, advanced technology condition-based methods and statistical performance-based methods.

Second, minimum activities are included in the Tables for the various components of Protection Systems in the proposed PRC-005-2 Standard. These activities provide a technically sound means to ensure Protection Systems are kept in working order but do not specifically prescribe “the how-to”. Entities must perform the activities required by this proposed Standard, but have the flexibility to use various technologies to create their own Protection System Maintenance Program. The activities listed in the Tables are accompanied by the maximum allowable intervals appropriate for the activities and components listed. These activities enhance reliability by making uniform requirements mandatory for entities inter-connected with the Bulk Electric System throughout North America. Proposed PRC-005-2 now requires key activities fostering consistent, effective maintenance.

Lastly, the criteria established in Requirement R2 of proposed PRC-005-2 and Attachment A provide a technically sound methodology describing a statistical performance-based maintenance approach that allows for a maintenance program that can use trending,

success rates and statistical analysis to mold a maintenance program into the specific needs of an entity without any compromise to the reliability of the Bulk Electric System.

**2. Proposed Reliability Standard is applicable only to users, owners and operators of the bulk power system, and is 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 and is clear and unambiguous as to what is required and who is required to comply. The proposed Reliability Standard also clearly lists the types of Facilities subject to compliance with proposed PRC-005-2.

NERC Reliability Standard PRC-005-1b (the currently-effective Reliability Standard) is not specific as to the applicable Protection Systems in generating stations. The proposed PRC-005-2 Reliability Standard adds specificity regarding these Protection Systems in that those Protection Systems that could trip the generator, either directly or by a generator lockout relay, are explicitly included.

**3. Proposed Reliability Standard includes clear and understandable consequences and a range of penalties (monetary and/or non-monetary) for a violation.**

The proposed Reliability Standard includes clear and understandable consequences by assigning each primary Requirement a VRF and a VSL. These elements support the determination of an initial value range for the base penalty amount regarding violations of requirements in Reliability Standards, as defined in the ERO Sanction Guidelines. Analysis of the VRFs and VSLs for proposed Reliability Standard PRC-005-2 is contained in **Exhibit I**.

**4. Proposed Reliability Standard identifies 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 each Requirement by clearly identifying what is required to demonstrate compliance and how the requirement will be

enforced. These Measures, included below, help provide clarity regarding how the Requirements will be enforced, and ensure that the Requirements will be enforced in a clear, consistent, and non-preferential manner and without prejudice to any party.

- M1.** Each Transmission Owner, Generator Owner and Distribution Provider shall have a documented Protection System Maintenance Program in accordance with Requirement R1. For each Protection System Component Type, the documentation shall include the type of maintenance method applied (time-based, performance-based, or a combination of these maintenance methods), and shall include all batteries associated with the station dc supply Component Types in a time-based program as described in Table 1-4 and Table 3. (Part 1.1) For Component Types that use monitoring to extend the maintenance intervals, the responsible entity(s) shall have evidence for each protection Component Type (such as manufacturer's specifications or engineering drawings) of the appropriate monitored Component attributes as specified in Tables 1-1 through 1-5, Table 2, and Table 3. (Part 1.2)
- M2.** Each Transmission Owner, Generator Owner, and Distribution Provider that uses performance-based maintenance intervals shall have evidence that its current performance-based maintenance program(s) is in accordance with Requirement R2, which may include but is not limited to Component lists, dated maintenance records, and dated analysis records and results.
- M3.** Each Transmission Owner, Generator Owner, and Distribution Provider that utilizes time-based maintenance program(s) shall have evidence that it has maintained its Protection System Components included within its time-based program in accordance with Requirement R3. The evidence may include but is not limited to dated maintenance records, dated maintenance summaries, dated check-off lists, dated inspection records, or dated work orders.
- M4.** Each Transmission Owner, Generator Owner, and Distribution Provider that utilizes performance-based maintenance intervals in accordance with Requirement R2 shall have evidence that it has implemented the Protection System Maintenance Program for the Protection System Components included in its performance-based program in accordance with Requirement R4. The evidence may include but is not limited to dated maintenance records, dated maintenance summaries, dated check-off lists, dated inspection records, or dated work orders.
- M5.** Each Transmission Owner, Generator Owner, and Distribution Provider shall have evidence that it has undertaken efforts to correct identified Unresolved Maintenance Issues in accordance with Requirement R5. The evidence may include but is not limited to work orders, replacement Component orders, invoices, project schedules with completed milestones, return material authorizations (RMAs) or purchase orders.

