

Meeting Notes

Project 2010-05.3 Remedial Action Schemes

Standard Drafting Team

February 10-12, 2015 | 8:00 p.m. – 5:00 p.m. ET

FRCC
Tampa, FL

Administrative

- **Introductions and chair remarks**

Gene Henneberg, the chair, brought the meeting to order on Tuesday, February 10, 2015 and welcomed everyone. Those in attendance were:

Name	Company	Member/ Observer	In Person	Conference Call/Web
Gene Henneberg	NV Energy / Mid-American	Member	X	
Bobby Jones	Southern Company	Member	X	
Amos Ang	Southern California Edison	Member	X	
Sharma Kolluri	Entergy	Member	X	
Alan Engelmann	ComEd / Exelon	Member	X	
Davis Erwin	Pacific Gas and Electric	Member		X
Charles-Eric Langlois	Hydro-Quebec TransEnergie	Member	X	
Robert J. O'Keefe	American Electric Power	Member	X	
Hari Singh (Jan 20-22 only)	Xcel Energy	Member	X	
Al McMeekin	NERC	Member	X	
Lacey Ourso	NERC	Member	X	

Name	Company	Member/Observer	In Person	Conference Call/Web
Syed Ahmad	FERC	Observer	X	
Jonathan Meyer	Idaho Power	Observer	X	
Bill Edwards	NERC	Observer		X
Guy Zito	NPCC	Observer	X	
Matthew C Veghte	Peak Reliability	Observer		X

- **Determination of quorum**

The rule for NERC standard drafting team (SDT or team) states that a quorum requires two-thirds of the voting members of the SDT. Quorum was achieved as 9 of the 10 voting members were present for most of the meeting.

- **NERC Antitrust Compliance Guidelines and Public Announcement**

Mr. McMeekin reviewed the NERC Antitrust Compliance Guidelines and public announcement disclaimer.

- **Review team roster**

The team reviewed the roster and confirmed that it was accurate.

Agenda Items

1. Review and Discuss Assignments

The SDT reviewed each requirement in the draft standard from a high level. Discussion was held regarding the reliability need for a RAS database (R6). It was determined that there is a reliability need for the database to assist in coordination among different RAS. The database should list RAS and give enough detail to know if additional details should be obtained.

Requirement R8 states “Each Planning Coordinator shall make available the RAS database for its planning area to the Electric Reliability Organization (ERO) or its designee to maintain Interconnection-wide RAS database(s).” It was decided that this requirement is not needed because NERC can get the data anyway.

The SDT spent some time reviewing draft of Attachments 1-3. The draft definition for “significant impact” raised some concerns. The qualifiers “BES voltage levels in violation of applicable emergency limits and loadings on BES transmission facilities in violation of applicable emergency limits” might be too broad and result in misclassifying some RAS as significant which shouldn’t be classified as significant.

The team discussed who the RAS-Entity would be if a RAS was jointly owned. It was suggested that the one who owns the controller would be the RAS-Entity.

2. Continue Standard Development

There was much discussion on who the Reviewing Entity would be. Ultimately, it was decided that the Reviewing entity would be the Reliability Coordinator. It is possible that the RC could get the Region to conduct the review if the Region was willing to do it. However, the RC would still be responsible for compliance with the requirement for reviewing.

All of the requirements were reconsidered in great detail. Many changes were made to the requirements and a re-ordering of the requirements was done to get them in a more logical order. It was decided that the RC should be the keeper of the database rather than the PC.

The drafts of the Measures were reviewed and modified to be consistent with changes made to the requirements.

The correct entity to do the five-year assessment was discussed. It was decided that the TP is the best entity for this review.

Assignments were made to revise the rationales to be consistent with the revised requirements. These were reviewed the next morning.

The SDT discussed again the need for RAS classifications. It was decided to have classifications and to use the term “significant” or “limited” in describing the impact of failures or inadvertent operations. It was also decided that if a RAS was installed for a Planning Event, it would have the requirement that the failure of a single component should not keep it from meeting the requirements of the TPL standard. The term “significant” will mean:

- Cascading
- Loss of synchronism of more than a single generating plant
- Not acceptably damped according to the PC’s criteria

3. Next Steps

Schedule a conference call prior to the next face-to-face meeting

4. Future meeting(s)

- a. February 25, 2015 | Ready Talk 2:00 – 4:00 ET
- b. March 17-19, 2015 | New Orleans, LA
- c. April 14-16, 2015 | Atlanta, GA

5. Adjourn

The meeting adjourned at 5:00 p.m. ET on Thursday, February 12, 2015.

From: [Al McMeekin](#)
To: [spsdtd_plus](#); spsdtd@nerc.com
Subject: Working_doc_02-19-15_team
Date: Thursday, February 19, 2015 7:03:58 PM
Attachments: [Working_doc_02-19-15_team.docx](#)

All,

The draft standard is attached. You will notice that it has undergone a few changes since last week. Please carefully review the standard and circulate any ideas for improvement.

Remember our next meeting is a conference call next Wednesday, February 25, 2015. 2 -5 PM Eastern

Phone: 1-866-740-1260 5301963 676869

Web: www.readytalk.com

5301963

Thanks.

Al

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When this standard receives Board adoption, the rationale boxes will be moved to the Supplemental Material Section of the standard.

A. Introduction

1. **Title:** Remedial Action Schemes
2. **Number:** PRC-012-2
3. **Purpose:** To ensure that all Remedial Action Schemes (RAS) are properly designed, meet performance requirements, and are coordinated with other protection systems.
4. **Applicability:**
 - 4.1. **Functional Entities:**
 - 4.1.1. Reliability Coordinator
 - 4.1.2. Planning Coordinator
 - 4.1.3. Transmission Planner
 - 4.1.4. RAS-owner – Transmission Owner, Generator Owner, and ~~Distribution~~ Distribution Provider that ~~owns a RAS~~ owns a RAS
 - 4.2. **Facilities:**
 - 4.2.1. Remedial Action Schemes
 - 4.2.2. (Subset of Facilities)
 - 4.3. **Exemptions:**
 - 4.3.1. (Subset of Facilities) (DELETE GREEN TEXT PRIOR TO PUBLISHING)
Include this section only if there are certain facilities exempt from the standard.
5. **Effective Date:** See Implementation Plan
6. **Standard-Only Definition:** (DELETE GREEN TEXT PRIOR TO PUBLISHING) This section is to be used only for standards that currently have standard only definitions. Going forward a standard must provide a justification as to why the standard needs a standard-only definition and cannot be moved to the NERC Glossary of Terms.

B. Requirements [WE4] and Measures

Rationale for Requirement [WE5] R1: Because each Remedial Action Scheme (RAS) is unique and its action(s) can have a significant impact on the reliability and integrity of the Bulk Electric System (BES), the SDT contends that a thorough review of a new or functionally-modified RAS must be completed prior to placing the RAS in service. The SDT asserts this review shall be performed by an entity other than the RAS-owner or the Transmission Planner (TP) that designed the RAS. Therefore, Requirement R1 mandates the RAS-owner submit Attachment 1 to its Reliability Coordinator to perform the review. The data and supporting documentation outlined in Attachment 1 provide the RC with sufficient details of the RAS design, function, and operation to perform a comprehensive review.

Note: A retirement of a RAS would be considered a functional modification and must be reviewed prior to removal from service.

- R1.** Prior to placing a new or functionally modified RAS in-service, each RAS-owner [WE6] shall submit the data and supporting documentation identified in Attachment 1 to its [WE7] Reliability Coordinator, for review. *[Violation Risk Factor:] [Time Horizon:]*
- M1.** Acceptable evidence for Requirement R1 is dated evidence that the RAS-owner provided Attachment 1 to its Reliability Coordinator prior to placing the new or modified RAS in service.

Rationale for Requirement R2: Requirement R2 mandates the Reliability Coordinator provide a review of each new or functionally modified RAS proposed for installation in its Reliability Coordinator Area. The SDT selected the Reliability Coordinator (RC) because of its wide area perspective that provides continuity to the review process and facilitates the coordination aspects of RAS with other RAS. The RC selection minimizes the possibility of conflict of interest due to association with the RAS-owner or Transmission Planner (TP), thus providing a more independent review.

The RC is required to perform the review in accordance with Attachment 3, which identifies important design and implementation aspects of the RAS. Following the checklist of Attachment 3 will assure consistent reviews for each RAS submitted. The RC must review the proposed RAS and provide written feedback to the RAS-owner within 120 calendar days of receipt of Attachment 1. The 120 calendar day timeframe is consistent with current utility practice; however, flexibility for variance is provided by allowing the parties to negotiate a different schedule for the review.

- R2.** For each RAS submitted pursuant to Requirement **R1**, the Reliability Coordinator, within 120 calendar days of receipt or on a mutually agreed upon schedule, shall: *[Violation Risk Factor:] [Time Horizon:]*
- 2.1** Perform a review of the RAS in accordance with Attachment 3.

2.2 Provide a written response to the RAS-owner(s) regarding its findings.

M2. Acceptable evidence may include, but is not limited to, date-stamped reports, or other documentation detailing the RAS review, and date-stamped communications showing that results and comments from the review were provided to the RAS-owner within 120 calendar days of receipt or within the mutually agreed upon schedule.

