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

Draft 1 of PRC-012-2 corrects the applicability of the fill-in-the-blank standards (PRC-012-1, PRC-013-1, PRC-014-1) by assigning the requirement responsibilities to the specific users, owners, and operators of the Bulk-Power System, and incorporates the reliability objectives of all the RAS/SPS-related standards. This draft of PRC-012-2 contains eleven (11) requirements and measures, and the associated rationale boxes and corresponding technical guidelines. There are also three (3) attachments within the draft standard incorporated via references in the requirements. This draft of PRC-012-2 does not contain "Compliance" elements such as VRFs, VSLs; they cannot be determined until requirement development is completed. PRC-012-2 is posted for a 21-day informal comment period to gather stakeholder input for use in the standards development process.

Completed Actions	Date
Standards Committee approved Standard Authorization Request (SAR) for posting	February 12, 2014
SAR posted for comment	February 18, 2014
Standards Committee approved the SAR	June 10, 2014

Anticipated Actions	Date
Draft 1 of PRC-012-2 posted for informal comment	April 30 – May 20, 2015
45-day formal comment period with ballot	July 2015
10-day final ballot	October 2015
NERC Board (Board) adoption	November 2015

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 Remedial Action Schemes (RAS) do not introduce unintentional or unacceptable reliability risks to the Bulk Electric System (BES).
4. **Applicability:**
   - **4.1. Functional Entities:**
     - **4.1.1.** Reliability Coordinator
     - **4.1.2.** Transmission Planner
     - **4.1.3.** RAS-owner – the Transmission Owner, Generator Owner, or Distribution Provider that owns all or part of a RAS
     - **4.1.4.** RAS-entity – the Transmission Owner, Generator Owner, or Distribution Provider designated to represent all owners of the RAS
   - **4.2. Facilities:**
     - **4.2.1.** Remedial Action Schemes (RAS)
5. **Effective Date:** See Implementation Plan for Project 2010-05.3 PRC-012-2

B. Requirements and Measures

Rationale for Requirement R1: 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); therefore, a review of a proposed new RAS or an existing RAS proposed for functional modification or retirement (removal from service) must be completed prior to implementation. A functional modification is any modification to a RAS beyond the replacement of components that preserves the original functionality.To facilitate a review that promotes reliability, the RAS-entity 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-entity provide them to the reviewing Reliability Coordinator (RC). The RC responsible for the review will be the RC that coordinates the area where the RAS is located. In cases where a RAS crosses multiple RC Area boundaries, each affected RC would be responsible for conducting either individual reviews or a coordinated review.

R1. Prior to placing a new or functionally modified RAS in-service or retiring an existing RAS, each RAS-entity shall submit the information identified in Attachment 1 to the reviewing Reliability Coordinator(s). *[Violation Risk Factor:] [Time Horizon:]*

M1. Acceptable evidence is a copy of the Attachment 1 documentation and the dated communications with the reviewing Reliability Coordinator(s) in accordance with Requirement R1.

Rationale for Requirement R2: Requirement R2 mandates that the Reliability Coordinator (RC) perform a review of a proposed new RAS or an existing RAS proposed for functional modification or retirement (removal from service) in its RC area.

The RC is the functional entity best-suited to perform the RAS reviews because it has a wide-area perspective of reliability that includes awareness of reliability issues in its neighboring RC Areas. This wide-area purview provides continuity in the review process and better facilitates the coordination of interactions among separate RAS as well as the coordination of interactions among RAS and other protection and control systems. The selection of the RC also minimizes the possibility of a “conflict of interest” that could exist because of business relationships among the RAS-Entity, Planning Coordinator (PC), Transmission Planner (TP), or other entity that could be involved in the planning or implementation of a RAS. The RC may designate a third party to conduct the RAS reviews; however, the RC will retain the responsibility of compliance with this requirement.

Attachment 2 of this standard is a checklist provided to the RC to assist in identifying important design and implementation aspects of RAS, and in facilitating consistent reviews for each RAS submitted. The time frame of four 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.

Note: An RC may need to include this task in its reliability plan(s) for the Region(s) in which it is located.

