

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Consideration of Comments

Project 2007-17.3 Protection System
Maintenance and Testing (PRC-005-X)

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RELIABILITY | ACCOUNTABILITY



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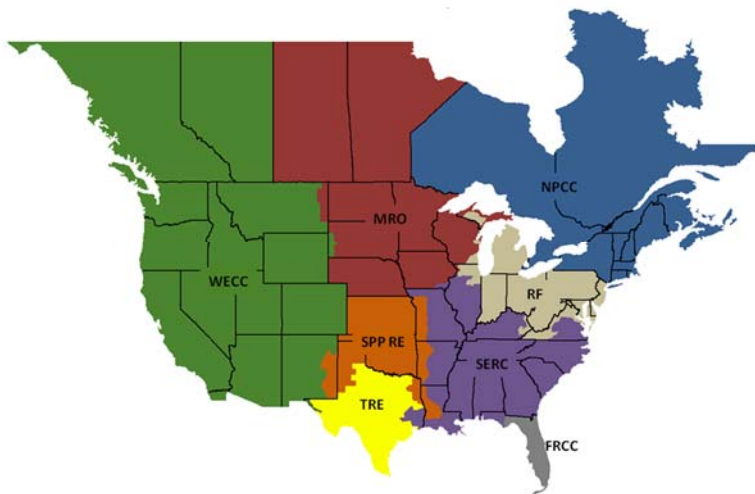
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Preface

The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose mission is to ensure the reliability of the bulk power system (BPS) in North America. NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the BPS through system awareness; and educates, trains, and certifies industry personnel. NERC’s area of responsibility spans the continental United States, Canada, and the northern portion of Baja California, Mexico. NERC is the electric reliability organization (ERO) for North America, subject to oversight by the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada. NERC’s jurisdiction includes users, owners, and operators of the BPS, which serves more than 334 million people.

The North American BPS is divided into several assessment areas within the eight Regional Entity (RE) boundaries, as shown in the map and corresponding table below.



FRCC	Florida Reliability Coordinating Council
MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
RF	ReliabilityFirst
SERC	SERC Reliability Corporation
SPP-RE	Southwest Power Pool Regional Entity
TRE	Texas Reliability Entity
WECC	Western Electricity Coordinating Council

Introduction

The Project 2007-17.3 drafting team thanks everyone who submitted comments on draft 2 of the PRC-005-X standard. Each comment received has been reviewed and given careful consideration by the drafting team.

This standard was posted for a 45-day public comment period from July 30, 2014, through September 12, 2014. NERC asked stakeholders to provide feedback on the standard and associated documents through a special electronic comment form. There were 47 sets of responses, including comments from approximately 116 people from approximately 82 companies, representing all 10 Industry Segments.

All comments submitted may be reviewed in their original format on the standard's [project page](#).

If you feel that your comment has been overlooked, please let us know immediately. Our goal is to give every comment serious consideration in this process. If you feel there has been an error or omission, you can contact the Director of Standards Valerie Agnew at 404-446-2560 or at Valerie.agnew@nerc.net. In addition, there is a NERC Reliability Standards Appeals Process.¹

¹ The appeals process is in the Standard Processes Manual: http://www.nerc.com/files/Appendix_3A_StandardsProcessesManual_20120131.pdf

Consideration of Comments

Sudden Pressure Relaying

Some comments received asserted that Sudden Pressure Relaying does not impact the reliable operation of the Bulk Electric System; therefore, should not be included in PRC-005-X. Below is additional background regarding the FERC directive and why Sudden Pressure Relaying are being added to PRC-005-X.