Rationale for Requirement R3: Requirement R2 mandates the RAS-owner respond in writing to the Reliability Coordinator's review of a proposed RAS. This ensures the RAS-owner has considered the RC's review and has addressed any reliability-related concerns prior to placing the RAS in-service. This communication promotes the reliability and security of the RAS and the BES. A specific time period for the RAS-owner to respond is not necessary because an expeditious response is in the self-interest of the RAS-owner to effect a timely implementation. The response should include one of the following:

- The RAS-owner accepts the recommendation(s) (if any) of the RC's review, and implements the changes to the RAS prior to placing it in service.
- The RAS-owner identifies and proposes alternative means that may be equally effective and efficient in addressing any reliability concern(s) identified in the RC's review. Any such alternative(s) would require the same level of review as the original proposal (Requirements R1 and R2).
- The RAS-owner decides not to modify the RAS to mitigate or avoid the reliability issues identified in the RC's review, the RAS-owner shall document the technical reasons why the RC's technical concerns are not justified.

R3. Each RAS-owner, prior to placing a new or functionally modified RAS in-service, shall provide a written response to [WE8] the Reliability Coordinator to address reliability-related issue(s) identified in the RAS review performed pursuant to Requirement R2. The response must contain: [Violation Risk Factor:] [Time Horizon:-]

- Acceptance of the recommendation(s), or
- Technical justification(s) for proposed alternative approach(es), or
- Technical justification(s) for taking no action. [WE9]

Each RAS-owner, prior to placing a new or functionally modified RAS in-service, shall address reliability-related [WE10] issue(s) identified in the RAS review performed pursuant to Requirement R2 or obtain agreement from the Reliability Coordinator that no action is necessary. [Violation Risk Factor:] [Time Horizon:]

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M3. Acceptable evidence may include, but is not limited to, date-stamped communications to the Reliability Coordinator detailing how the reliability-related issues were addressed.

Rationale for Requirement R4: The purpose of periodic RAS evaluation is to verify the continual effectiveness and coordination of the RAS, as well as its inadvertent operation performance. This periodic evaluation is needed due to possible changes in system topology and operating conditions that may have occurred since the previous RAS evaluation (or initial review) was completed. Based on the periodicity time frames for similar requirements in Reliability Standards PRC-006-1 and PRC-010-1, and in current RAS evaluation practices, it was determined that 60 calendar months between the RAS evaluations is both reasonable and adequate. The RAS evaluation can be performed sooner if it is determined that material changes to system topology or system operating conditions that could potentially impact the effectiveness or coordination of the RAS, have occurred since the previous RAS evaluation. The periodic RAS evaluation will typically lead to one of the following outcomes – affirmation that the existing RAS implementation is adequate; or, identification of changes needed to the existing RAS implementation; or, justification for RAS retirement. Because the items addressed in the evaluations (Parts 4.1, 4.2, 4.3) are planning analyses, the SDT asserts that the functional entity best qualified to perform them is the Transmission Planner (TP). [AM11] To promote reliability, the TP is required to provide the RAS-owner and the Reliability Coordinator with the results of each evaluation.

R4. Each Transmission Planner shall perform an evaluation of each RAS in its planning area at least once every 60 calendar months and provide the RAS-owner(s) and its [WE12] Reliability Coordinator the results and any identified deficiencies. Each evaluation shall include, but is not limited to, analyses that evaluate whether: [Violation Risk Factor:] [Time Horizon:]

- 4.1** The RAS addresses the System condition(s) for which it was designed.
- 4.2** The RAS is coordinated with other RAS, protection [WE13] and control systems.
- 4.3** The inadvertent operation of the RAS satisfies the same performance requirements as those for which it was designed.

M4. Acceptable evidence may include, but is not limited to, date-stamped reports or other documentation of the analyses comprising the evaluation of each RAS.

Rationale for Requirement R5: Deficiencies identified by the periodic RAS evaluation conducted by the Transmission Planner in Requirement R4 are likely to pose a reliability risk to the BES due to the impact of either RAS operation or misoperation. To avoid this reliability risk, Requirement R5 mandates the RAS-owner develop a Corrective Action Plan that sets forth the mitigation methods and timetable to address the deficiency. Submitting the Corrective Action Plan to the Reliability Coordinator provides a second check of the mitigating actions, ensuring any deficiencies are adequately addressed in a timely manner.

R5. Each RAS-owner notified of a deficiency in its RAS, based on the evaluation performed pursuant to Requirement R4, shall develop a Corrective Action Plan to address the deficiency, and subsequently provide its Reliability Coordinator the Corrective Action Plan (including updated data and supporting documentation pursuant to Requirement R1).
[Violation Risk Factor:] [Time Horizon:]

M5. Acceptable evidence may include, but is not limited to, a date-stamped Corrective Action Plan, and date-stamped reports or other documentation supporting the Corrective Action Plan.

Rationale for Requirement R6:

R6. Each RAS-owner shall have a RAS functional testing program that, at a minimum includes:
[Violation Risk Factor:] [Time Horizon:]

6.1 Summary of testing procedure.

6.2 Periodicity of testing.

M6. Acceptable evidence may include, but is not limited to, date-stamped documentation of the functional testing program.

Rationale for Requirement R7: Because the correct operation of a Remedial Action Scheme (RAS) is important to maintaining the reliability and integrity of the Bulk Electric System (BES), the SDT contends that all operations of a RAS should be analyzed. Any incorrect operation or misoperation of a RAS regardless of when it is identified (during functional testing or in response to an actual system event) indicates the RAS effectiveness and/or coordination has been compromised.

R7. Following the functional testing of a RAS, or an operation of a RAS, the RAS-owner, shall analyze the operation to determine whether the RAS operated correctly or misoperated.
[Violation Risk Factor:] [Time Horizon:][AM14]

M7. Acceptable evidence may include, but is not limited to, date-stamped documentation detailing the analysis of the RAS operation.

Rationale for Requirement R8: Requirement R8 mandates the RAS-owner develop a Corrective Action Plan to address any identified misoperation. Submitting the Corrective Action Plan (CAP) and updated Attachment 1 data to the Reliability Coordinator ensures that any misoperations are addressed in a timely manner.

R8. For any identified misoperation, the RAS-owner shall develop a Corrective Action Plan (CAP) and subsequently provide its Reliability Coordinator the CAP (including updated data and supporting documentation pursuant to Requirement R1). [Violation Risk Factor:] [Time Horizon:]

M8. Acceptable evidence may include, but is not limited to, date-stamped documentation that it developed and provided the Corrective Action Plan to its Reliability Coordinator.

Rationale for Requirement R9: The purpose of the RAS database is to comprise a comprehensive record of all RAS existing in a Reliability Coordinator's area, along with basic descriptive information about each RAS including its purpose, operating actions, and "who to" contact information if detailed information is needed. Other functional entities may have a reliability-based need to be aware of existing RAS, for example, to ensure coordination with other schemes; therefore, an accurate source of such information must be maintained. At a minimum, the information described in Attachment 2 facilitates this purpose. Continued maintenance of the RAS database is required to ensure accuracy. The RC will be receiving the information required for the database as each new or modified RAS is submitted for review, so it is logical that the RC be assigned this responsibility.

R9. Each Reliability Coordinator shall maintain a RAS database containing the information in Attachment 2. [Violation Risk Factor:] [Time Horizon:]

M9. Acceptable evidence may include, but is not limited to, date-stamped spreadsheets, database reports, or other documentation demonstrating a RAS database was maintained.

Rationale for Requirement R10: The STD contends that other registered entities may have a reliability need for modeling RAS operations and will require additional information than what is listed in Attachment 2 in order to model RAS accurately. Requirement R1 mandates that the RAS-owner provide detailed information to the relevant functional entity to model RAS operation. Such information may be needed to address one or more of the following reliability needs:

- Perform periodic RAS evaluation
- Planning assessment studies
- Operations planning and/or real-time analyses
- BES event analyses
- Coordinating RAS actions between entities

R10. Each RAS-owner shall provide other registered entities with a reliability need, information to model RAS operation, within 30 calendar days of a written request. [Violation Risk Factor:] [Time Horizon:]

M10. Acceptable evidence may include, but is not limited to, date-stamped emails, letters, or other documentation demonstrating information to model RAS operation was provided within 30 calendar days of receipt of a written request.

When this standard receives Board adoption, the rationale boxes will be moved to the Supplemental Material Section of the standard.

A. Introduction

1. **Title:** **Remedial Action Schemes**
2. **Number:** **PRC-012-2**
3. **Purpose:** To ensure that all Remedial Action Schemes (RAS) are properly designed, meet performance requirements, and are coordinated with other protection systems.
4. **Applicability:**
 - 4.1. **Functional Entities:**
 - 4.1.1. Reliability Coordinator
 - 4.1.2. Planning Coordinator
 - 4.1.3. Transmission Planner
 - 4.1.4. RAS-owner - Transmission Owner, Generator Owner, or Distribution Provider that owns RAS components
 - 4.2. **Facilities:**
 - 4.2.1. Remedial Action Schemes (RAS)
 - 4.2.2. (Subset of Facilities)
 - 4.3. **Exemptions:**
 - 4.3.1. (Subset of Facilities) **(DELETE GREEN TEXT PRIOR TO PUBLISHING)**
Include this section only if there are certain facilities exempt from the standard.
5. **Effective Date:** See Implementation Plan for PRC-012-2
6. **Standard-Only Definition:** **(DELETE GREEN TEXT PRIOR TO PUBLISHING)** This section is to be used only for standards that currently have standard only definitions. Going forward a standard must provide a justification as to why the standard needs a standard-only definition and cannot be moved to the NERC Glossary of Terms.