R2. For each RAS submitted pursuant to Requirement R1, each reviewing Reliability Coordinator shall, within four full calendar months of receipt of Attachment 1 materials, or on a mutually agreed upon schedule, perform a review of the RAS in accordance with Attachment 2, and provide written feedback to the RAS-entity. *[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 the dated communications with the RAS-entity in accordance with Requirement R2.

Rationale for Requirement R3: Requirement R3 mandates the RAS-entity address all reliability-related issues identified by the Reliability Coordinator (RC) during the RAS review, and obtain approval from the RC that the RAS implementation can proceed. This interaction promotes reliability by minimizing the introduction of inadvertent actions (risks) to the BES. A specific time period for the RAS-entity to respond to the RC's review is not necessary because an expeditious response is in the self-interest of the RAS-owner(s) to effect a timely implementation. The review by the RC is intended to identify reliability issues that must be resolved before the RAS can be put in service. The reliability issues could involve dependability, security, or both. A more detailed explanation of dependability and security is included in the Supplemental Materials section of the standard.

R3. Following the review performed pursuant to Requirement R2, the RAS-entity shall address each identified reliability-related issue and obtain approval from each reviewing Reliability Coordinator, prior to placing a new or functionally modified RAS in-service or retiring an existing RAS. *[Violation Risk Factor:] [Time Horizon:]*

M3. Acceptable evidence may include, but is not limited to, date-stamped documentation and date-stamped communications with the reviewing Reliability Coordinator in accordance with Requirement R3.

Rationale for Requirement R4: Requirement R4 mandates that a technical evaluation of each RAS be performed at least once every 60 full calendar months. The purpose of periodic RAS evaluation is to verify the continued effectiveness and coordination of the RAS, as well as BES performance following an inadvertent RAS operation. 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. Sixty (60) full calendar months was selected as the maximum time frame for the evaluation based on the time frames for similar requirements in Reliability Standards PRC-006-1, PRC-010-1, and PRC-014-1. 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 or will occur before the next scheduled evaluation. The periodic RAS evaluation will typically lead to one of the following outcomes: 1) affirmation that the existing RAS is adequate; 2) identification of changes needed to the existing RAS; or, 3) justification for RAS retirement.

The items required to be addressed in the evaluations (Parts 4.1, 4.2, 4.3) are planning analyses which involve modeling of the interconnected transmission system; consequently, the Transmission Planner (TP) is the functional entity best qualified to perform the analyses. To promote reliability, the TP is required to provide the RAS-owner(s) and the Reliability Coordinator(s) with the results of each evaluation.

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: *[Violation Risk Factor:] [Time Horizon:]*

4.1. The RAS mitigates the System condition(s) or contingency(ies) for which it was designed.

4.2. The RAS avoids adverse interactions with other RAS, and protection and control systems.

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

M4. Acceptable evidence may include, but is not limited to, date-stamped reports or other documentation of the analyses comprising the evaluation(s) of each RAS and date-stamped communications with the RAS-owner(s) and the Reliability Coordinator(s) in accordance with Requirement R4.

Rationale for Requirement R5: Deficiencies identified in 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 incorrect operation. To avoid this reliability risk, Requirement R5 mandates that the RAS-owner(s) submit a Corrective Action Plan that establishes the mitigation methods and timetable to address the deficiency. Submitting the Corrective Action Plan to the Reliability Coordinator (RC) within six full calendar months of receipt ensures any deficiencies are adequately addressed in a timely manner. If the Corrective Action Plan requires that a functional change be made to a RAS, the RAS-owner(s) will need to submit information identified in

Attachment 1 to the RC(s) for review prior to placing RAS modifications in service per Requirement 1.

R5. Within six full calendar months of being notified of a deficiency in its RAS based on the evaluation performed pursuant to Requirement R4, each RAS-owner shall submit a Corrective Action Plan to its reviewing Reliability Coordinator(s). *[Violation Risk Factor:] [Time Horizon:]*

M5. Acceptable evidence is a date-stamped Corrective Action Plan and date-stamped communications with each reviewing Reliability Coordinator in accordance with Requirement R5.

Rationale for Requirement R6: The correct operation of a RAS is important to maintaining the reliability and integrity of the Bulk Electric System (BES). Any incorrect operation of a RAS indicates the RAS effectiveness and/or coordination has been compromised. Therefore, all operations of a RAS and failures of a RAS to operate when expected should be analyzed. The 120 calendar day time frame aligns with the time frame established in Requirement R1 from PRC-004-4 regarding the investigation of a Protection System Misoperation.

