

**NERC**

NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

# Project 2010-05.3

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

Industry Webinar  
September 10, 2015

**RELIABILITY | ACCOUNTABILITY**



- Welcome and Introductions
- Administrative Items
  - NERC Antitrust Guidelines and Disclaimer
  - Webinar Format
- Project Background, Scope, and Objectives
- Standard Drafting Team Members
- Presenters
- Overview of PRC-012-2 – Draft 1
- Questions and Answers
- Closing Remarks



# 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**
  - Two 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.
  - FERC issued a notice of proposed rulemaking on June 18, 2015 proposing to approve the revised definition of the term Remedial Action Scheme.
  - Phase 3 was initiated in January 2015.
  - The SDT posted a preliminary draft of PRC-012-2 for a 21-day informal comment period in May, 2015.

## Phase 3

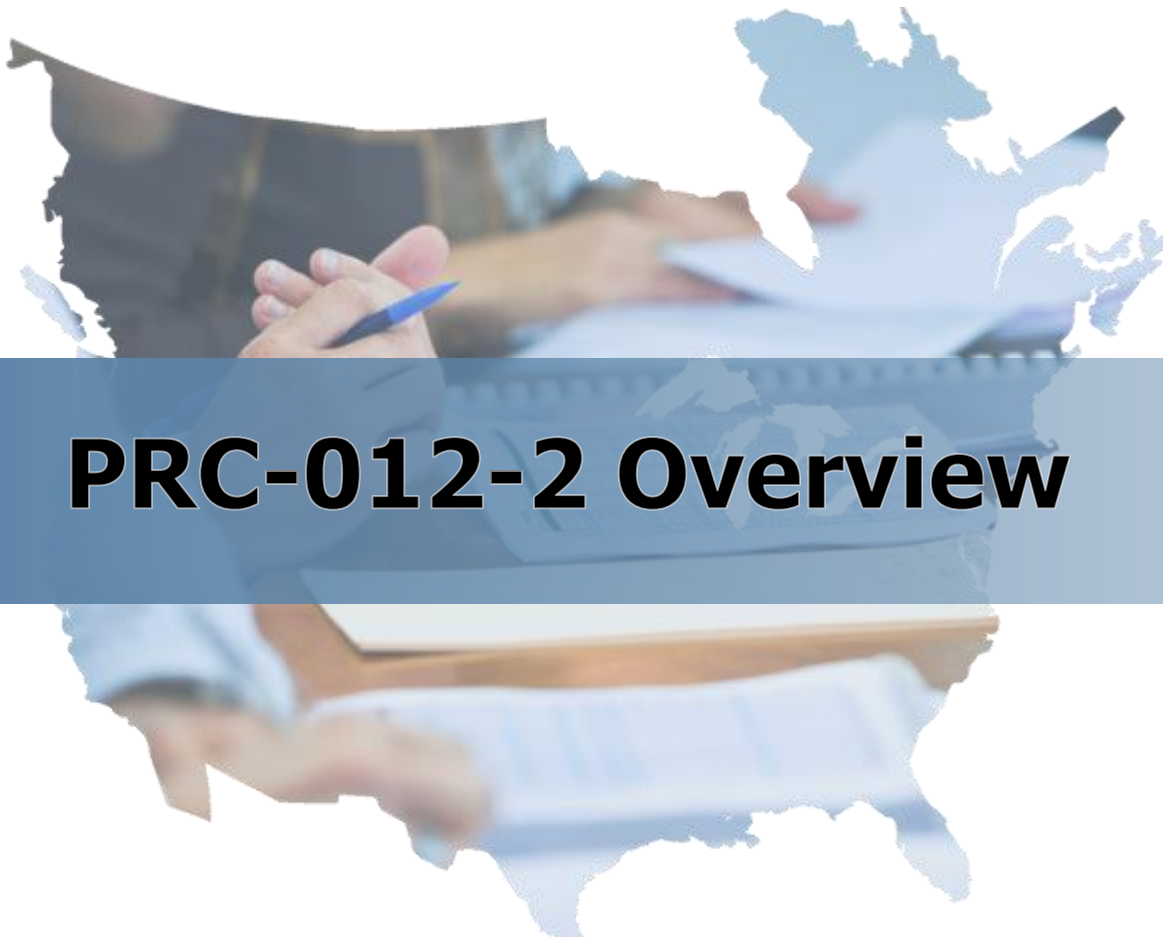
- Address the reliability objectives associated the six Remedial Action Scheme (RAS)/Special Protection System (SPS)-related standards:
    - PRC-012-1 Remedial Action Scheme Review Procedure
    - PRC-013-1 Remedial Action Scheme Database
    - PRC-014-1 Remedial Action Scheme Assessment
    - PRC-015-1 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
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Sharma Kolluri	Entergy
Charles-Eric Langlois	Hydro-Quebec TransEnergie
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Hari Singh	Xcel Energy