B. Requirements and Measures

Rationale for Requirement R1: Because each Remedial Action Scheme (RAS) is unique and its action(s) can have a significant impact on the reliability and integrity of the Bulk Electric System (BES), the SDT contends that a thorough review of proposed new RAS or existing RAS proposed for functional modifications or retirement (removal from service), must be completed prior to implementation. To facilitate a comprehensive review that ensures reliability, the RAS-owner must provide the reviewer with sufficient details of the RAS design, function, and operation. This data and supporting documentation are identified in Attachment 1 of this standard, and Requirement R1 mandates the RAS-owner provide them. The SDT asserts the RAS review shall be performed by an entity other than the RAS-owner or the Transmission Planner (TP) that designed the RAS, and assigned this task to the designated Reliability Coordinator. The RC designated for the review will most often be the RC that controls the area where the RAS controller is located because there could be instances where RAS may cross RC Area boundaries.

- R1.** Prior to RAS implementation, each RAS-owner shall submit the data and supporting documentation identified in Attachment 1 to the designated Reliability Coordinator, for review. *[Violation Risk Factor:] [Time Horizon:]*
- M1.** Acceptable evidence for Requirement R1 is dated evidence that the RAS-owner provided Attachment 1 to the designated Reliability Coordinator prior to RAS implementation.

Rationale for Requirement R2: Requirement R2 mandates the Reliability Coordinator provide a review of each new or functionally modified RAS proposed for installation in its Reliability Coordinator Area. The SDT selected the Reliability Coordinator (RC) because of its wide area perspective that provides continuity to the review process and facilitates the coordination aspects of RAS with other RAS. The RC selection minimizes the possibility of conflict of interest due to association with the RAS-owner or Transmission Planner (TP), thus providing a more independent review.

The RC is required to perform the review in accordance with Attachment 3, which identifies important design and implementation aspects of the RAS.^[AMI] Following the checklist of Attachment 3 will assure consistent reviews for each RAS submitted. The RC must review the proposed RAS and provide written feedback to the RAS-owner within 4 full calendar months of receipt of Attachment 1. The timeframe of 4 full calendar months is consistent with current utility practice; however, flexibility is provided by allowing the parties to negotiate a different schedule for the review.

- R2.** For each RAS submitted pursuant to Requirement R1, the Reliability Coordinator shall, within 4 full calendar months of receipt or on a mutually agreed upon schedule, perform a review of the RAS in accordance with Attachment 3: *[Violation Risk Factor:] [Time Horizon:]*
- M2.** Acceptable evidence may include, but is not limited to, date-stamped reports, or other documentation detailing the RAS review in accordance with Requirement R1.

Rationale for Requirement R3: Requirement R3 mandates the RAS-owner address all reliability-related issues identified by the Reliability Coordinator during the RAS review, and reach agreement with the Reliability Coordinator that the RAS implementation can proceed. This interaction promotes reliability and security of the BES by minimizing the introduction of inadvertent actions (risks).^[AM2] A specific time period for the RAS-owner to respond is not necessary because an expeditious response is in the self-interest of the RAS-owner to effect a timely implementation. The response should include one of the following:

- R3.** Following the review performed pursuant to Requirement R2, each RAS-owner shall address each identified reliability-related issue(s) and obtain agreement to proceed with the RAS implementation from the reviewing RC. : *[Violation Risk Factor:] [Time Horizon:]*
- M3.** Acceptable evidence may include, but is not limited to, date-stamped documentation and date-stamped communications to and from the Reliability Coordinator in accordance with Requirement R3.

Rationale for Requirement R4: The purpose of periodic RAS evaluation is to verify the continual effectiveness and coordination of the RAS, as well as its inadvertent operation performance. This periodic evaluation is needed due to possible changes in system topology and operating conditions that may have occurred since the previous RAS evaluation (or initial review) was completed. Based on the periodicity time frames for similar requirements in Reliability Standards PRC-006-1 and PRC-010-1, and in current RAS evaluation practices, it was determined that 60 calendar months between the RAS evaluations is both reasonable and adequate. The RAS evaluation can be performed sooner if it is determined that material changes to system topology or system operating conditions that could potentially impact the effectiveness or coordination of the RAS, have occurred since the previous RAS evaluation. The periodic RAS evaluation will typically lead to one of the following outcomes – affirmation that the existing RAS implementation is adequate; or, identification of changes needed to the existing RAS implementation; or, justification for RAS retirement. Because the items addressed in the evaluations (Parts 4.1, 4.2, 4.3) are planning analyses, the SDT asserts that the functional entity best qualified to perform them is the Transmission Planner (TP). To promote reliability, the TP is required to provide the RAS-owner and the Reliability Coordinator with the results of each evaluation.

R4 choices:

Each RAS-owner shall perform an evaluation of each RAS at least once every 60 calendar months and provide its Reliability Coordinator the results including any identified deficiencies. Each evaluation shall include, but is not limited to, analyses that evaluate whether:

Each Reliability Coordinator shall perform an evaluation of each RAS it is designated to review (in its RC Area) at least once every 60 calendar months and provide the RAS-owner(s) the results including any identified deficiencies. Each evaluation shall include, but is not limited to, analyses that evaluate whether:

R4. Each Transmission Planner shall perform an evaluation of each RAS in its planning area at least once every 60 calendar months and provide the RAS-owner(s) and the designated Reliability Coordinator the results including any identified deficiencies. Each evaluation shall include, but is not limited to, analyses that evaluate whether: [*Violation Risk Factor:*] [*Time Horizon:*]

- 4.1** The RAS addresses the System condition(s) for which it was designed.
- 4.2** The RAS is coordinated with other RAS, protection and control systems.
- 4.3** The inadvertent operation of the RAS satisfies the same performance requirements as those for which it was designed.

M4. Acceptable evidence may include, but is not limited to, date-stamped reports or other documentation of the analyses comprising the evaluation of each RAS.

Rationale for Requirement R5: Deficiencies identified by the periodic RAS evaluation conducted by the Transmission Planner in Requirement R4 are likely to pose a reliability risk to the BES due to the impact of either a RAS operation or misoperation. To avoid this reliability risk, Requirement R5 mandates the RAS-owner develop a Corrective Action Plan that establishes the mitigation methods and timetable to address the deficiency. Submitting the Corrective Action Plan to the Reliability Coordinator provides a second check of the mitigating actions, ensuring any deficiencies are adequately addressed in a timely manner.

- R5.** Each RAS-owner notified of a deficiency in its RAS, based on the evaluation performed pursuant to Requirement R4, shall within 6 full calendar months of receipt: *[Violation Risk Factor:] [Time Horizon:]*
- 5.1** Develop a Corrective Action Plan
 - 5.2** Submit an updated Attachment 1 to the designated Reliability Coordinator
- M5.** Acceptable evidence may include, but is not limited to, a date-stamped Corrective Action Plan and an updated Attachment 1, and date-stamped communications with the Reliability Coordinator in accordance with Requirement R5.

Rationale for Requirement R6: Because the correct operation of a Remedial Action Scheme (RAS) is important to maintaining the reliability and integrity of the Bulk Electric System (BES), the SDT contends that all operations of a RAS should be analyzed. Any incorrect operation or misoperation of a RAS indicates the RAS effectiveness and/or coordination has been compromised.

R6. Following the operation of a RAS, the RAS-owner shall analyze the operation to determine whether the RAS operated correctly or misoperated. [*Violation Risk Factor:*] [*Time Horizon:*]

M6. Acceptable evidence may include, but is not limited to, date-stamped documentation detailing the analysis of the RAS operation.

Rationale for Requirement R7: Requirement R7 mandates the RAS-owner develop a Corrective Action Plan to address any identified misoperation. Submitting the Corrective Action Plan (CAP) and updated Attachment 1 data to the Reliability Coordinator ensures that any misoperations are addressed in a timely manner.

R7. For any identified misoperation that requires a functional modification to the RAS, the RAS-owner shall, within **timeframe** of identifying the misoperation: [*Violation Risk Factor:*]
[*Time Horizon:*]

7.1 Develop a Corrective Action Plan

7.2 Submit an updated Attachment 1 to the designated Reliability Coordinator

M7. Acceptable evidence may include, but is not limited to, a date-stamped Corrective Action Plan and an updated Attachment 1, and date-stamped communications with the Reliability Coordinator in accordance with Requirement R7.

Rationale for Requirement R8: Requirement R8 mandates the RAS-owner implement a Corrective Action Plan to address any identified misoperation. Implementing the Corrective Action Plan (CAP) ensures that any misoperations are addressed in a timely manner.

- R8.** For each CAP developed pursuant to Requirements R5 and R7, each RAS-owner shall implement the CAP. *[Violation Risk Factor:] [Time Horizon:]*
- M8.** Acceptable evidence may include, but is not limited to, dated documentation (electronic or hardcopy format) such as work management program records, work orders, and maintenance records that document the implementation of a CAP in accordance with Requirement R8.