FERC NOPR Proposing to Approve PRC-005 Interpretation

In FERC's Notice of Proposed Rulemaking (NOPR), the Commission proposed to accept NERC's proposed interpretation of Reliability Standard PRC-005-1 Requirement R1. However, the Commission stated that the proposed interpretation highlights a gap in the required Protection System maintenance and testing pursuant to Requirement R1 of PRC-005-1. To prevent a gap in reliability, FERC stated that any component that detects any quantity needed to take an action, or that initiates any control action (initial tripping, reclosing, lockout, etc.) affecting the reliability of the Bulk-Power System should be included as a component of a Protection System. Accordingly, to address FERC's concern, pursuant to section 215 (d) (5) of the Federal Power Act, FERC proposed to direct NERC to develop a modification to the Reliability Standard to include *any component or device that is designed to detect defective lines or apparatuses or other power system conditions of an abnormal or dangerous nature and to initiate appropriate control circuit actions.*

NERC NOPR Comments (pgs. 6-7)

"Regarding FERC's proposed directive to include in the Reliability Standard any device, including auxiliary and backup protection devices, that is designed to sense or take action against any abnormal system condition that will affect reliable operation, NERC states that it understands FERC's concerns related to protective relays that do not respond to electrical quantities and agrees that sudden pressure relays which trip for fault conditions should be maintained in accordance with NERC Reliability Standard requirements. However, NERC is not aware of any existing documents that establish a technical basis for either minimum maintenance activities or maximum maintenance intervals for these devices. NERC expressed concern that the scope of this proposed directive is so broad that any device that is installed on the bulk power system to monitor conditions in any fashion may be included. In fact, many of these devices are advisory in nature and should not be reflected within NERC Standards if they do not serve a necessary reliability purpose. NERC therefore proposed to develop, either independently or in association with other technical organizations such as IEEE, one or more technical documents which:

- i. Describe the devices and functions (to include sudden pressure relays which trip for fault conditions) that should address FERC's concern; and
- ii. Propose minimum maintenance activities for such devices and maximum maintenance intervals, including the technical basis for each.

These technical documents will address *those protective relays that are necessary for the reliable operation of the bulk power system* and will allow for differentiation between protective relays that detect faults from other devices that monitor the health of the individual equipment and are advisory in nature (e.g., oil temperature). Following development of the above-referenced document(s), NERC would propose a new or revised standard (e.g., PRC-005) using the NERC Reliability Standards development process to include maintenance of such devices, including establishment of minimum maintenance activities and maximum maintenance intervals. NERC did not believe it is necessary for the Commission to issue a directive to address this issue. Rather, NERC proposed to add this issue to the reliability standards issues database for inclusion in the list of issues to address the next time the PRC-005 standard is revised."

FERC Order No. 758 (Para. 12-15)²

[Summary of NERC’s NOPR comments in P 12-14 have been omitted here for brevity]

“15. The Commission accepts NERC’s proposal, and directs NERC to file, within sixty days of publication of this Final Rule, a schedule for informational purposes regarding the development of the technical documents referenced above, including the identification of devices that are designed to sense or take action against any abnormal system condition that will affect reliable operation. NERC shall include in the informational filing a schedule for the development of the changes to the standard that NERC stated it would propose as a result of the above-referenced documents. NERC should update its schedule when it files its annual work plan.”

NERC April 12, 2012 Informational Filing³

Summary: NERC’s filing included a schedule for preparing the necessary technical documents through the SPCS and a schedule for the SPCS work. However, the filing did not include a schedule for the standard development as FERC had required. FERC noted that NERC should update its schedule for the standard development when it files its annual work plan. NERC’s Reliability Standards Development Plan (RSDP) has included the development work schedule. Because NERC filed the item as “informational”, FERC did not issue an order accepting or rejecting the filing as it would have done for a “compliance” filing. NERC submitted a further informational filing in July 2012 addressing reclosing relays, but did not include any additional discussion of sudden pressure relays.

Sudden Pressure Relays and Other Devices that Respond to Non-Electrical Quantities

NERC Special Protection and Control Subcommittee (SPCS) Input for Standard Development in Response to FERC Order No. 758 – December 2013.

