

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Project 2010-05.3

Phase 3 of Protection Systems
PRC-012-2 Remedial Action Schemes

Industry Webinar
May 7, 2015

RELIABILITY | ACCOUNTABILITY



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- Standard Drafting Team Members
- Presenters
- Overview of PRC-012-2 – Preliminary Draft 1
- Questions and Answers
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Administrative Items

- It is NERC's policy and practice to obey the antitrust laws and to avoid all conduct that unreasonably restrains competition. This policy requires the avoidance of any conduct that violates, or that might appear to violate, the antitrust laws. Among other things, the antitrust laws forbid any agreement between or among competitors regarding prices, availability of service, product design, terms of sale, division of markets, allocation of customers or any other activity that unreasonably restrains competition. It is the responsibility of every NERC participant and employee who may in any way affect NERC's compliance with the antitrust laws to carry out this commitment.

- **Public**
 - Participants are reminded that this meeting is public. Notice of the meeting was widely distributed. Participants should keep in mind that the audience may include members of the press and representatives of various governmental authorities, in addition to the expected participation by industry stakeholders.
- **Presentation Material**
 - Wording in this presentation is used for illustrative purposes and may not reflect the exact draft of the posted standard.
- **Webinar Format**
 - Three hours
 - Presentation
 - Question and Answer Session

- NERC Project 2010-05.3 Remedial Action Schemes is phase 3 of Protection Systems
 - Phase 2 was initiated in February 2014 and culminated with the revised definition of Remedial Action Scheme being adopted by the NERC Board of Trustees (BOT) on November 13, 2014.
 - Phase 2 replaced the term Special Protection System with the term Remedial Action Scheme in approximately half of the forty-three (43) NERC Reliability Standards that contained the term.
 - Phase 3 was initiated in January 2015.
 - The standard drafting team (SDT) has developed a preliminary draft of PRC-012-2 that is currently posted for a 21-day informal comment period.

Phase 3

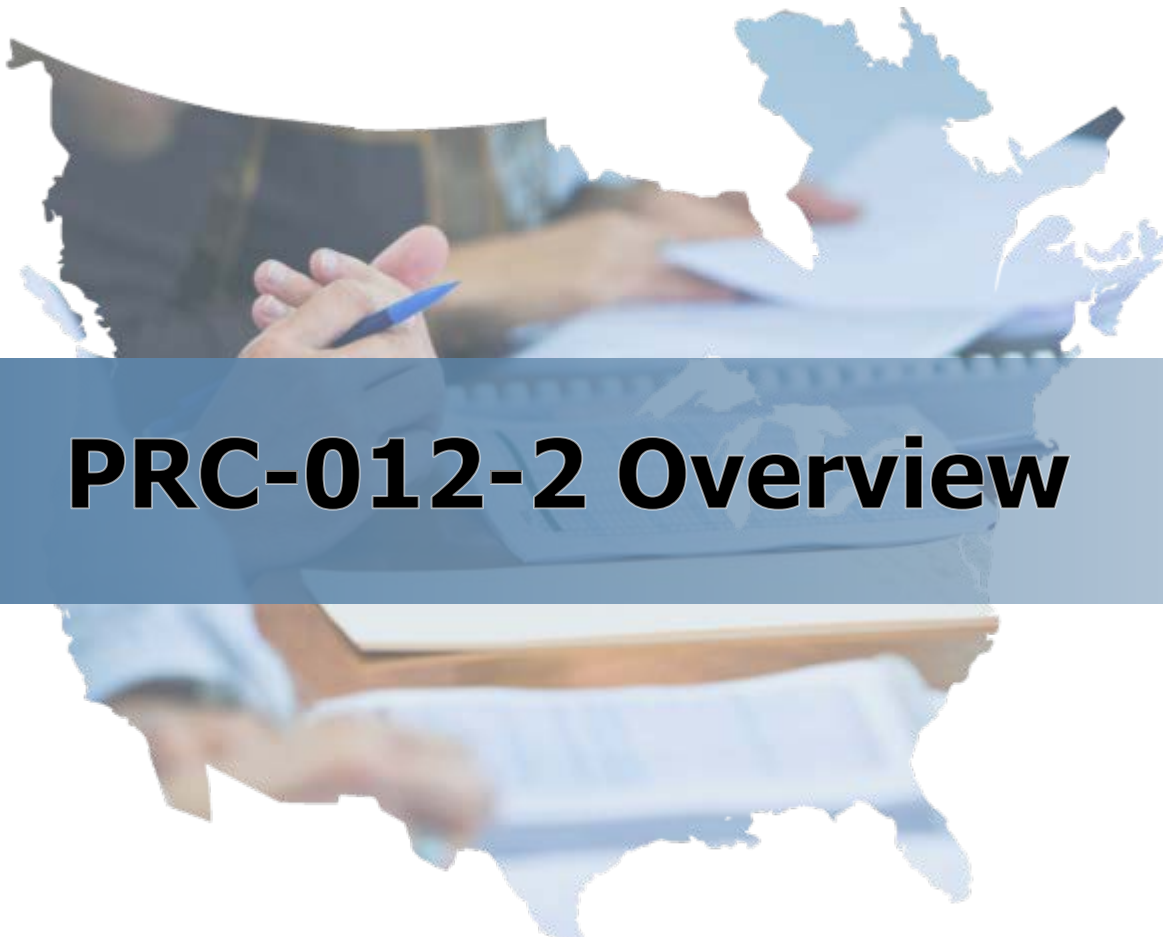
- Address the reliability objectives associated the six Remedial Action Scheme (RAS)/Special Protection System (SPS)-related standards:
 - PRC-012-1 Remedial Action Scheme Review Procedure
 - PRC-013-1 Remedial Action Scheme Database
 - PRC-014-1 Remedial Action Scheme Assessment
 - PRC-015-1 Remedial Action Scheme Data and Documentation
 - PRC-016-1 Remedial Action Scheme Misoperations
 - PRC-017-1 Remedial Action Scheme Maintenance and Testing*