Rationale for Requirement R9: The purpose of the RAS database is to comprise a comprehensive record of all RAS existing in a Reliability Coordinator's area, along with basic descriptive information about each RAS including its purpose, operating actions, and "who to" contact information if detailed information is needed. Other functional entities may have a reliability-based need to be aware of existing RAS, for example, to ensure coordination with other schemes; therefore, an accurate source of such information must be maintained. At a minimum, the information described in Attachment 2 facilitates this purpose. Continued maintenance of the RAS database is required to ensure accuracy. The RC will be receiving the information required for the database as each new or modified RAS is submitted for review, so it is logical that the RC be assigned this responsibility.

R9. Each Reliability Coordinator shall maintain a RAS database containing the information in Attachment 2. [*Violation Risk Factor:*] [*Time Horizon:*]

M9. Acceptable evidence may include, but is not limited to, date-stamped spreadsheets, database reports, or other documentation demonstrating a RAS database was maintained in accordance with Requirement R9.

Rationale for Requirement R10: The STD contends that other registered entities may have a reliability need for modeling RAS operations and will require additional information than what is listed in Attachment 2 in order to model RAS accurately. Requirement R1 mandates that the RAS-owner provide detailed information to the relevant functional entity to model RAS operation. Such information may be needed to address one or more of the following reliability needs:

- Perform periodic RAS evaluation
- Planning assessment studies
- Operations planning and/or real-time analyses
- BES event analyses
- Coordinating RAS actions between entities

R10. Each RAS-owner shall provide other registered entities with a reliability need, information to model RAS operation, within 30 calendar days of a written request. [*Violation Risk Factor:*] [*Time Horizon:*]

M10. Acceptable evidence may include, but is not limited to, date-stamped emails, letters, or other documentation demonstrating information to model RAS operation was provided in accordance with Requirement R10.

Standard Development Timeline

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Description of Current Draft

(DELETE GREEN TEXT PRIOR TO PUBLISHING) Describe the type of action associated with this posting, such as 30-day informal comment period, 45-day formal comment period with ballot, 45-day formal comment period with additional ballot, final ballot. Note that “Anticipated Actions” once finished should move up to “Completed Actions” section for each new draft.

Completed Actions	Date
Standards Committee approved Standard Authorization Request (SAR) for posting	
SAR posted for comment	

Anticipated Actions	Date
45-day formal comment period with ballot	
45-day formal comment period with additional ballot	
10-day final ballot	
NERC Board (Board) adoption	

New or Modified Term(s) Used in NERC Reliability Standards

This section includes all new or modified terms used in the proposed standard that will be included in the *Glossary of Terms Used in NERC Reliability Standards* upon applicable regulatory approval. Terms used in the proposed standard that are already defined and are not being modified can be found in the *Glossary of Terms Used in NERC Reliability Standards*. The new or revised terms listed below will be presented for approval with the proposed standard. Upon Board adoption, this section will be removed.

Term(s):

When this standard receives Board adoption, the rationale boxes will be moved to the Supplemental Material Section of the standard.

A. Introduction

1. **Title:** Remedial Action Schemes
2. **Number:** PRC-012-2
3. **Purpose:** To ensure that all Remedial Action Schemes (RAS) are properly designed, meet performance requirements, and are coordinated with other protection systems.
4. **Applicability:**
 - 4.1. **Functional Entities:**
 - 4.1.1. Reliability Coordinator
 - 4.1.2. Planning Coordinator
 - 4.1.3. Transmission Planner
 - 4.1.4. RAS-owner – Transmission Owner, Generator Owner, and Distribution Provider that owns a RAS
 - 4.2. **Facilities:**
 - 4.2.1. Remedial Action Schemes
 - 4.2.2. (Subset of Facilities)
 - 4.3. **Exemptions:**
 - 4.3.1. (Subset of Facilities) **(DELETE GREEN TEXT PRIOR TO PUBLISHING)**
Include this section only if there are certain facilities exempt from the standard.
5. **Effective Date:** See Implementation Plan
6. **Standard-Only Definition:** **(DELETE GREEN TEXT PRIOR TO PUBLISHING)** This section is to be used only for standards that currently have standard only definitions. Going forward a standard must provide a justification as to why the standard needs a standard-only definition and cannot be moved to the NERC Glossary of Terms.

B. Requirements and Measures

Rationale for Requirement R1: The SDT contends that a new RAS must be reviewed prior to putting it in service, independent of the RAS-owner review. This helps ensure that “a fresh set of eyes” will look over the design of the RAS and discover any oversight. This review is needed because RAS can have a significant impact to the BES. This is consistent with current industry practice. Also, a significantly modified RAS needs to be reviewed prior to placing it into service with modifications. The detailed data needed for a review is given in Attachment 1. The SDT believes that the Reliability Coordinator is the correct entity to perform this review. (TP may identify the need for a RAS during an annual TPL assessment or other studies and would present the proposal to the potential RAS-owner.)

(Amos)

- R1.** Prior to placing a new or functionally modified RAS in-service, each RAS-owner shall [AM1]submit the data and supporting documentation identified in Attachment 1 to its Reliability Coordinator, for review. [Violation Risk Factor:] [Time Horizon:][AM2:]
- M1.** Acceptable evidence for Requirement R1 is dated evidence that the RAS-owner provided the required data and supporting documentation in Attachment 1 to its Reliability Coordinator prior to placing the new or modified RAS in service.

Rationale for Requirement R2: Before being placed in service, a new or functionally modified RAS should be carefully evaluated to ensure it does not have unintended adverse consequences on reliability. This requirement provides that an entity other than the owner or operator of the RAS review the data and supporting documentation provided by the RAS-owner under Requirement R1. A checklist of considerations to be included in a RAS review is provided in Attachment 3. Attachment 3 is provided to identify key reliability risk factors to be considered, and to promote consistency in the way all RAS are reviewed. R1 requires the RAS-entity to respond to comments received from the Reliability Coordinator before placing the RAS in service, and must be assured of receiving such comments within a reasonable timeframe. Requirement R2 supports this need by requiring the Reliability Coordinator to provide a status within 120 days.

(Rob)

- R2.** For each RAS submitted pursuant to Requirement 1, the Reliability Coordinator shall, within 120 calendar days of receipt or on a mutually agreed upon schedule, perform a review of the RAS in accordance with Attachment 3 and provide feedback to the RAS-owner. [Violation Risk Factor:] [Time Horizon:]
- M2.** Acceptable evidence may include, but is not limited to, date-stamped reports, or other documentation detailing the RAS review, and date-stamped communications showing that results and comments from the review were provided to the RAS-owner within 120 calendar days of receipt or within the mutually agreed upon schedule.

Rationale for Requirement R3: The purpose of periodic RAS evaluation is to verify the continual effectiveness and/or coordination of the RAS, as well as its inadvertent operation performance, due to the changes in the system topology and/or the operating conditions that could have occurred/taken place since the previous (or initial) RAS evaluation was completed. Based on the periodicity time frames for similar requirements in the PRC-006-1 and PRC-010-1 Reliability Standards, it is determined that 60 calendar months between the RAS evaluations is both reasonable and adequate. RAS evaluation can be performed sooner than the maximum 60-calendar months period if the Transmission Planner and/or the RAS Owner determines that material changes have occurred (since the previous RAS evaluation) to system topology or generation dispatch or system operating conditions that can potentially impact the effectiveness and/or coordination of the RAS. The periodic RAS evaluation will typically lead to one of the following outcomes – reaffirm the existing RAS implementation is adequate, or identify changes needed to the existing RAS implementation, or provide justification for RAS retirement.

(Gene)

- R3.** Each RAS-owner, prior to placing a new or functionally modified RAS in-service, shall provide a written response to the Reliability Coordinator to address reliability-related issue(s) identified in the RAS review performed pursuant to Requirement R2. The response must contain: [Violation Risk Factor:] [Time Horizon:]
- Acceptance of the recommendation(s), or
 - Technical justification(s) for proposed alternative approach(es), or
 - Technical justification(s) for taking no action
- M3.** Acceptable evidence may include, but is not limited to, date-stamped communications to the Reliability Coordinator detailing how the reliability-related issues were addressed.

Rationale for Requirement ~~R3~~R4: The purpose of periodic RAS evaluation is to verify the continual effectiveness and/or coordination of the RAS, as well as its inadvertent operation performance, due to the changes in the system topology and/or the operating conditions that could have occurred/taken place since the previous (or initial) RAS evaluation was completed. Based on the periodicity time frames for similar requirements in the PRC-006-1 and PRC-010-1 Reliability Standards, it is determined that 60 calendar months between the RAS evaluations is both reasonable and adequate. RAS evaluation can be performed sooner than the maximum 60-calendar months period if the Transmission Planner and/or the RAS Owner determines that material changes have occurred (since the previous RAS evaluation) to system topology or generation dispatch or system operating conditions that can potentially impact the effectiveness and/or coordination of the RAS. The periodic RAS evaluation will typically lead to one of the

following outcomes – reaffirm the existing RAS implementation is adequate, or identify changes needed to the existing RAS implementation, or provide justification for RAS retirement. (subset of initial review) (Bobby)

R4. Each Transmission Planner shall perform an evaluation of each RAS in its planning area at least once every 60 calendar months and notify the RAS-owner and its Reliability Coordinator of the results. Each evaluation shall include, but is not limited to, analyses that evaluate whether: *[Violation Risk Factor:] [Time Horizon:]*

4.1 The RAS addresses the System condition(s) for which it was designed.

4.2 The RAS is coordinated with other RAS, protection and control systems.

4.3 The inadvertent operation of the RAS satisfies the same performance requirements as those for which it was designed.

M4. Acceptable evidence may include, but is not limited to, date-stamped reports or other documentation of the analyses comprising the evaluation of each RAS.