In developing this report, the SPCS evaluated all devices on the IEEE list of device numbers to identify which devices that respond to non-electrical quantities may impact reliable operation of the Bulk-Power System. As a result of this analysis, the SPCS concludes the only devices responding to non-electrical quantities that should be included in the applicability of PRC-005 are sudden pressure relays utilized in a tripping function. When applied in a tripping function, these devices initiate actions to clear faults to support reliable operation of the Bulk-Power System. The other devices evaluated respond to abnormal equipment conditions and take action to protect equipment from mechanical or thermal damage, or premature loss of life, rather than for the purpose of initiating fault clearing or mitigating an abnormal system condition to support reliable operation of the Bulk-Power System.

From SPCS Report:

Table 1: Classification of Devices		
Initiate Actions to Clear Faults or Mitigate Abnormal System Conditions to Support Reliable Operation of the Bulk-Power System	Initiate Action for Abnormal Equipment Conditions for Purposes other than Supporting Reliable Operation of the Bulk-Power System	Monitor the Health of Individual Equipment and Provide Information that is Advisory in Nature
Sudden Pressure (63) (when utilized in a trip application)	<ul style="list-style-type: none"> • Overspeed Device (12) • Underspeed Device (14) • Apparatus Thermal Device (26) • Flame Detector (28) • Bearing Protective Device (38) 	<ul style="list-style-type: none"> • Apparatus Thermal Device (26) • Bearing Protective Device (38) • Mechanical Condition Monitor (39) • Atmospheric Condition Monitor (45)

² Interpretation of Protection System Reliability Standard, 138 FERC ¶ 61,094 (Order No. 748) (2012)

http://www.nerc.com/files/Order_Interp_Protection_Sys_RS_2011.2.3.pdf

³ Informational Filing in Compliance with Order No. 758 – Interpretation of Protection System Reliability Standard, FERC Docket No. RM10-5-000, (2012)

http://www.nerc.com/FilingsOrders/us/NERC%20Filings%20to%20FERC%20DL/Order%20758%20Letter%20Filing_complete.pdf

	<ul style="list-style-type: none"> • Mechanical Condition Monitor (39) • Atmospheric Condition Monitor (45) • Machine or Transformer Thermal Relay (49) • Density Switch or Sensor (61) • Pressure Switch (63) (other than sudden pressure relays utilized in trip application) • Level Switch (71) 	<ul style="list-style-type: none"> • Machine or Transformer Thermal Relay (49) • Density Switch or Sensor (61) • Pressure Switch (63) (other than sudden pressure relays utilized in trip application) • Level Switch (71)
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Following the issuance of the report by the Planning Committee, Project 2007-17.3 was proposed for the 2014-2016 NERC Reliability Standards Development Plan (RSDP), and adopted by the NERC Board. The SDT added Sudden Pressure Relaying to PRC-005-X in accordance with the technical recommendations from the SPCS report.

An additional concern was expressed that sudden pressure relays represent third level transformer protection; primary and backup transformer differential relays would isolate the transformer in case of a fault. The drafting team thanks you for your comment. All Sudden Pressure Relaying applicable under Facilities Section 4.2, regardless of what level of protection, are subject to the requirements of the standard.

Definitions

One commenter provided suggestions on the definition for Countable Event. The drafting team thanks you for your comment. However, at this time changes to the Countable Event definition are outside the scope of project 2007-17.3.

Another commenter requested clarification on the defined NERC Glossary term Segment. The entity’s “concern is that if the definition is tied to the manufacturer and model, many items that may have benefited from a performance based maintenance program will not be included due to the difficulty of having 60 components of a single manufacturer and model. As a result, less performance based maintenance will be done in favor of more time based maintenance, which does not appear to be the stated objective of the standard. BPA believes that there are other drivers of equipment reliability and that going simply by manufacturer make and model is too restrictive and almost forces the use of time based maintenance intervals. These time based maintenance intervals have been established by surveying utilities and taking the average maintenance interval of the surveyed utilities. BPA suggests it would be better to allow an alternate definition of Segment to include, for example, mechanical sudden pressure relays to be grouped as an item, provided the population has consistent performance across the population and provided the population is tracked by manufacturer and model. BPA believes this would allow performance based maintenance systems to be applied more broadly and would be more effective than using time based maintenance intervals. For example, provided an entity also tracks manufacturer and model and establishes consistent performance across the population, could an entity track the following groups as a population segment? 1. Mechanical Sudden Pressure Relay 2. Electronic Sudden Pressure Relay 3. Mechanical Buchholz Relay 4. Mechanical Sudden Flow Relay.” The drafting team thanks you for your comment. The Segment definition aligns with the drafting team’s intent. The definition states: Segment – 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.