* The maintenance of the Protection System components associated with RAS (PRC-017-1 Remedial Action Scheme Maintenance and Testing) are already addressed in PRC-005-2. PRC-012-2 addresses the testing of the non-Protection System components associated with RAS/SPS.

- Consolidate the existing RAS-related standards into one standard – PRC-012-2 Remedial Action Schemes and deliver it to the NERC BOT in early 2016.
- Revise the definition of Special Protection System to reflect the new definition of Remedial Action Scheme.

Member	Entity
Gene Henneberg (Chair)	NV Energy / Berkshire Hathaway Energy
Bobby Jones (Vice Chair)	Southern Company
Amos Ang	Southern California Edison
Alan Engelmann	ComEd / Exelon
Davis Erwin	Pacific Gas and Electric
Sharma Kolluri	Entergy
Charles-Eric Langlois	Hydro-Quebec TransEnergie
Robert J. O'Keefe	American Electric Power
Hari Singh	Xcel Energy

- Industry Stakeholders
 - Gene Henneberg (Chair)
 - Bobby Jones (Vice Chair)
 - Alan Engelmann
 - Davis Erwin
 - Charles-Eric Langlois
 - Robert J. O'Keefe
 - Hari Singh
 - Jonathan Meyer
- NERC Staff
 - Al McMeekin



PRC-012-2 Overview

- **4.1 Functional Entities:**

- 4.1.1 Reliability Coordinator

- 4.1.2 Transmission Planner

- 4.1.3 RAS-owner – the Transmission Owner, Generator Owner, or Distribution Provider that owns all or part of a RAS

- 4.1.4 RAS-entity – the Transmission Owner, Generator Owner, or Distribution Provider designated to represent all owners of the RAS

- **4.2 Facilities:**

- Remedial Action Schemes

Requirement R1:

Prior to placing a new or functionally modified RAS in-service or retiring an existing RAS, each RAS-entity shall submit the information identified in Attachment 1 to the reviewing Reliability Coordinator(s).

Reviewing Reliability Coordinator:

The reviewing Reliability Coordinator (RC) is the RC in whose Area the RAS components and Facilities are installed. Usually a RAS is installed in a single RC Area, but in cases where a RAS crosses RC Area boundaries, each affected RC would be responsible for conducting an independent review or coordinated review with the other RCs.

Functional Modifications:

Any modification to a RAS beyond the replacement of components that preserve the original functionality is a functional modification.

Attachment 1:

Attachment 1 is a checklist of subject areas that need to be reviewed to assure System reliability.

Requirement R2:

For each RAS submitted pursuant to Requirement R1, each reviewing Reliability Coordinator shall, within four full calendar months of receipt of Attachment 1 materials, or on a mutually agreed upon schedule, perform a review of the RAS in accordance with Attachment 2, and provide written feedback to the RAS-entity.