~~Communications to owner~~

~~M4.~~

Rationale for Requirement ~~R4~~R5: Deficiencies identified by the Transmission Planner or RAS-entity are likely to pose a reliability risk to the BES due to the expected impact of either RAS operation or misoperation, depending on the identified deficiencies. To avoid this reliability risk, a Corrective Action Plan sets forth the mitigation methods and timetable to address the deficiency. Submitting the Corrective Action Plan to the Reviewing Entity provides a second check of the mitigating actions, ensuring any deficiencies are adequately addressed in a timely manner. (Misoperation - explanation) (Hari)

R5. Each RAS-owner notified of a deficiency in its RAS, based on the evaluation performed pursuant to Requirement R4, shall develop a Corrective Action Plan to address the deficiency and subsequently provide its Reliability Coordinator the Corrective Action Plan (including updated data and supporting documentation pursuant to Requirement R1) ~~to its Reliability Coordinator.~~ ^[AM3] *[Violation Risk Factor:] [Time Horizon:]*

M5. Acceptable evidence ~~must may~~ include, but is not limited to, a date-stamped Corrective Action Plan, ~~that addresses identified deficiencies and may also include and~~ date-stamped reports or other documentation supporting the Corrective Action Plan.

Rationale for Requirement ~~R3~~R6: The purpose of periodic RAS evaluation is to verify the continual effectiveness and/or coordination of the RAS, as well as its inadvertent operation performance, due to the changes in the system topology and/or the operating conditions that could have occurred/taken place since the previous (or initial) RAS evaluation was completed. Based on the periodicity time frames for similar requirements in the PRC-006-1 and PRC-010-1 Reliability Standards, it is determined that 60 calendar months between the RAS evaluations is both reasonable and adequate. RAS evaluation

can be performed sooner than the maximum 60-calendar months period if the Transmission Planner and/or the RAS Owner determines that material changes have occurred (since the previous RAS evaluation) to system topology or generation dispatch or system operating conditions that can potentially impact the effectiveness and/or coordination of the RAS. The periodic RAS evaluation will typically lead to one of the following outcomes – reaffirm the existing RAS implementation is adequate, or identify changes needed to the existing RAS implementation, or provide justification for RAS retirement. (Jonathan)

R6. Each RAS-owner shall have a RAS functional testing program that, at a minimum includes: [Violation Risk Factor:] [Time Horizon:]

- Summary of testing procedure.
- Periodicity of testing.

M6. Acceptable evidence may include, but is not limited to, date-stamped documentation of the functional testing program detailing the evaluation of each RAS misoperation, any CAP developed, or corrective actions taken.

M6.

Rationale for Requirement R73: The purpose of periodic RAS evaluation is to verify the continual effectiveness and/or coordination of the RAS, as well as its inadvertent operation performance, due to the changes in the system topology and/or the operating conditions that could have occurred/taken place since the previous (or initial) RAS evaluation was completed. Based on the periodicity time frames for similar requirements in the PRC-006-1 and PRC-010-1 Reliability Standards, it is determined that 60 calendar months between the RAS evaluations is both reasonable and adequate. RAS evaluation can be performed sooner than the maximum 60-calendar months period if the Transmission Planner and/or the RAS Owner determines that material changes have occurred (since the previous RAS evaluation) to system topology or generation dispatch or system operating conditions that can potentially impact the effectiveness and/or coordination of the RAS. The periodic RAS evaluation will typically lead to one of the following outcomes – reaffirm the existing RAS implementation is adequate, or identify changes needed to the existing RAS implementation, or provide justification for RAS retirement. (Hari)

R7. Following an operation or functional testing of its RAS, each RAS-owner, shall: [Violation Risk Factor:] [Time Horizon:]

7.1 Analyze the operation to determine whether the RAS operated correctly or misoperated.

7.2 For any identified misoperation, take corrective actions to avoid future misoperations or develop a Corrective Action Plan.

-
- ~~For any identified misoperation, take corrective actions to avoid future misoperations or develop a Corrective Action Plan. [Violation Risk Factor:] [Time Horizon:]~~

M7. Acceptable evidence may include, but is not limited to, date-stamped documentation detailing the ~~functional test result evaluation of each RAS misoperation, any CAP developed, or corrective actions taken, misoperation analysis, corrective actions, and documentation of a CAP.:~~

Rationale for Requirement ~~R5~~R8: Having accurate and current data is required for the Planning Coordinator to update and share an up to date database according to R6 and R8. The SDT contents that the data information specified in Attachment 2 may not be sufficient for modeling (this is covered in R7). The goal of the database information required in R5 is for the PC to have the essential information required to understand the usage, impacts and interactions of RAS in its area without requiring systematically detailed information about the design. Requirement R5 supports this reliability need by requiring the RAS-entity to provide RAS data specified in Attachment 2 to its Planning Coordinator. Link to R6.

Rationale for Requirement R6: The purpose of the RAS database is to maintain information on existing RAS in the Planning Coordinator’s planning area which can be provided to the ERO and other entities with a reliability-based need for this data. Having accurate and up-to-date data in the RAS database is required so that entities using the data can be confident in its accuracy. Requirement R6 supports this need by requiring the Planning Coordinator to maintain a RAS database and to update it at least once each calendar year. The database should contain the information described in Attachment 2 for each RAS. (The Planning Coordinator shall record the date of the most recent revision as part of its “master” database. – Maybe put in G&TB.) link to R5 (AI)

R8. Each Reliability Coordinator shall maintain a RAS database containing the information in Attachment 2. [Violation Risk Factor:] [Time Horizon:]

- ~~Text, text, text~~

M8. Acceptable evidence may include, but is not limited to, date-stamped spreadsheets, database reports, or other documentation demonstrating a RAS database was ~~updated~~maintained.

~~M8. Acceptable evidence may include, but is not limited to, date-stamped emails, letters, or other documentation demonstrating data listed in Attachment 2 was provided to the Reliability Coordinator according to the specified schedule.~~

~~Acceptable evidence may include, but is not limited to, date-stamped spreadsheets, database reports, or other documentation demonstrating a RAS database was updated. The database shall contain the information described in Attachment 2 for each RAS. The Planning Coordinator shall record the date of the most recent revision as part of its “master” database.~~

Rationale for Requirement R7R9: The STD contents that entities with a reliability need related to RAS operation may require more information than what is listed in Attachment 2 and required in R5. In such a case, R7 ensures that the RAS-entity will provide sufficient information to the relevant functional entity to model RAS operation in studies or event analysis. The SDT is aware that the usage of specific and detailed RAS models is difficult and limited in the current industry practice. However, if a functional entity, based on the information provided per R5, determines the need to study RAS operation for a reliability purpose, R7 requires the RAS-entity to collaborate in providing sufficient information for that purpose (e.g. additional diagrams, detailed parameters and conditions). [\(Sharma\)](#)

R9. Each RAS-owner shall provide other registered entities with a reliability need, information to model RAS operation, within 30 calendar days of a written request. *[Violation Risk Factor:] [Time Horizon:]*^[AM4]

M9. Acceptable evidence may include, but is not limited to, date-stamped emails, letters, ~~or~~ or other documentation demonstrating ~~sufficient~~ information to model RAS operation was provided within 30 calendar days of receipt of a written request.

Rationale for Requirement R8: Requirement R5 is complementary to Requirements R6, R7 and R8. Together, the reliability objective of these four requirements is to ensure availability of accurate and up to date RAS data (per Attachment 2) to enable any functional entity with a reliability-related need to acquire sufficient information on the implementation and operational details of one or more RAS. Such information for accurately modeling and coordinating RAS actions would be required to perform one or more of the following reliability needs:

- (a) periodic RAS evaluation (by RAS Entity and Transmission Planner),
- (b) planning assessment studies (by planning entities like TP and PC),
- (c) operations planning and/or real-time analyses (by operations entities like TOP and RC),
- (d) BES event analyses (by variety of reliability entities).

It is noted that the RAS database (design objectives and operation) maintained by each Planning Coordinator, per Requirement R6, will be aggregated into an Interconnection-wide RAS database by the ERO or its designee, as per Requirement R8 (similar to the creation of Interconnection-wide cases in MOD-032-1). Starting from the Attachment 2 RAS data available in the RAS database enables an entity to acquire detailed RAS information as per Requirement 7. Therefore, Requirement R5 is the necessary first step to enable an entity to acquire summary RAS data per Attachment 2 and, if needed, additional detailed information pertaining to all the RAS that are relevant to its reliability-related needs.

OR

An interconnection-wide RAS database is necessary from the viewpoint of facilitating the review of RAS coordination. It is necessary to know what RAS are out there, where they are stationed, and something about the conditions and events they are intended to address, their objectives, and their operations in order to properly assess the possibility of miscoordination with other RAS during the RAS reviews.

C. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority:

As defined in the NERC Rules of Procedure, “Compliance Enforcement Authority” means NERC or the Regional Entity in their respective roles of monitoring and enforcing compliance with the NERC Reliability Standards.

1.2. Evidence Retention:

The following evidence retention period(s) identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full-time period since the last audit.