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  - Bobby Jones (Drafting Team Vice Chair)
  - Alan Engelmann
  - Davis Erwin
  - Sharma Kolluri
  - Charles-Eric Langlois
  - Robert J. O'Keefe
  - Hari Singh
  - Jonathan Meyer
  - Amos Ang
- 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 RAS-owner designated to represent all RAS-owner(s) for coordinating the review and approval of a RAS

- **4.2 Facilities:**

- Remedial Action Schemes

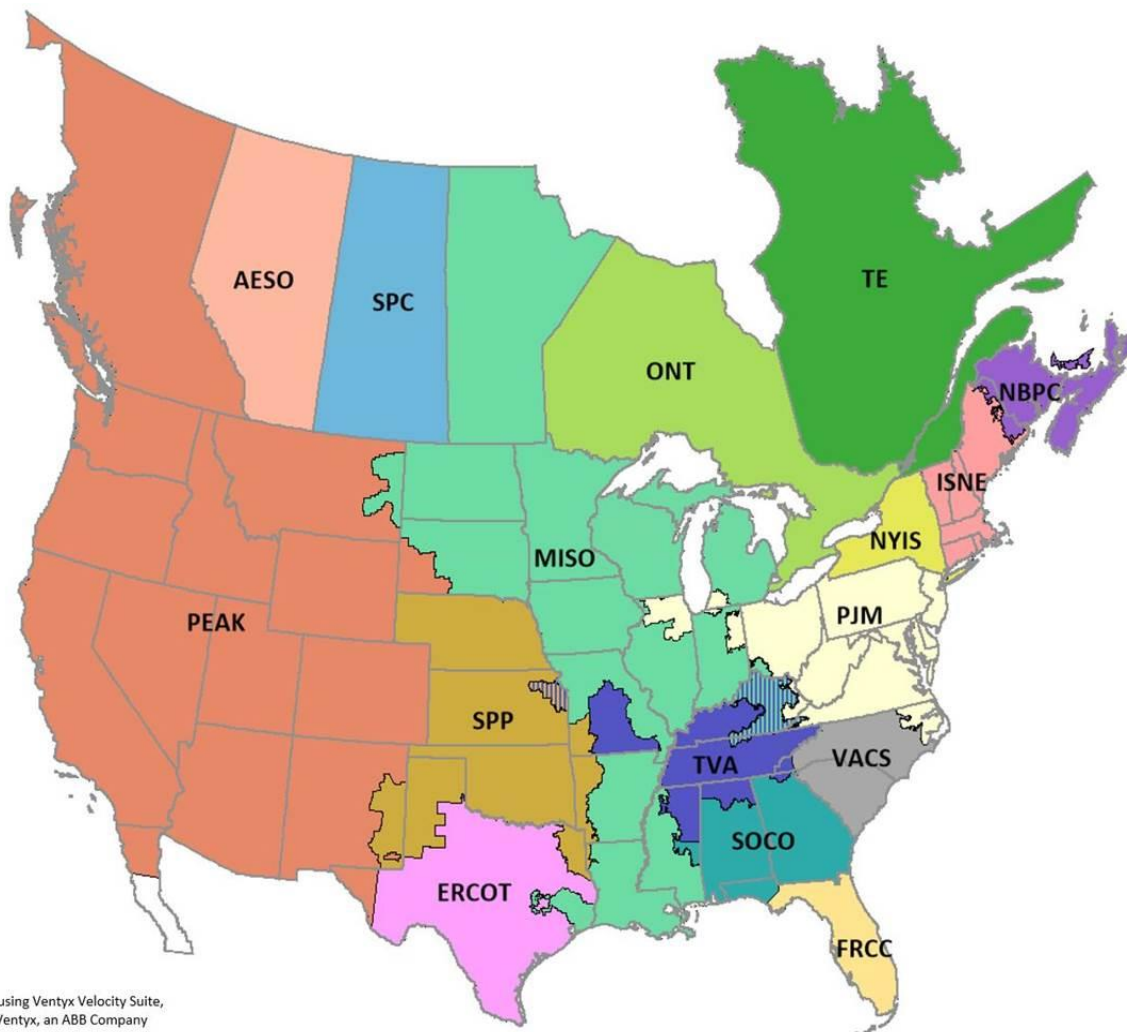
Choice of entity to replace Regional Reliability Organization (RRO)  
for reviewing RAS