R6. Within 120-calendar days of each RAS operation or each failure of a RAS to operate, each RAS-owner(s) shall analyze the RAS for performance deficiencies. The analysis shall determine whether the: *[Violation Risk Factor:] [Time Horizon:]*

6.1. Power System conditions appropriately triggered the RAS.

6.2. RAS responded as designed.

6.3. RAS was effective in mitigating power System issues it was designed to address.

6.4. RAS operation resulted in any unintended or adverse power System response.

M6. Acceptable evidence may include, but is not limited to, date-stamped documentation detailing the RAS operational analysis in accordance with Requirement R6.

Rationale for Requirement R7: Performance deficiencies identified in the analysis conducted by the RAS-owner(s), pursuant to Requirement R6, are likely to pose a reliability risk to the BES. To avoid this reliability risk, Requirement R7 mandates that the RAS-owner(s) submit a Corrective Action Plan that establishes the mitigation methods and timetable to address the deficiency. Submitting the Corrective Action Plan to the Reliability Coordinator (RC) within six full calendar months of receipt ensures any deficiencies are adequately addressed in a timely manner. If the Corrective Action Plan requires that a functional change be made to a RAS, the RAS-owner(s) will need to submit information identified in Attachment 1 to the RC(s) for review prior to placing RAS modifications in service per Requirement 1.

R7. Within six full calendar months of identifying a performance deficiency in its RAS based on the analysis performed pursuant to Requirement R6, each RAS-owner shall submit a Corrective Action Plan to its reviewing Reliability Coordinator(s). *[Violation Risk Factor:] [Time Horizon:]*

M7. Acceptable evidence is a date-stamped Corrective Action Plan and date-stamped communications with the reviewing Reliability Coordinator(s) in accordance with Requirement R7.

Rationale for Requirement R8: Requirement R8 mandates the RAS-owner(s) implement a Corrective Action Plan submitted to address any identified deficiency(ies) found in conjunction with the periodic evaluation pursuant to Requirement R4, and any identified incorrect operation found by the analysis of an actual RAS operation pursuant to Requirement R6. Implementing the Corrective Action Plan (CAP) submitted pursuant to either Requirement R5 or Requirement R7 ensures that any identified deficiency(ies) or incorrect operation(s) are addressed in a timely manner. The CAP identifies the work (corrective actions) as well as the work schedule (the time frame within which the corrective actions are to be taken).

R8. For each CAP submitted pursuant to Requirement R5 and Requirement 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: Due to the wide variety of RAS designs and implementations, and the potential for impacing BES reliability, it is important that periodic functional testing of RAS is performed. A functional test provides an overall confirmation of the RAS's ability to operate as designed and verifies the proper operation of the non-Protection System (control) components of a RAS that are not addressed in PRC-005. Protection System components that are part of a RAS are maintained in accordance with PRC-005. The six calendar year interval was chosen to coincide with the maintenance intervals of various Protection System and Automatic Reclosing components established in PRC-005-3. The RAS-owner is in the best position to determine the testing procedure and schedule due to its overall knowledge of the RAS design, installation, and expected operation. Periodic functional testing promotes the identification of changes in System infrastructure that could have introduced latent failures into the RAS. Functional testing is not synonymous with end-to-end testing. Each segment of a RAS should be tested but the segments can be tested individually negating the need for complex maintenance schedules.

R9. At least once every six calendar years, each RAS-owner shall perform a functional test of each RAS to verify the overall RAS performance and the proper operation of non-Protection System components. *[Violation Risk Factor:] [Time Horizon:]*

M9. Acceptable evidence may include, but is not limited to, date-stamped documentation of the functional testing.

Rationale for Requirement R10: The RAS database is a comprehensive record of all RAS existing in a Reliability Coordinator's area. The database enables the RC to provide other entities with a reliability need the ability to attain high level information on existing RAS that potentially impact the entities' operational and/or planning activities. Attachment 3 lists the minimum information required for the RAS database. This information allows an entity to evaluate the need for requesting more detailed information (e.g., modeling information - Requirement R11) from the RAS-entity. The Reliability Coordinator (RC) is the appropriate entity to maintain the database because the RC receives the required database information when a new or modified RAS is submitted for review.