The applicable entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.

- The applicable entity shall keep data or evidence to show compliance with requirements **(DELETE GREEN TEXT PRIOR TO PUBLISHING) Add requirements as appropriate for this standard. This section is only for those requirements that do not have the default data retention.** since the last audit.

1.3. Compliance Monitoring and Enforcement Program

As defined in the NERC Rules of Procedure, “Compliance Monitoring and Enforcement Program” refers to the identification of the processes that will be used to evaluate data or information for the purpose of assessing performance or outcomes with the associated Reliability Standard.

Violation Severity Levels

R #	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1.				
R2.				
R3.				

D. Regional Variances

None.

E. Associated Documents

Link to the Implementation Plan and other important associated documents. **(DELETE GREEN TEXT PRIOR TO PUBLISHING) A link should be added to the implementation plan and other important documents associated with the standard once finalized.**

Version History (DELETE GREEN TEXT PRIOR TO PUBLISHING) Note: All version histories' content should be carried over to next generation.

Version	Date	Action	Change Tracking
		(DELETE GREEN TEXT PRIOR TO PUBLISHING) Project #: action completed	(DELETE GREEN TEXT PRIOR TO PUBLISHING) New, Errata, Revisions, Addition, Interpretation, etc.

Standard Attachments

(DELETE GREEN TEXT PRIOR TO PUBLISHING) NOTE: Use this section for attachments or other documents (Interpretations, etc.) that are referenced in the standard as part of the requirements. These should appear after the end of the standard template and before the Supplemental Material. If there are none, delete this section.

[Title of document]

(DELETE GREEN TEXT PRIOR TO PUBLISHING) Documents that should appear in this section are as follows: Application Guidelines, Guidelines and Technical Basis, Training Material, Reference Material and/or other Supplemental Material. The header should remain "Supplemental Material."

Rationale

During development of this standard, text boxes were embedded within the standard to explain the rationale for various parts of the standard. Upon BOT adoption, the text from the rationale text boxes was moved to this section.

Attachment 1
Supporting Documentation for RAS Review

The following checklist identifies important RAS information for each new or functionally modifiedⁱ RAS that the RAS-owner shall document and provide to the Reliability Coordinator for review pursuant to Requirement R1.

I. General

- ❑ Locational Data – Maps, one-lines, substation drawings, etc. as necessary to ensure that the RAS review team is able to understand the physical and electrical location of the RAS and related facilities.

II. Transmission Planning Evaluation (Assessment)

- ❑ Design Objectives – Contingencies and system conditions that the RAS is intended to remedy. [Reference NERC Reliability Standards PRC-012, R1.2 and PRC-013, R1.1]
- ❑ Operational Data – The actions to be taken by the RAS in response to disturbance conditions. [Reference NERC Reliability Standards PRC-012, R1.2 and PRC-013, R1.2]
- ❑ Functional Data – Information on detection logic, equipment or hardware, and settings/parameters that control the operation of the RAS. [Reference NERC Reliability Standards PRC-012, R1.2 and PRC-013, R1.3]
- ❑ Identification of the RAS-Owner’s classification of the RAS.
- ❑ Documentation of technical studies including study year(s), system conditions, and contingencies analyzed (N-1, N-1-1, N-2, and Extreme) on which the RAS design is based, when those technical studies were performed, and information regarding any future system plans that will impact the RAS. [Reference NERC Reliability Standard PRC-014, R3.2]
- ❑ Documentation that the proposed RAS actions satisfy System performance objectives for the scope of System events and conditions that the RAS is intended to remedy.
- ❑ If RAS modifications are proposed pursuant to a Corrective Action Plan (CAP), provide a copy of the CAP.
- ❑ Documentation that inadvertent operation of the RAS satisfies the same System performance requirements as those required of the contingency for which it was designed. For RAS that are installed for conditions or contingencies for which System performance requirements are not specified, demonstrate that the inadvertent operation satisfies the System performance requirements of Table 1, Category P7 of NERC Reliability Standard TPL-001-4 or its successor. [Reference NERC Reliability Standard PRC-012, R1.4]
- ❑ Documentation that the RAS coordinates with other RAS, and protection and control systems. [Reference NERC Reliability Standards PRC-012, R1.5 and PRC-014, R3.4]
- ❑ Documentation indicating whether or not the RAS could impact Bulk Electric System facilities located in another Reliability Coordinator area. [Reference NERC Reliability Standard PRC-014, R2]

Implementation Design

- ❑ Documentation describing the use of equipment for detection, telecommunications, transfer trip, logic processing, and monitoring, whichever are applicable.
- ❑ Documentation that any multifunction device used to perform RAS function(s), in addition to other functions such as protective relaying or SCADA, does not compromise the reliability of the RAS when the device is not in service or is being maintained.
- ❑ Documentation that a single component failure, when the [Planning Significant (PS) or Planning Limited (PL)] RAS was intended to operate, does not prevent the Bulk Electric System from meeting the performance requirements defined in NERC Reliability Standard TPL-001-4, or its successor. The documentation should describe or illustrate how the implementation design achieves this objective. [\[Reference NERC Reliability Standard PRC-012, R1.3\]](#)

Operational Data

- ❑ Documentation of all misoperations since the last review if applicable. The documentation shall include implementation status of any corrective actions and/or CAPs associated with misoperations. [\[Reference NERC Reliability Standard PRC-012, R1.7\]](#)

ⁱFunctionally Modified: Scheme modifications including changes to the hardware, transfer levels, or any change with possible impact to the overall functionality, timing, or redundancy level documented at the time of the original submission for review.

Attachment 2

Database Information

1. RAS name
2. RAS owner and contact information
3. Name and contact information for the individual with sufficient detail necessary to model the RAS
4. Expected in-service date; most recent review date; 5-year comprehensive evaluation date; and, to the extent applicable, date of retirement
5. RAS classification (as identified in Attachment 1)
6. Description of the contingencies or System conditions for which the RAS was designed
7. Information on parameters that control operation of the RAS
8. System performance issue necessitating the RAS (*e.g.*, thermal overload, angular instability, poor oscillation damping, voltage instability, under-/over-voltage, slow voltage recovery)
9. Corrective action taken by the RAS

Attachment 3

Reliability Coordinator RAS Review Checklist

Introduction

The following checklist identifies important design and implementation information that the Reliability Coordinator shall review for each new or functionally modifiedⁱ RAS.

DESIGN

- ❑ RAS actions satisfy System performance objectives for the scope of System events and conditions that the RAS is intended to remedy.
- ❑ Identify the classification of the RAS (PS, PL, ES, EL); for a scheme modification, does this classification change?
- ❑ RAS actions are permissible in accordance with NERC TPL standards, specifically limits on non-consequential load loss where applicable.
- ❑ RAS actions satisfy NERC TPL standard performance requirements associated with the contingency type the RAS is intended to remedy.
- ❑ The appropriateness of RAS arming conditions to the System performance objectives, if applicable.
- ❑ The possibility of miscoordination or adverse interaction with other RAS, protection systems, control schemes, and operating procedures.
- ❑ System configuration changes due to RAS operation to not adversely affect protection relay function, e.g. distance relays OC supervision, potential source switching, bF relay pickup.
- ❑ The effect of RAS misoperation, including inadvertent operation and failure to operate.
- ❑ Identify effect of future system plans on the design and operation of the RAS, when possible.

If the RC's RAS review concludes that the RAS is properly classified as either PL or EL (Planning or Extreme Limited), the RC may elect review of the Implementation Design is not required.

IMPLEMENTATION

- ❑ Implementation of RAS logic correlates desired actions (outputs) with system events and conditions (inputs); the timing of RAS actions is appropriate to achieve system performance objectives.
- ❑ The redundancy of RAS components is required if the RAS must to satisfy NERC TPL or other System performance standards. – also see classifications
- ❑ The implementation of redundancy, if required.

- ❑ Scheme testing procedure considerations

OPERATIONS

- ❑ RAS operating procedure documentation, if applicable.
- ❑ Whether the RAS is armed automatically or manually, if applicable.
- ❑ RAS arming procedures implemented in consideration of reducing the risk of unintended operation
- ❑ Monitor operational status and arming status of the RAS as required by PRC-001, R6 and TOP-003-2, R5. And suggested in the white paper – (at least what the TOP and RC requires)
- ❑ RAS component maintenance procedure considerations

'Functionally Modified: Scheme modifications including changes to the hardware, transfer levels, or any change with possible impact to the overall functionality, timing, or redundancy level documented at the time of the original submission for review.

Technical Justification for Attachment 1 Checklist Material - working materials

Working definition of significant and limited impacts

A significant impact on the BES is characterized by any of the following conditions:

- a. Cascading
- b. Loss of synchronism of generators that occurs at more than a single generating plant
- c. Power oscillations that do not exhibit acceptable damping as established by the Planning Coordinator and Transmission Planner.

If an impact is not “significant” from the above definition, then the impact is “limited.”