## Desirable characteristics of reviewing entity:

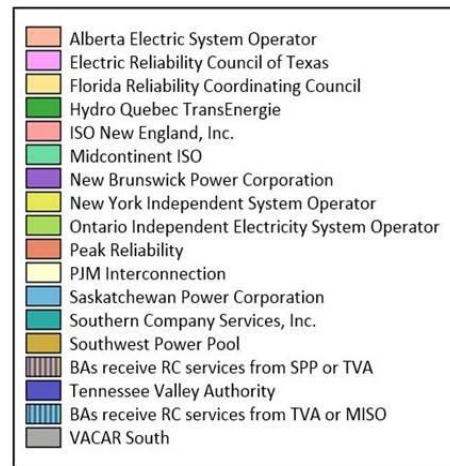
1. Independence from RAS-owners
2. Expertise in planning, protection, operations, equipment
3. Continuity (institutionalization of the review process for consistency of reviews)
4. Geographic areas approximating the present RRO administered reviews (for BES reliability oversight)

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

1. Minimizes fragmentation of present RRO reviews (8 RROs, 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 planning or implementing a RAS



## NERC Reliability Coordinators As of May 31, 2015



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## **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 for review to the Reliability Coordinator(s) that coordinates the area(s) where the RAS is located.



Attachment 1 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. The RC may also request any other data needed to evaluate any reliability issues of the RAS.

- 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 (if it is not a new RAS).
- The Corrective Action Plan (CAP) if RAS functional modifications are described in a CAP.
- Data to populate the RAS database.

- 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 BES performance objectives.
- Information regarding any future system plans that will impact the RAS.
- Documentation showing the RAS performance for inadvertent operation following a single component malfunction.
- Show that the RAS avoids adverse interactions with other RAS, and protection and control systems.
- Identification of all 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 that a single RAS component failure will not prevent the BES 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.

## **Requirement R2:**

Each Reliability Coordinator that receives Attachment 1 information pursuant to Requirement R1, shall, within four-full-calendar months of receipt, 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.

Attachment 2 assists the RC in identifying reliability-related considerations of RAS...