Applicability Section

One commenter stated that “(1) Applicability section 4.2.4 should be modified for clarity and to avoid potential conflicts with the definition of Remedial Action Schemes (RAS). The prior posting of the Remedial Action Scheme definition in Project 2010-05.2 “Special Protection Systems included the following statement: these schemes are not Protection Systems. This statement would conflict directly with section 4.4.2 that states Protection Systems installed as a Remedial Action Scheme. Even though current posting of the RAS definition has eliminated the clause causing the ambiguity, we suggest changing section 4.2.4 to simply be Remedial Action Scheme would avoid this ambiguity altogether and make PRC-005-X not dependent on changes that the other drafting team is making.” The drafting team thanks you for your comment. The Project 2010-05.2 Standard Drafting Team (SDT) is aware of this concern and made the change to the RAS definition to resolve this conflict.

PRC-005-X Requirements

Comments were received regarding Requirements R3, R4 and the deleted R6, which are summarized and addressed below.

Requirement R3 and R4

A few commenters questioned the clarity regarding the removal of subparts from Requirement R3 and R4. The drafting team thanks the commenters, but disagrees and contends Requirement R3 and R4 are clear.

Several commenters expressed concern regarding the maintenance of Automatic Reclosing Components that become newly applicable due to changes in the largest BES generating unit in the BA/RSG. The drafting team notes that the entity only needs to complete the maintenance by the end of the established interval within Table 4, the shortest of which is six years from the time the change in the largest generating unit was made. Additionally, a frequently asked question has been developed and inserted into section 15.8.1 of the “Supplementary Reference and Frequently Asked Questions” to clarify this intent.

Requirement R6

A few comments stated that the Balancing Authority (BA) should be held accountable for providing the information to the Transmission Owner (TO), Generator Owner (GO), or Distribution Provider (DP) of the largest generating unit. Following discussion, the drafting team determined that the Automatic Reclosing equipment "owner" is responsible for identifying Automatic Reclosing Components that must be included in their PSMP. Therefore, the owner is responsible for obtaining the largest generating unit information. If the BA does not provide the appropriate information requested, the owner should contact its Regional Entity (RE) for assistance in acquiring the appropriate information.

Another commenter questioned what an auditor will request during an audit. The owner should be able to provide a call log or an email to the BA requesting information regarding the largest generating unit. Additionally, the Balancing Authority or RSG could post the largest generating unit information, if it chooses to do so. The entity could complete a “print screen” and provide that as evidence to the auditor.

A few additional commenters noted that Requirement R6 did not show up in the redline version of PRC-005-X draft two. The drafting team notes that the version posted was the accurate and the redline of Requirement R6 was erroneously removed.

Additional comments support the removal of Requirement R6.

Tables

Table 5

Some commenters expressed concern regarding confusion of the wording in the note in the title box of Table 5. It refers to Table 1-5, yet in the title box for Table 1-5 it states that Sudden Pressure Relaying is excluded. The drafting team thanks you for your comments. The items in Table 5 are for components that are unique to Sudden Pressure Relaying.

Another commenter states that “it is not clear in Table 5 if verification of the pressure or flow sensing mechanism is operable includes a test that the fault pressure relay when activated actually operates the auxiliary relay, electromechanical lockout device or circuit breaker or other interrupting device to which it is connected? Is it intended that this test is a part of the control circuitry test of Table 5? It is recommended that a clarification be made for this issue either in Table 5 or the reference document.” The drafting team thanks you for your comment. The maintenance activities for Sudden Pressure Relaying must be performed whether as discrete activities or via an overall functional test.