Working Definition of Significant	White Paper Definition of Significant
BES: any instability that results in Cascading	These criteria identify system performance indicative of the potential for instability, uncontrolled separation, or cascading outages
BES: any loss of synchronism of generators that extends to more than a single generating plant	Loss of synchronism between two or more portions of the system each including more than one generating plant
unacceptable BES dynamic response; oscillations not acceptably(?) damped within 30 seconds of the initiating event.	Negatively damped oscillations
BES voltage levels in violation of applicable emergency limits;	No direct voltage measures
(power flows) loadings on BES facilities in violation of applicable emergency limits.	No direct loading measures
No direct reference to “local” or “wide” areas.	Consider only the electrical scale of the event (no geographic or electrical difficulty with “wide” and “local” areas)
No direct load / generation loss measures	Non consequential 300 MW load loss / Largest resource in interconnection

Do the proposed voltage and loading measures perhaps substantially expand what would be considered to be a “significant” impact, compared to the load/generation options in the white paper?

Is the anti-Cascading proposal narrower than the white paper?

RAS are categorized into four distinct types.

The classification uses two words to describe the contingency and impact, e.g. Extreme and Significant

Extreme Limited (EL)	Extreme Significant (ES)	Planning Limited (PL)	Planning Significant (PS)
A scheme designed to limit the impact of two or more elements removed, an extreme event, or Cascading, where failure or inadvertent operation of the scheme can have only a limited impact on the BES.	A scheme designed to limit the impact of two or more elements removed, an extreme event, or Cascading, where failure or inadvertent operation of the scheme can have a significant impact on the BES.	A scheme designed to meet system performance requirements identified in the NERC Reliability Standards, where failure or inadvertent operation of the scheme can have only a limited impact on the BES.	A scheme designed to meet system performance requirements identified in the NERC Reliability Standards, where failure or inadvertent operation of the scheme can have a significant impact on the BES.
No redundancy required	No redundancy required	No redundancy required	Redundancy required
Review: confirm classification	Review: confirm classification, system performance (for misoperations), design implementation, operator visibility	Review: confirm classification	Review: confirm classification, system performance, design implementation, operator visibility
Is CIP applicability really needed?	CIP required	Is CIP applicability really needed?	CIP required
If any Regional classifications were used for existing RAS. The following corresponding classifications will be transferred until such time as that RAS undergoes a review under the (new) R2 [grandfather class]	NPCC: Type II WECC: Safety Net (SN)	NPCC: Type III ERCOT: Type 2 WECC: Local Area Protection Scheme (LAPS)	NPCC: Type I ERCOT: Type 1 WECC: Wide Area Protection Scheme (WAPS)

		<p>?? existing NPCC Type III's would not need redundancy upgrades to the NPCC standard (if in excess of new NERC) until such time as a new R2 review was performed for that RAS. [partially grandfather redundancy]</p>	

I still have some discomfort over the PL classification with “No redundancy required.” As we were developing the WECC criteria, we couldn’t get away from the existing PRC-012_R1.3 requirement that any scheme, big or little, intended to address TPL-001 – 003 (now TPL-001-4, P1-P7) had to meet the same performance standards. Only the extreme mitigation schemes (TPL-004, now “Extreme”) didn’t need redundancy because you aren’t required to do mitigation for extreme events. This approach is entirely consistent with the NERC white paper approach to this issue. If the motivation for installing the PL scheme is not standards compliance, then maybe redundancy shouldn’t be necessary, but otherwise, I think that not requiring redundancy could be easily interpreted as leaving a reliability hole in this proposal that would not have been in the existing PRC-012-0.

From the NERC white paper:

For example, if a scheme is installed to meet system performance requirements identified in the NERC Reliability Standards then it is an SPS regardless of its potential impact. A failure of the SPS would result in a violation of a NERC Reliability Standard. Thus, excluding a scheme with impact below a certain threshold would undermine the reliability objective of the standard requirement the scheme is installed to address.

Working definition of “significant” or “functional” modifications

RAS Significant (Functional?) Modification: Any modification to RAS hardware beyond the substitution of components that merely preserve the original functionality, any change in RAS logic, RAS relay settings, RAS control settings, or any other modification that affects overall RAS functionality, timing, or redundancy level as documented in the original submission for review, or RAS modifications identified by a Corrective Action Plan developed pursuant to R4.

(WECC) Possible added Requirement?: Owners will separately inform all their neighbors who may be affected by a scheme that the scheme is being significantly modified /removed. (probably already covered under PRC-001)

Functional modifications of RAS consist of any of the following:

- Changes to inputs, outputs, or internal scheme logic
- Major component changes

- Revision of the existing RAS architecture
- CAP modifications resulting from R3 evaluations

Working definition of “RAS Reporting Entity” (RAS-entity)

RAS Entity: Any NERC functional model entity responsible for the planning, ownership, installation, operation, or control of RAS equipment. Such entities may include one or more of the following:

Transmission Planners
Transmission Owners
Transmission Operators
Generator Owners
Generator Operators

The RAS Reporting Entity (RAS-entity) will be identified from among the following entities, where applicable for each specific RAS:

- Transmission Owner
- Generator Owner
- Distribution Provider

When all RAS Facilities and components have a single owner, the “RAS Reporting Entity” is that owner,

When the Facilities or components that make up a RAS have more than one owner, the multiple owners may designate a single entity as the “RAS Reporting Entity.” If the multiple owners do not designate a single owner, the “RAS Reporting Entity” is the entity that (alt 1) is responsible to implement the functional specifications of the RAS or (alt 2) is responsible for operation of the RAS controller. (alt 3) anything else? [Historically, as this function is used within WECC, the RAS Reporting Entity (i.e. Reporting Party) when there are multiple owners has usually been the owner of the RAS controller.]

Owners of Facilities or components of a RAS who are not the RAS Reporting Entity for that RAS have the responsibility to keep their RAS Reporting Entity informed of any functional modifications made to their individual Facilities or components. This is a form of coordination per PRC-001. Non-RAS Reporting Entity owners do not have any direct responsibilities under this standard, but still have all responsibilities assigned to them under all other NERC standards, such as coordination with other entities (PRC-001) and maintenance (PRC-005).

Working definition of “RAS Review Entity”

RAS are individually designed, unique control schemes that require a higher level of experience and expertise to evaluate, design, implement, test, operate, and maintain that more routine Element protection systems or small scale control systems such as those described in the exclusions in the RAS definition. Similarly, the skills required for review of RAS are multidisciplinary, virtually always including transmission planning, transmission operations, relaying systems, and often, depending on the specific RAS characteristics, also including generation operation, telecommunication, automation, control systems, information technology, and/or substation design. Specific RAS applications may also require additional skills. Equally important is the ability to integrate these skills into a comprehensive review process.

Because of their complexity and potentially large System impact, it does not promote reliability for the RAS Review Entity to have a close corporate relationship with the RAS Reporting Entity. For example, in certain areas of North America (e.g. WECC and probably FRCC), Planning Coordinators are often staffed by the same Transmission Planners and all are employed by the same Transmission Owner who is the RAS Reporting Entity. The PC/TP area of responsibility is substantially coincident with the Facilities owned by that Transmission Owner. This situation is a clear conflict of interest for the purpose of an independent review. This structure also results in a narrower view of the System than is appropriate for RAS reviews.

In order to avoid such conflicts of interest, the RAS Reporting Entity should be an independent, third party with the appropriate skills available to it. The existing NERC Functional Model does not appear to have any existing single or combination of entities that has the institutional structure to provide the necessary skill set for independent RAS reviews. The Reliability Assurer (RA) would seem to have possibilities, though no entities have registered as a RA (see below). The PC's structure and skill set focus on planning for System performance within its area of responsibility, but PCs don't have the appropriate physical design or transmission operations skills. The RC focuses on near-term transmission planning (starting with day ahead) and transmission operation within its area of responsibility, but similar to the PC, does not have the appropriate physical design skills. Neither the PC nor RC has any particular skills in testing and maintenance issues. Transmission Owners usually have the skill sets available to them that RAS review requires, but have an inherent conflict of interest for review of their own RAS.

How about using some combination of neighboring PCs, Owners, and RCs as the RAS Review Entity when the specific PC would have a conflict of interest? Such an approach could provide the individual skills from other PCs, Owners, and RCs which are appropriate for RAS review, but not available from PCs and RCs alone. The disadvantages include that each RAS review would need to be separately organized, perhaps with different membership, imposing a potentially significant administrative burden on the RAS Reporting Entity. There would also be minimum opportunity for continuity and consistency as a RAS Reporting Entity by the reviewers to develop the integrated system-wide view that is important to a RAS review.

Could an engineering contractor provide the necessary RAS reviews? Many Engineering firms have wide ranging skills available to them, perhaps including the listed skills. But they do expect and deserve to be paid for their services. The entity that has the money available to finance contractor services is the Owner. A contractor paid by the RAS Reporting Entity (owner) for review would be expected to keep the owner's interest clearly in mind, raising the same conflict of interest issue inherent to PC/TP/Owner review discussed above. In addition, contractors are not any kind of Entities in the NERC Functional Model, so cannot have responsibilities assigned to them through the standards.

Since the proposed PRC-012-1 standard does not require "approval" by the Reviewing Entity, but rather review and feedback between the RAS Reporting Entity and the RAS Review Entity, the existing Regions may be in a good position to provide the RAS Review service. All the Regions have access to the necessary skills through their organizations and/or their individual members and already have a Regional RAS or SPS review process in place. It is not possible to assign such responsibilities to the Regions directly through the Standards process for the similar reasons as a contractor cannot be assigned such responsibilities. If the Regions were to perform a review service it could not be directly as a result of

assignment in a standard. Such an arrangement, if possible, may require implementation through contractual or other appropriate means.