- Design
- Implementation

for review and verification

Attachment 2 facilitates the consistency of RAS reviews

Attachment 2 is not an exhaustive list

- RAS actions satisfy performance objectives for scope of events and conditions that the RAS is intended to mitigate
- RAS arming conditions, if applicable, are appropriate to its System performance objectives
- RAS avoids adverse interactions with other RAS, and protection and control systems
- Effects of RAS incorrect operation (inadvertent operation and failure to operate) have been identified
- Check on RAS inadvertent operation from a single component malfunction per R4.4
- Effects of future BES modifications on design and operation of the RAS have been identified, where applicable



- Implementation of RAS logic appropriately correlates desired actions (outputs) with events and conditions (inputs)
- Timing of RAS actions appropriate to BES performance objectives
- Single component failure in RAS does not prevent BES from meeting same performance requirements as those required for the events and conditions for which RAS was designed
- RAS design facilitates periodic testing and maintenance
- Mechanism or procedure by which RAS armed clearly described, and appropriate for reliable arming and operation of RAS for the conditions and events for which it is designed

## **Requirement R3:**

Following the review performed pursuant to Requirement R2, the RAS-entity shall address each identified issue and obtain approval from each reviewing Reliability Coordinator 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 possible inadvertent operation of the RAS resulting from any single RAS component malfunction satisfies all of the following:
    - 4.3.1. The BES shall remain stable.
    - 4.3.2. Cascading shall not occur.
    - 4.3.3. Applicable Facility Ratings shall not be exceeded.
    - 4.3.4. BES voltages shall be within post-Contingency voltage limits and post-Contingency voltage deviation limits as established by the Transmission Planner and the Planning Coordinator.
    - 4.3.5. Transient voltage responses shall be within acceptable limits as established by the Transmission Planner and the Planning Coordinator.

- The evaluation shall also determine whether:
  - **4.4** A single component failure in the RAS, when the RAS is intended to operate, does not prevent the BES from meeting the same performance requirements (defined in Reliability Standard TPL-001-4 or its successor) as those required for the events and conditions for which the RAS is designed.

## Requirement R5:

Each RAS-owner shall, within 120-calendar days of a RAS operation or failure of a RAS to operate when expected, analyze the RAS performance and provide the results of the analysis, including any identified deficiencies, to its reviewing Reliability Coordinator(s).

The RAS operational performance analysis shall determine whether:

- **5.1** The System events and/or conditions appropriately triggered the RAS.
- **5.2** The RAS responded as designed.
- **5.3** The RAS was effective in mitigating BES performance issues it was designed to address.
- **5.4** The RAS operation resulted in any unintended or adverse BES response.

Parts 5.1 – 5.4 must be addressed in the RAS operational performance analysis to adequately determine if the RAS operation (or lack thereof) was a correct response:

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

## **Requirement R6:**

Within six-full-calendar months of being notified of a deficiency in its RAS pursuant to Requirement R4 or Requirement R5, each RAS-owner shall participate in developing a Corrective Action Plan (CAP) and submit the CAP to its reviewing Reliability Coordinator(s).



## Requirement R7:

For each CAP submitted pursuant to Requirement R6, each RAS-owner shall:

- **7.1** Implement the CAP
- **7.2** Update the CAP if Actions or timetables change.
- **7.3** Notify each reviewing Reliability Coordinator if CAP actions or timetables change.

## **Requirement R8:**

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.