Choice of entity to replace Regional Reliability Organization (RRO)
for reviewing RAS

Desirable characteristics of reviewing entity:

1. Independence from RAS-owners
2. Expertise in planning, protection, operations, equipment
3. Continuity (institutionalization of the review process for consistency of reviews)
4. Geographic areas approximating the present RRO administered reviews (for BES reliability oversight)

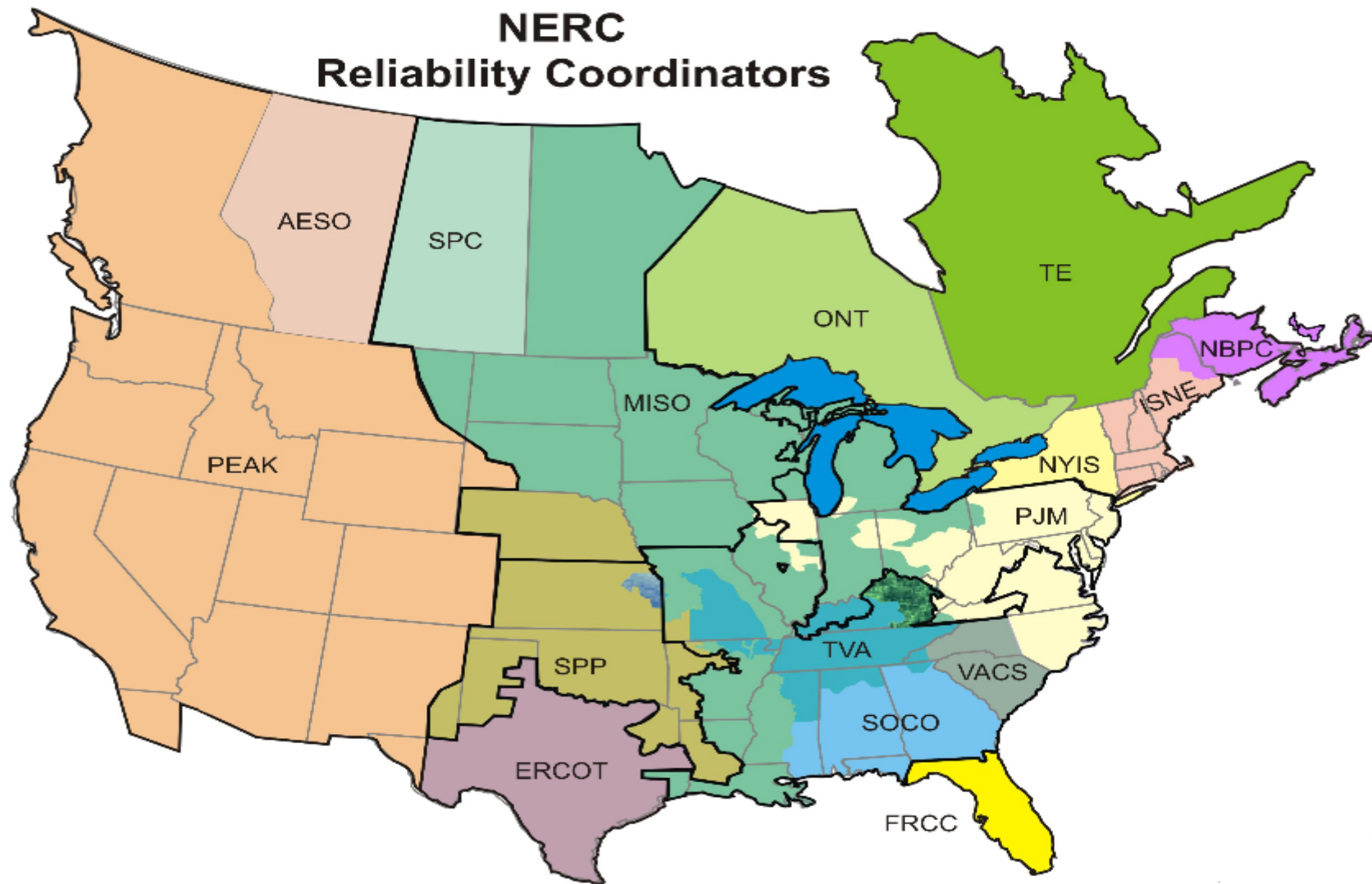
The Reliability Coordinator (RC) is the best choice because:

1. Minimizes fragmentation of present RRO reviews (16 RCs versus 80+ PCs); i.e., RCs have the widest geographic oversight among Functional Model entities (desirable for assessing RAS impact on BES reliability)
2. Maximizes the desirable “functional” independence of the RAS review from the RAS-owners and other entities that could be involved in the planning or implementing a RAS