**5. Proposed Reliability Standard achieves a reliability goal effectively and efficiently — but does not necessarily reflect “best practices” without regard to implementation cost or historical regional infrastructure design.**

The proposed PRC-005-2 Reliability Standard achieves the reliability goal of maintaining Protection Systems in working order effectively and efficiently by relying upon any single method or approach to performing maintenance activities. The proposed PRC-005-2 is flexible enough to encourage the use of advanced technology that can enhance Bulk Electric System



reliability making the proposed Reliability Standard effective to meet the reliability goal. The proposed Reliability Standard is effective in that it requires Transmission Owners, Generator Owners, and Distribution Providers to have a Protection System Maintenance Program.

This approach is efficient because it allows entities to design its own program without specifically stating “how” a program must be tailored. Efficiency is also achieved, in part, through the combination of four protection system Reliability Standards into a single Reliability Standard, streamlining compliance and enforcement. The entities’ Protection System Maintenance Program must include, at a minimum, the activities listed in the proposed PRC-005-2 Tables. The activities listed must be performed with a frequency that is at least as stringent as the maximum allowable time intervals stated in the proposed Reliability Standard.

The proposed Reliability Standard also requires the testing of Protection System components while minimizing Bulk Electric System exposure to excessive planned and unplanned system outages. The proposed Reliability Standard thus strikes a balance between traditional recurring maintenance activities and the unnecessary additional time out-of-service that traditional maintenance approaches require. If Protection System components are unnecessarily out-of-service, overall reliability of the Bulk Electric System can be negatively affected.

- 6. Proposed Reliability Standard is not “lowest common denominator,” *i.e.*, does not 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. To the contrary, the proposed Standard represents a significant improvement over the previous version as described in the petition. The requirements in the proposed PRC-005-2

Reliability Standard propose a standard approach to all entities, without differentiation based on entity size. The final proposed Reliability Standard clearly identifies the Requirements for distributed Undervoltage Load Shedding and Underfrequency Load Shedding equipment. The final proposed Reliability Standard also benefited from involvement from subject-matter-experts from the Institute of Electrical and Electronics Engineers in better characterizing the maintenance activities for station batteries. The end result of the standards development process was a stronger proposed Reliability Standard that meets FERC's directives and improves reliability.

All entities, small and large, are expected to comply with this proposed Reliability Standard in the same manner. There are no Requirements in proposed PRC-005-2 that place undue burden on small entities. All entities are expected to maintain similar equipment in a similar fashion at similar intervals, and the amount of equipment to be maintained is directly related to entity size. As a result, small entities may find the transition to the proposed Reliability Standard PRC-005-2 to be less burdensome given the flexibility the mandated Protection System Maintenance Program grants entities for determining the necessary components to maintain.

The proposed PRC-005-2 Reliability Standard also allows an entity to implement a performance-based Protection System Maintenance Program. Entities can share data across ownership lines provided certain criteria are met. For example, two entities in such a shared program may have populations of like components that can be aggregated with equivalent Protection System Maintenance Program obligations for those components. The combined entities' shared program can show total populations, total numbers of components tested and total failures found. The combined entities' Protection System Maintenance Program would

follow the same intervals, test procedures, and statistical analysis. Entity cooperation would allow the same outcome as if a process were applied to a single entity. There is no inherent advantage or disadvantage to multiple entities cooperating in such a manner. The proposed Reliability Standard is written such that small entities with small populations of equipment have the same access to performance-based maintenance as the larger entities.

- 7. Proposed Reliability Standard is 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.

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

The proposed Reliability Standard does not restrict the available transmission capability or limit use of the bulk-power system in a preferential manner. Specifically, the requirements in the proposed Reliability Standard should cause no restriction of the grid because proper and timely maintenance and testing of Protection System components helps to assure that the Bulk Electric System operates in a safe and reliable manner under both normal and abnormal conditions.

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

The proposed effective date for the proposed Reliability Standard is just and reasonable and appropriately balances the urgency in the need to implement the proposed Reliability Standard against the reasonableness of the time allowed for those who must comply to develop necessary procedures, software, facilities, staffing or other relevant capability. This will allow

applicable entities adequate time to ensure compliance with the requirements. The proposed effective date is explained in detail in the proposed Implementation Plan, 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 Reliability Standard was developed in accordance with NERC's ANSI-accredited processes for developing and approving Reliability Standards. A complete description of the development process is contained in this petition in Section V and the complete development record is included as **Exhibit J**. These processes included, among other things, multiple comment periods, pre-ballot review periods, and balloting periods. Additionally, all standard drafting team meetings were properly noticed and open to the public. The initial and recirculation ballots both achieved a quorum and exceeded the required ballot pool approval levels. The standard development process did include certain Standards Committee-approved deviations and these are described in Section V of this petition.

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

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

**12. Proposed Reliability Standard considers any other appropriate factors.**

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

**Exhibits B—K**

(Available on the NERC Website at  
[http://www.nerc.com/fileUploads/File/Filings/Attachments\\_PRC-005-2\\_Exhibits](http://www.nerc.com/fileUploads/File/Filings/Attachments_PRC-005-2_Exhibits))