R10. Each Reliability Coordinator shall maintain a RAS database containing the information in Attachment 3. *[Violation Risk Factor:] [Time Horizon:]*

M10. 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 R10.

Rationale for Requirement R11: Other registered entities may have a reliability-related need for modeling RAS operations and will require additional information beyond what is listed in Attachment 3. Such information may be needed to address one or more of the following reliability-related needs:

- Periodic RAS evaluations
- Planning assessment studies
- Operations planning and/or real-time analyses
- BES event analyses
- Coordination of RAS among entities

Requirement R11 mandates that each RAS-entity provide the requester with either the detailed information required to model a RAS, or a written response specifying the basis for denying the request. Thirty (30) calendar days is a reasonable amount of time for each RAS-entity to respond to a request.

R11. Within 30 calendar days of receiving a written request from a registered entity with a reliability-related need to model RAS operation, each RAS-entity shall provide the requesting entity with either the requested information or a written response specifying the basis for denying the request. *[Violation Risk Factor:] [Time Horizon:]*

M11. Acceptable evidence may include, but is not limited to, date-stamped communications e.g. emails, letters, or other documentation demonstrating that the RAS-entity either provided the information to model RAS operation or provided a written response specifying the basis for denying the request in accordance with Requirement R11.

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.**

Attachment 1
Supporting Documentation for RAS Review

The following checklist identifies important RAS information for each new or functionally modified[1] RAS that the RAS-entity shall document and provide to the Reliability Coordinator for review pursuant to Requirement R1. When a RAS has been previously reviewed, only the proposed modifications to that RAS require review; however, it will be helpful to the reviewers if the RAS entity provides a summary of the previously approved functionality.

I. General

- ❑ Information such as maps, one-line drawings, substation and schematic drawings that identify the physical and electrical location of the RAS and related facilities.
- ❑ Functionality of new RAS or proposed functional modifications to existing RAS and documentation of the pre- and post-modified functionality of the RAS.
- ❑ The Corrective Action Plan (CAP) if RAS modifications are proposed in a CAP.
  [Reference NERC Reliability Standard PRC-012, Requirements R5 and R7]

II. Functional Description and Transmission Planning Information

- ❑ Contingencies and system conditions that the RAS is intended to remedy.
  [Reference NERC Reliability Standards PRC-012, R1.2 and PRC-013, R1.1]
- ❑ 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]
- ❑ A summary of technical studies, if applicable, demonstrating that the proposed RAS actions satisfy System performance objectives for the scope of System events and conditions that the RAS is intended to remedy. The technical studies should include information such as the study year(s), system conditions, and contingencies analyzed on which the RAS design is based, and when those technical studies were performed.
  [Reference NERC Reliability Standard PRC-014, R3.2]
- ❑ Information regarding any future system plans that will impact the RAS.
  [Reference NERC Reliability Standard PRC-014, R3.2]
- ❑ Documentation showing that inadvertent operation of the RAS satisfies the same performance requirements as those required for the contingency for which it was designed. For RAS that are installed for conditions or contingencies for which there are no applicable System performance requirements, 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]

[1]Functionally Modified:
Any modification to a RAS beyond the replacement of components that preserve the original functionality is a functional modification.

- An evaluation indicating that the RAS avoids adverse interactions with other RAS, and protection and control systems.
  [Reference NERC Reliability Standards PRC-012, R1.5 and PRC-014, R3.4]

- Identification of other affected RCs.

III. Implementation

- Documentation describing the equipment used for detection, telecommunications, transfer trip, logic processing, and monitoring, whichever are applicable.

- Information on detection logic and settings/parameters that control the operation of the RAS. [Reference NERC Reliability Standards PRC-012, R1.2 and PRC-013, R1.3]

- Documentation showing 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 showing that an appropriate level of redundancy is provided such that a single RAS component failure, when the RAS is intended to operate, does not prevent the interconnected transmission system from meeting the same performance requirements (defined in Reliability Standard TPL-001-4 or its successor) as those required for the System events and conditions for which the RAS was designed. The documentation should describe or illustrate how the implementation design achieves this objective.
  [Reference NERC Reliability Standard PRC-012, R1.3]

- Documentation describing the functional testing process.