Reliability Coordinators

Reliability Coordinators	
Code	Name
ERCOT	ERCOT ISO
FRCC	Florida Reliability Coordinating Council
TE	Hydro Quebec, TransEnergie
ISNE	ISO New England Inc.
MISO	Midcontinent Independent System Operator
NBPC	New Brunswick Power Corporation
NYIS	New York Independent System Operator
ONT	Ontario - Independent Electricity System Operator
PJM	PJM Interconnection
SPC	SaskPower
SOCO	Southern Company Services, Inc.
SPP	Southwest Power Pool
TVA	Tennessee Valley Authority
VACS	VACAR-South
PEAK	Peak Reliability
AESO*	Alberta Electric System Operator

*AESO is currently providing their own Reliability Coordinator services consistent with Alberta legislation.



Attachment 2:

Attachment 2 is provided to assist in identifying important reliability checks and in maintaining consistency of RAS reviews.

Requirement R3:

Following the review performed pursuant to Requirement R2, the RAS-entity shall address each identified reliability-related issue and obtain approval from each reviewing RC, prior to placing a new or functionally modified RAS in-service or retiring an existing RAS.

Requirement R4:

Each Transmission Planner shall perform an evaluation of each RAS within its planning area at least once every 60 full calendar months and provide the RAS-owner(s) and the Reliability Coordinator(s) the results including any identified deficiencies. Each evaluation shall determine whether:

- **R4.1** The RAS mitigates the System condition(s) or contingency(ies) for which it was designed.
- **R4.2** The RAS avoids adverse interactions with other RAS, and protection and control systems.

- The evaluation shall also determine whether:
 - **4.3** The inadvertent operation of the RAS satisfies the same performance requirements as those required for the contingency for which it was designed or, if no performance requirements apply, the inadvertent operation of the RAS satisfies the requirements of Category P7 in Table 1 of NERC Reliability Standard TPL-001-4, or its successor.

Requirement R6:

Within 120-calendar days of each RAS operation or each failure of a RAS to operate, each RAS-owner(s) shall analyze the RAS for performance deficiencies. The analysis shall determine whether the:

- **6.1** Power System conditions appropriately triggered the RAS.
- **6.2** RAS responded as designed.
- **6.3** RAS was effective in mitigating power System issues it was designed to address.
- **6.4** RAS operation resulted in any unintended or adverse power System response.

Analysis of RAS effectiveness and coordination must address items 6.1 – 6.4 to determine whether:

- **6.1** Power System conditions appropriately triggered the RAS.
(i.e. RAS inputs were above the trigger thresholds)
- **6.2** RAS responded as designed.
(i.e. RAS output/action was consistent with design)
- **6.3** RAS was effective in mitigating power System issues it was designed to address.
(i.e. RAS action was correct and resulted in intended system performance)
- **6.4** RAS operation resulted in any unintended or adverse power System response.
(i.e. RAS action was incorrect, or RAS failed to operate when expected, which resulted in unintended or adverse system performance)

Requirement R5:

Within six full calendar months of being notified of a deficiency in its RAS based on the evaluation performed pursuant to Requirement R4, each RAS-owner shall submit a Corrective Action Plan to its reviewing Reliability Coordinator(s).

Requirement R7:

Within six full calendar months of identifying a performance deficiency in its RAS based on the analysis performed pursuant to Requirement R6, each RAS-owner shall submit a Corrective Action Plan to its reviewing Reliability Coordinator(s).

Requirement R8:

For each Corrective Action Plan submitted pursuant to Requirement R5 and Requirement R7, each RAS-owner shall implement the Corrective Action Plan.

Requirement R9:

At least once every six calendar years, each RAS-owner shall perform a functional test of each RAS to verify the overall RAS performance and the proper operation of non-Protection System components.

Requirement R10:

Each Reliability Coordinator shall maintain a RAS database containing the information in Attachment 3.

- **Attachment 3: Database information**

- RAS name
- RAS-entity and contact information
- Expected or actual in-service date; most recent (Requirement R2) review date; 5-year (Requirement R4) evaluation date; and, date of retirement, if applicable
- System performance issue or reason for installing the RAS (*e.g.*, thermal overload, angular instability, poor oscillation damping, voltage instability, under-/over-voltage, slow voltage recovery)
- Description of the contingencies or System conditions for which the RAS was designed (initiating conditions)
- Corrective action taken by the RAS
- Any additional explanation relevant to high level understanding of the RAS

Requirement R11:

Within 30 calendar days of receiving a written request from a registered entity with a reliability-related need to model RAS operation, each RAS-entity shall provide the requesting entity with either the requested information or a written response specifying the basis for denying the request.