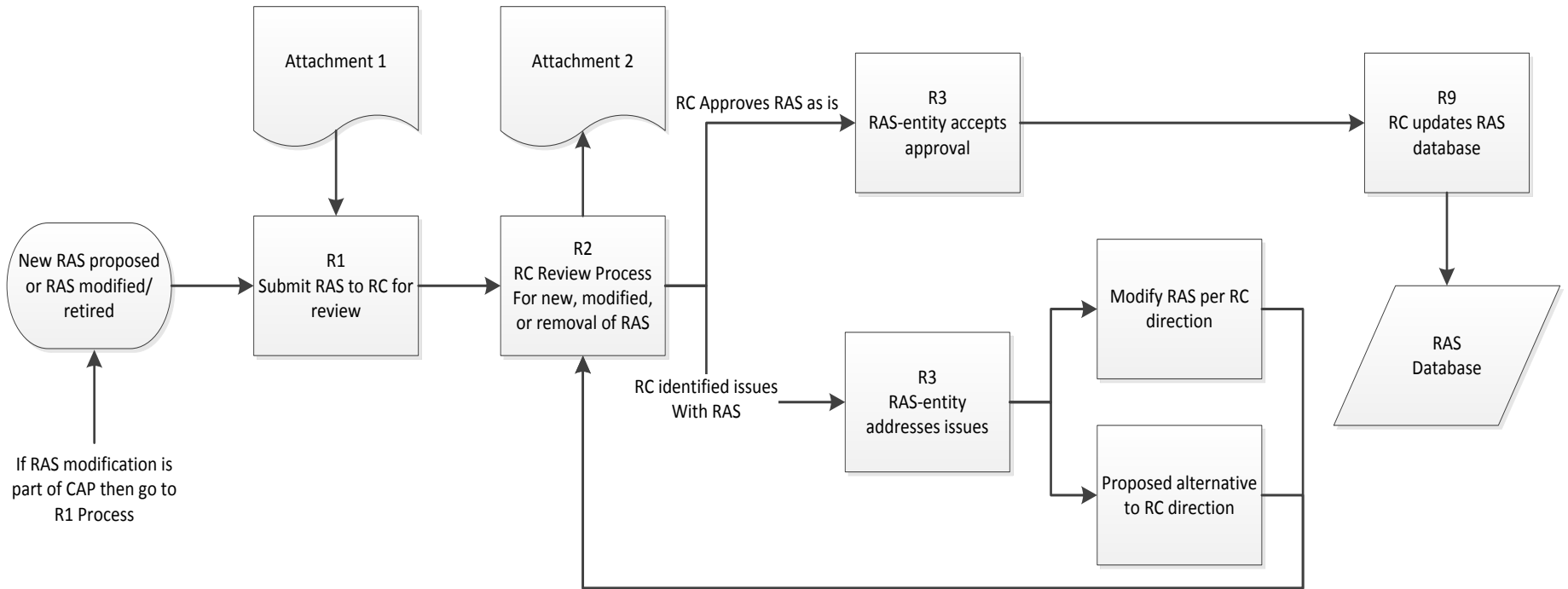
## **Requirement R9:**

Each Reliability Coordinator shall update a RAS database containing, at a minimum, the information in Attachment 3 at least once each calendar year.