A few comments were received recommending fault pressure relays be placed on a 12 calendar year maintenance interval instead of a six year maintenance interval. The drafting team thanks you for your comments. The frequency of the testing is set to align with the NERC SPCS report responding to FERC Order 758.

Another commenter stated that “errors in the text of Table 5 remain. It fails to differentiate the maintenance interval between monitored and un-monitored elements. The suggested change is: Change Component Attributes from Control circuitry associated with Sudden Pressure Relaying to Unmonitored control circuitry associated with Sudden Pressure Relaying from the fault pressure relay to the interrupting device trip coil(s).” The drafting team thanks you for your comment and notes that the word “unmonitored” has been added to Table 5 for clarification.

An additional commenter states “the note below the title of Table 5 implies to us that if such Components differ from those in Table 1-5, they are outside Applicability in both PRC-005-2 and PRC-005-3. Is that correct?” The drafting team thanks you for your comment. It was previously stated in the Supplementary reference and FAQ that PRC-005-2 and PRC-005-3 included the sudden pressure relaying control circuitry; however, Table 5 of PRC-005-X makes it clear.

An additional commenter states “we feel the current draft of Table 5 is too broad in the use of the term, Any Fault Pressure Relay. The SCPS report conclusion (Page 31) indicates, where the device is installed to respond to rapid pressure rise in facilities described in the applicability section of Reliability Standard PRC-005, and configured to take action to initiate fault clearing to support reliable operation of the Bulk Power System, it should be included as a device to be maintained and tested. Since many SPR devices are installed simply to protect equipment from excessive loss of life (or simply indication) rather than to provide fault detection or clearing for the BES, the mandatory inclusion of Any Fault Pressure Relay to the PSMP via Table 5 falls outside the intended scope of the SPCS report. Additional validation of this interpretation is gained from the previous sentence in the SPCS document: Where this device is applied to respond to abnormal equipment conditions, it takes action to protect the equipment from excessive loss of life or to indicate unavailability of service, rather than for the purpose of initiating fault clearing or mitigating an abnormal system condition to support reliable operation of the Bulk-Power System. We feel if the device is not providing support for reliable operation of the Bulk Power System it should be excluded from the PSMP.” The drafting team thanks you for your comments. The scope is limited by the Sudden Pressure Relaying definition:

“Sudden Pressure Relaying – A system that trips an interrupting device(s) to isolate the equipment it is monitoring and includes the following Components:

- Fault pressure relay – a mechanical relay or device that detects rapid changes in gas pressure, oil pressure, or oil flow that are indicative of Faults within liquid-filled, wire-wound equipment

- Control circuitry associated with a fault pressure relay.”

Another commenter expressed that they “disagree with the handling of sudden pressure relays. The added requirement for electrical testing of the lockout relay should be deleted. Typically the physical separation of the pathway by the lockout relay will prevent any signal flow. The key to this relay is if it will mechanically operate. Further, the lockout function only serves to prevent reclosing without a physical reset. For generator step up transformers this reclosing will occur when the unit is disconnected from the BES. There is no BES protection reason for testing this component.” The drafting team thanks you for your comments. If the lockout is not used for tripping there is no requirement in Table 5 to test it.

A comment was received regarding the Table 2 comment in the title part of Table 5. The drafting team thanks you for your comments. Table 2 discusses the maintenance on the monitoring path if an entity wishes to use monitoring to extend or defer physical maintenance and also stipulates that the monitoring must be conveyed to a location where corrective action can be initiated.

A commenter recommended the drafting team consider integrating the language found in the individual Tables in an effort to reduce the burden on the industry of monitoring and maintaining compliance with a number of different Tables. The drafting team thanks you for your comment. Table 1-1 through 1-5, and Table 3 apply to Protection System components; Automatic Reclosing is Table 4 and Sudden Pressure Relaying is Table 5, and monitoring attributes is Table 2. The drafting team has considered various options and concluded that the way the tables have been laid out is clear.