- Detailed models difficult to obtain and in limited use in industry practice
- The RAS-entity should provide information sufficient to model RAS operation such as:
 - Specific existing model(s) with documentation and settings
 - Detailed logic diagrams, arming conditions, relay settings and time delays
 - Detail list of system conditions and contingencies
 - Sequence of operations that can be translated into software specific language for simulation of the RAS actions

The checklist identifies the most common critical subjects that need to be described by the RAS-entity in enough detail so that the RAS may be reviewed.

- General
- Functional Description
- Implementation
- RAS Retirement

- Maps, one-line drawings, substation and schematic drawings that identify the location of the RAS and related facilities.
- Describe the pre- and post-modified functionality of the RAS.
- The Corrective Action Plan if RAS modifications are proposed in a Corrective Action Plan.

- Contingencies and system conditions that the RAS is intended to remedy.
- The actions to be taken by the RAS in response to disturbance conditions.
- A summary of technical studies, if applicable, demonstrating that the proposed RAS actions satisfy System performance objectives.
- Information regarding any future system plans that will impact the RAS.
- Documentation showing the RAS performance for inadvertent operation.
- Show that the RAS avoids adverse interactions with other RAS, and protection and control systems.
- Identification of other affected RCs.

- Describe the equipment used for detection, telecommunications, transfer trip, logic processing, and monitoring, whichever are applicable.
- Describe detection logic and settings/parameters that control the operation of the RAS.
- Describe application of any devices used to perform RAS function(s), in addition to other functions such as protective relaying or SCADA.
- Document an appropriate level of redundancy, i.e. a single RAS component failure will not prevent the System from meeting the intended performance requirements.
- Describe the functional testing process.

- Information so that the Reliability Coordinator is able to understand the physical and electrical location of the RAS and related facilities.
- A summary of technical studies, if applicable, upon which the decision to retire the RAS is based.
- Anticipated date of RAS retirement.

Attachment 2 provides a checklist of items for the RC to review:

- Design
- Implementation
- Review Level

- RAS actions satisfy System performance objectives for events and conditions that the RAS is intended to mitigate.
- RAS arming conditions are appropriate to its System performance objectives.
- The RAS avoids adverse interactions with other RAS, protection systems, control systems, and operating procedures.
- The effects of RAS incorrect operation (inadvertent operation and failure to operate) have been identified and meet the requirements.
- The effects of future System plans on the design and operation of the RAS have been identified.

- The implementation of RAS logic appropriately correlates desired actions (outputs) with System events and conditions (inputs).
- A single component failure in a RAS does not prevent the BES from meeting the same performance requirements as those required for the System events and conditions for which the RAS was designed.
- The RAS design facilitates periodic testing and maintenance.
- The mechanism or procedure by which the RAS is armed is clearly described, and is appropriate for reliable arming and operation of the RAS for the System conditions and events for which it is designed to operate.

- Level of review by the RC may be limited if the System response for a failure of the RAS to operate or inadvertent operation of the RAS could **not** result in any of the following conditions:
 - Frequency-related instability
 - Unplanned tripping of load or generation
 - Uncontrolled separation or cascading outages



Questions and Answers

- Please submit your questions via the chat window
 - To help facilitate a productive webinar
 - Preface comments with “Comment:”
 - Preface questions with “Question:”
 - Please reference slide number, standard section, etc.
 - Presenters will respond to as many questions as possible
 - Some questions may require discussion by the full drafting team



Closing Remarks

- PRC-012-2 is posted for informal comment
 - April 30 – May 20, 2015
- SDT meeting scheduled for June 8-11, 2015
- Anticipated formal comment and initial ballot in July-August, 2015

- NERC Standards Developer, Al McMeekin
 - Email at al.mcmeekin@nerc.net
 - Telephone: 404-446-9675
 - To receive **Project 2010-05.3** announcements and updates
 - Request to be added to email distribution list: **SPSSDT_Plus**
- Project 2010-05.3 website: [Project 2010-05.3 Phase 3 of Protection Systems: Remedial Action Schemes](#)
- Webinar slides and recording will be posted to www.nerc.com
 - Within three business days following webinar under “Standards” / “Webinars”
 - Link will be provided in the next “Standards Bulletin”
- Thank you for participating