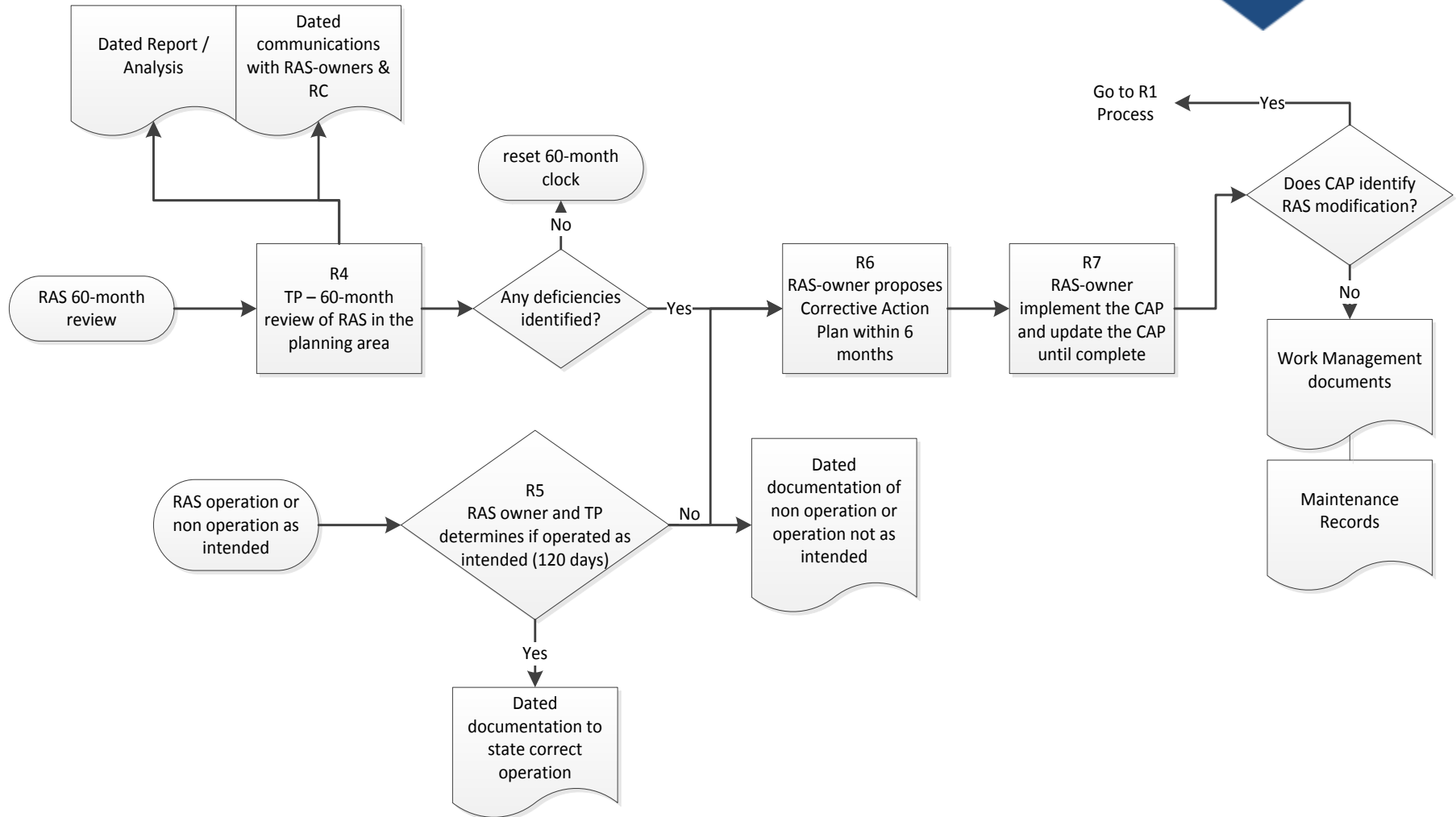
- **Attachment 3: Database information**

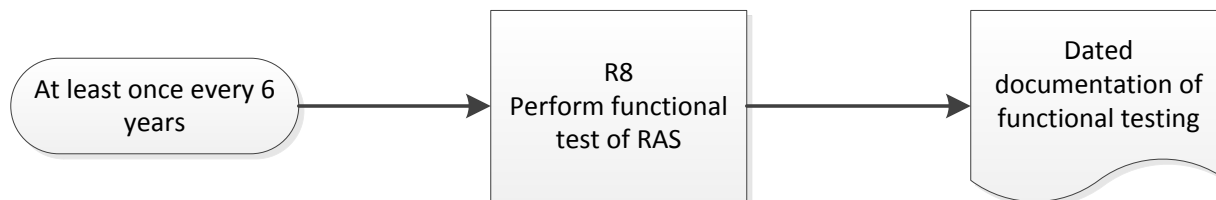
- RAS name.
- RAS-entity and contact information.
- Expected or actual in-service date; most recent RC-approval date (Requirement R3); most recent evaluation date (Requirement R4); and date of retirement, if applicable.
- System performance issue or reason for installing the RAS (*e.g.*, thermal overload, 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).
- Action(s) to be taken by the RAS.
- Any additional explanation relevant to high level understanding of the RAS.

# PRC-012-2 Requirements Work Flow



# PRC-012-2 Requirements Work Flow







# 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 SDT



# Closing Remarks

- 45-day comment and initial ballot ends October 5, 2015
- SDT meeting scheduled the week of October 26-30, 2015
- Final ballot in December 2015
- BOT adoption in February 2016

- NERC Standards Developer, Al McMeekin
  - Email at [al.mcmeekin@nerc.net](mailto: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](http://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