The RAS SDT considers that, at present, the Regions are best positioned historically, with appropriate skill sets, wide-area oversight, continuity (including minimal disruption to existing RRO review processes), and without conflicts of interest to perform RAS reviews. The SDT recognizes that continuing to use the Regions similar to historical practice, but outside direct assignment of responsibilities through the standards, will have potentially difficult business and perhaps regulatory issues associated.

If the Regions cannot perform RAS reviews, the Reliability Assurer definition and tasks seem an almost equally appropriate entity,

The functional entity that monitors and evaluates the activities related to planning and operations, and coordinates activities of functional entities to secure the reliability of the Bulk Electric System within a Reliability Assurer area and adjacent areas.

Relationships with Other Functional Entities

1. Coordinates reliability assurance activities of the functional entities within the Reliability Assurer area.
2. Coordinates reliability assurance activities with adjacent Reliability Assurers.
3. Coordinates critical infrastructure protection programs with functional entities.
4. Collects information from functional entities related to Reliability Assurance processes.

Reliability Assurance Tasks

1. Coordinate reliability assurance among adjacent Reliability Assurers through the development of necessary protocols and processes.
2. Coordinate the activities related to maintaining critical infrastructure protection.
3. Establish reliability assurance processes and documentation related to planning and operations within the Reliability Assurer's area including such things as a regional reliability plan or a Reliability Coordinator plan.
4. Identify and address gaps in reliability processes and responsibilities.

The NERC white paper also suggests the RA as a reasonable entity to provide RAS reviews. However, since no entity appears to have ever filed to become a Reliability Assurer, it raises questions about the necessity of the function and its place in the Function Model. If it hasn't been needed so far to assure reliability of the BES, is it actually needed? Is anyone else doing these functions now? If not, why not? Does that leave serious holes in System reliability? Is it needed?

Description of the meaning of redundancy of RAS

The fundamental concept of RAS Redundancy: No single component failure shall prevent the RAS from operating as intended or designed to achieve the system performance the RAS was intended to accomplish.

(WECC) Redundancy should extend to the following RAS components:

- a) Detection
- b) Power supplies, batteries and chargers
- c) Telecommunications (not including M/W towers)
- d) Logic controllers (if applicable)
- e) RAS trip circuits

(NPCC) Areas of common exposure should be kept to a minimum to reduce the possibility of all groups being disabled by a single event such as fire, evacuation, water leakage, and other such incidents. There shall be two sources of station service ac supply, each capable of carrying at least all the battery chargers associated with the **RAS**. The equipment for each group shall be separated physically on non-adjacent panels and designed to minimize the risk of more than one **protection group** being disabled simultaneously by a single event or condition. Where **RAS** redundancy is achieved by the use of independent **protection groups** tripping the same circuit breakers without overarming, which is defined as providing for more corrective action than would be necessary if no failures are considered, each circuit breaker shall be equipped with two independent trip coils. (This dual trip coil criterion does not apply to Type II **RAS**.) Where the design of an **RAS** is composed of multiple **protection groups** for redundancy and each group requires a communication channel: The communication medium outside the substation/plant physical perimeter for each **protection group** shall be designed to minimize the risk of both **protection groups** being disabled simultaneously by a single event or condition. In addition, physical separation of the communication media outside the substation fence shall be a minimum of three feet. In cases where constraints do not allow three feet separation, this distance may be reduced if a proposed alternative design can achieve comparable physical protection of the communication medium. If an alternative design cannot be met, then an alternative communication path or protection scheme should be proposed. Except as identified otherwise in these criteria, the two **teleprotection** groups shall not share the same component. The use of a single communication tower for radio communication systems used by the two **protection groups** of an **RAS** is permitted as long as diversity of the communication signals is achieved. Where telecommunication route diversity cannot be achieved, overarming of the appropriate **RAS** trip outputs is an acceptable mitigation. If an **RAS** is designed to have multiple **protection groups** at a single location for redundancy, each individual **protection group** and **teleprotection** of the **RAS** shall be on non-adjacent vertical mounting assemblies or enclosures. If an **RAS** is designed to have multiple **protection groups** at a single location for redundancy, wiring for each individual **protection group** and **teleprotection** of the **RAS** shall not be in the same cable.

(White Paper) Redundancy should extend to the following RAS components:

- Any single ac current source and/or related input to the RAS. Separate secondary windings of a free-standing current transformer (CT) or multiple CTs on a common bushing should be considered an acceptable level of redundancy.

- Any single ac voltage source and/or related input to the RAS. Separate secondary windings of a common capacitance coupled voltage transformer (CCVT), voltage transformer (VT), or similar device should be considered an acceptable level of redundancy.
- Any single device used to measure electrical quantities used by the RAS. [other than CTs and PTs?]
- Any single communication channel and/or any single piece of related communication equipment used by the RAS.
- Any single computer or programmable logic device used to analyze information and provide RAS operational output.
- Any single element of the dc control circuitry that is used for the RAS, including breaker closing circuits.
- Any single auxiliary relay or auxiliary device used by the RAS.
- Any single breaker trip coil for any breaker operated by the RAS.
- Any single station battery or single charger, or other single dc source, where central monitoring is not provided for both low voltage and battery open conditions.

Some RAS utilize an Energy Management System (EMS) for transmitting signals or calculating information necessary for RAS operation such as the amount of load or generation to trip. Loss of the EMS system must be considered when assessing the impact of a single component failure. For example, when the EMS is used to transmit a signal, a separate communication path must be available. When a non-redundant EMS provides a calculated value to two otherwise independent systems, a backup calculation or default value must be provided to the RAS in the event of an EMS failure.

Also see "Redundancy Considerations for Protective Relaying Systems," IEEE PSRC I-19, 2009
 "Redundancy of Protection System Elements", NERC SPCS, Jan 2009

FAQ (a start)

Why the Reliability Coordinator chosen to perform the review.

1. FAQ document [Consider timing of when to release this; after 1st posting/comment]
 - a. Address and explain areas where differ from recommendations of white paper
 - i. Scheme classifications changes (significant)
 - ii. Redundancy for PL classification
 - iii. Who is the RAS Review Entity
 - iv. Annual and “comprehensive” assessments (evaluations) and who does them
 - v. More??
 - b. Why the regions were not included as part of the review process
 - i. Regions (and contractors) are not Planning, Operating or Owning Entities in the NERC Functional Model, so cannot have responsibilities assigned to them by the standards.
 - c. Why do schemes need to be reviewed?

RAS are unique and customized conglomerations of various protection and control components that do not follow any standardized or otherwise typical or customary utility practices. As such, they have a potential to introduce serious reliability risks if not carefully planned, designed, and installed. While a RAS may be installed to address a reliability issue, or achieve an economic or operational advantage, it might also introduce other reliability risks that may not be apparent to a RAS entity focused on the issue or advantage at hand. Any such unforeseen risks need to be identified, and a review by a multi-disciplinary panel of SMEs is the best means to identify such RAS introduced risks and recommend RAS modifications where necessary.
 - d. Why approval not required
 - i. focus of the RAS review really needs to be on System reliability impacts associated with the RAS. An independent Reviewer has the best opportunity to do that. The proposed feedback between RAS Entity and Review Entity is part of the record for each RAS. The RAS Entity (owner) still has responsibility to comply with all applicable standards and will have a strong incentive that the record of the review does not indicate that the Reviewer had unresolved concerns with the reliability of their RAS, which may be easily interpreted as a violation, even without a system disturbance involving the RAS.
 - e. Reason for not prescribing continent-wide review body

Reviews for specific areas (PC? RC? Region? are difficult enough to identify an appropriate reviewing body. No appropriately skilled continent-wide body presently exists. Some familiarity by the reviewers with the area electric system pertinent to each RAS is very useful to promote an efficient RAS review process, which would be much more difficult for a single continent-wide reviewing body.
 - f. Description of redundancy (minimum requirement for redundancy; see NPCC document)
 - g. Why is redundancy required for PS classified schemes?

If a RAS is deemed necessary to satisfy the performance requirements of a NERC reliability standard such as, and in particular, TPL-001, it is necessary that its operation under the conditions and events for which it is designed to operate be assured in the operational realm as well as in the planning realm. Full redundancy of the RAS components achieves

this goal. Full redundancy is also consistent with the performance requirements of TPL-001, Table 1, Category P5 where a component (relay) failure of a protection system is combined with a normal planning contingency. The companion consideration associated with the PS redundancy requirement is the assurance of avoiding significant adverse system impacts.

From: [William Edwards](#)
To: [Henneberg, Gene](#); [Al McMeekin](#)
Subject: Feedback
Date: Tuesday, February 17, 2015 12:51:01 PM
Attachments: [Working_doc_02-16-15_whe.docx](#)

Gene and Al - some feedback on the standard after doing a run through. Wanted to pitch a different approach to R4-R7 to you all as it may be more administrable and help keep the standard a little tighter and not introduce a Transmission Planner. My concern there is that we have this RC to RAS-owner loop going and then introduce the TP on a 60-month cycle. If the RC and the TP have different opinions on the technical issues, this could put the owner in a tough spot on who to address if there is a difference of opinion.

Can we set up 30 minutes? Wanted to go through you all as a filter and if anything is something you want to adopt, you have the ability to present it to the team so I don't throw the progress into the gutter....

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