RAS Retirement

The following checklist identifies important RAS information for each existing RAS to be retired that the RAS-entity shall document and provide to the Reliability Coordinator for review pursuant to Requirement R1.

- Information necessary to ensure that the Reliability Coordinator is able to understand the physical and electrical location of the RAS and related facilities.

- A summary of technical studies, if applicable, upon which the decision to retire the RAS is based.

- Anticipated date of RAS retirement.

Attachment 2
Reliability Coordinator RAS Review Checklist

The following checklist identifies important reliability related considerations for the Reliability Coordinator to review and verify for each new or functionally modified[2] RAS. The RC review is not limited to the checklist items and the RC may request additional information on any reliability issue related to the RAS.

Determination of Review Level

RAS can have varying impacts on the power System. RAS with more significant impact require a higher level of review than those having a lesser impact. The level of review by the RC may be limited if the System response for a failure of the RAS to operate or inadvertent operation of the RAS could not result in any of the following conditions:

- frequency-related instability
- unplanned tripping of load or generation
- uncontrolled separation or cascading outages

If any of the conditions above may be produced, the entire review checklist below should be followed.

RAS retirement reviews may use an abbreviated format that concentrates on the Planning justifications describing why the RAS is no longer needed. Implementation issues will seldom require removal review.

DESIGN

- ❑ The RAS actions satisfy System performance objectives for the scope of System events and conditions that the RAS is intended to mitigate.
- ❑ The RAS arming conditions, if applicable, are appropriate to its System performance objectives.
- ❑ The RAS avoids adverse interactions with other RAS, protection systems, control systems, and operating procedures.
- ❑ The effects of RAS incorrect operation, including inadvertent operation and failure to operate (if non-operation for RAS single component failure is acceptable), have been identified.
- ❑ The inadvertent operation of the RAS satisfies the same performance requirements as those required for the contingency for which it was designed. For RAS that are installed for conditions or contingencies for which there are no applicable System performance requirements, the inadvertent operation satisfies the System performance requirements of Table 1, Category P7 of NERC Reliability Standard TPL-001-4 or its successor.

[2] Functionally Modified:
Any modification to a RAS beyond the replacement of components that preserve the original functionality is a functional modification.

- The effects of future System plans on the design and operation of the RAS, where applicable, have been identified.

IMPLEMENTATION

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

Attachment 3
Database Information

1. RAS name
2. RAS-entity and contact information
3. Expected or actual in-service date; most recent (Requirement R2) review date; 5-year (Requirement R4) evaluation date; and, date of retirement, if applicable
4. 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)
5. Description of the contingencies or System conditions for which the RAS was designed (initiating conditions)
6. Corrective action taken by the RAS
7. Any additional explanation relevant to high level understanding of the RAS

Requirement R1:

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); therefore, a review of a proposed new RAS or an existing RAS proposed for functional modification or retirement (removal from service) must be completed prior to implementation. A functional modification is any modification to a RAS beyond the replacement of components that preserves the original functionality.To facilitate a review that promotes reliability, the RAS-entity 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-entity provide them to the reviewing Reliability Coordinator (RC). The RC responsible for the review will be the RC that coordinates the area where the RAS is located. In cases where a RAS crosses multiple RC Area boundaries, each affected RC would be responsible for conducting either individual reviews or a coordinated review.

Requirement R2:

Requirement R2 mandates that the Reliability Coordinator (RC) perform a review of a proposed new RAS or an existing RAS proposed for functional modification or retirement (removal from service) in its RC area.

The RC is the functional entity best-suited to perform the RAS reviews because it has a wide-area perspective of reliability that includes awareness of reliability issues in its neighboring RC Areas. This wide-area purview provides continuity in the review process and better facilitates the coordination of interactions among separate RAS as well as the coordination of interactions among RAS and other protection and control systems. The selection of the RC also minimizes the possibility of a “conflict of interest” that could exist because of business relationships among the RAS-Entity, Planning Coordinator (PC), Transmission Planner (TP), or other entity that could be involved in the planning or implementation of a RAS. The RC may designate a third party to conduct the RAS reviews; however, the RC will retain the responsibility of compliance with this requirement.