An additional comment provided states: “The title box for Table 1-5 refers to Automatic Reclosing (see Table 4). There is no Table 4. It should be reworded to read Tables 4-1 through 4-2 as it reads in the title box for Table 2. The many tables and cross references between the tables in the standard make the standard difficult to use. Reorganizing the tables, possibly having one table per component type with component attributes listed should be considered.” The drafting team thanks you for your comment. Reference to Table 4 within Table 1-5 includes all subparts of Table 4.

One commenter stated: “we understand the use of 'pressure or flow sensing' within the first Table 5 Maintenance Activity is within the context of the PRC-005-X Fault pressure relay definition and therefore does not include other types of pressure or oil flow devices found on transformers. Correct?” The drafting team thanks you for your comment. The above stated is correct.

Data Retention

A commenter commented regarding the terms “data retention” and “evidence retention” within the standard. The drafting team thanks you for your comment. The terms data retention and evidence retention are used interchangeably.

One comment stated that “Requirement R5 related to unresolved maintenance issues only applies when such an event occurs and that may not be associated with a particular periodic maintenance activity. It would seem more appropriate to retain records on the instances of unresolved maintenance issues that occurred since the last audit.” The drafting team thanks you for your comment. Updated Requirement R5 evidence retention language has been added to the Evidence Retention section for clarification.

A few commenters expressed concern regarding the data retention requiring data to be retained longer than the current audit cycle for PRC-005. The drafting team thanks you for your comments. The evidence retained from the last maintenance activity is used to verify compliance with required maintenance intervals that exceed the audit cycle.

Implementation Plan

Several commenters expressed concern regarding the maintenance of Automatic Reclosing Components that become newly applicable due to changes in the largest BES generating unit in the BA/RSG. The drafting team notes that the entity only needs to complete the maintenance by the end of the established interval within Table 4, the shortest of which is six years from the time the change in the largest generating unit was made. Additionally, a frequently asked question has been developed and inserted into section 15.8.1 of the “Supplementary Reference and Frequently Asked Questions” to clarify this intent.

Footnote 2

One commenter expressed concern that “Footnote 2 gives the impression that those components would be subject to the standard on the date the change occurred and those components would have to be compliant on the date of the change. We suggest the SDT make the following addition to Footnote 2: The largest BES generating unit within the Balancing Authority Area or the largest generating unit within the Reserve Sharing Group, as applicable, is subject to change. As a result of such a change, the Automatic Reclosing Components subject to the standard could change effective on the date of such change. From that day forward, those components would then have to be maintained according to the maintenance cycle as found in the applicable table for that specific component. The drafting team thanks you for your comment. The date of the change of the largest BES generating unit serves as the starting point for applicability of the standard and the intervals established in Table 4. A frequently asked question has been developed and can be located in section 15.8.1.

Supplementary Reference and Frequently Asked Questions Document

One commenter stated: “Regarding the sync-check relays mentioned in 2.4.1 Frequently Asked Questions: because their operation is reliant upon voltage inputs, sync-check relay maintenance must be addressed in the tables, specifically maintenance done with voltages applied. Table 4-2(b) addresses control circuit paths, but verifying a control circuit path could be done by manually blocking contacts closed.” The drafting team thanks you for your comment. Sync-check relays are not within the scope of this standard unless they are a part of a RAS. If part of a RAS they must be maintained according to Table 1.

Another commenter expressed that “pressure Relief Device (PRD) works on absolute pressure threshold. Currently there is no methodology to verify PRD sensing mechanism operation simulating required pressure. Can the drafting team an answer in the FAQ to guide us. Should PRD's not belong to the sudden pressure relay category?” The drafting team thanks you for your comment. The drafting team references the Sudden Pressure Relaying definition. PRD's are not included within the definition of Sudden Pressure Relays. See section 2.4.1 of the “Supplementary Reference and FAQ.”