Attachment 2 of this standard is a checklist provided to the RC to assist in identifying important design and implementation aspects of RAS, and in facilitating consistent reviews for each RAS submitted. The time frame of four 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.

Note: An RC may need to include this task in its reliability plan(s) for the Region(s) in which it is located

Requirement R3:

Requirement R3 mandates the RAS-entity address all reliability-related issues identified by the Reliability Coordinator (RC) during the RAS review, and obtain approval from the RC that the RAS implementation can proceed. This interaction promotes reliability by minimizing the introduction of inadvertent actions (risks) to the BES. A specific time period for the RAS-entity to respond to the RC’s review is not necessary because an expeditious response is in the self-

interest of the RAS-owner(s) to effect a timely implementation. The review by the RC is intended to identify reliability issues that must be resolved before the RAS can be put in service. The reliability issues could involve dependability, security, or both.

Dependability is a component of reliability and is the measure of a device's certainty to operate when required. Since RAS are usually installed to meet performance requirements of NERC standards, a failure of the RAS to operate when intended would put the System at risk of violating NERC performance standards if the critical contingency(ies) or System conditions occur. This risk is usually mitigated by installing an appropriate level of redundancy as part of the RAS so that it will still accomplish its intended purpose even while experiencing a single component failure.

Security is a component of reliability and is the measure of a device's certainty not to operate falsely. False, or inadvertent operation of a RAS results in taking some programmed action that the RAS would take for a correct operation, but without either the appropriate arming conditions or occurrence of the critical contingency(ies) or System conditions expected to trigger the RAS action. Typically these actions include shedding load or generation or re-configuring the System. This inadvertent action is undesirable in the absence of the critical System conditions and may, on its own, put the System in a less secure state. The standard allows an impact up to the level that would occur for a correct operation. If this risk needs to be further mitigated, voting schemes have been successfully used in the industry for both RAS and Protection systems.

Either type of reliability issue must be resolved before placing the RAS in service to avoid placing the System at unacceptable risk. The RAS-entity (and any other RAS-owner) or the RC may have alternative ideas or methods available to resolve the issue(s). In either case, the concern needs to be resolved in favor of reliability, and the RC has the final decision.

Requirement R4:

Requirement R4 mandates that a technical evaluation of each RAS be performed at least once every 60 full calendar months. The purpose of periodic RAS evaluation is to verify the continued effectiveness and coordination of the RAS, as well as BES performance following an inadvertent RAS operation. 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. Sixty (60) full calendar months was selected as the maximum time frame for the evaluation based on the time frames for similar requirements in Reliability Standards PRC-006-1, PRC-010-1, and PRC-014-1. 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 or will occur before the next scheduled evaluation. The periodic RAS evaluation will typically lead to one of the following outcomes: 1) affirmation that the existing RAS is adequate; 2) identification of changes needed to the existing RAS; or, 3) justification for RAS retirement.

The items required to be addressed in the evaluations (Parts 4.1, 4.2, 4.3) are planning analyses which involve modeling of the interconnected transmission system; consequently, the Transmission Planner (TP) is the functional entity best qualified to perform the analyses. To promote reliability, the TP is required to provide the RAS-owner(s) and the Reliability Coordinator(s) with the results of each evaluation.

Part 4.3 requires that the inadvertent operation of the RAS meet the same requirements as those required for the contingency(ies) or System conditions for which it was installed. So if the RAS was designed to meet one of the Planning Events (P0-P7) in TPL-001-4, then the inadvertent operation of the RAS must meet the same performance requirements listed in the standard for that planning event. Part 4.3 also requires that the inadvertent operation of the RAS installed for an Extreme Event in TPL-001-4 or for some other contingency or System condition not defined in TPL-001-4 (therefore without performance requirements), meet the minimum System performance requirements of Category P7 in Table 1 of NERC Reliability Standard TPL-001-4, or its successor. These would include requirements such as the System shall remain stable, cascading and uncontrolled islanding shall not occur, applicable Facility Ratings shall not be exceeded, System steady state voltages and post-Contingency voltage deviations shall be within acceptable limits, transient voltage responses shall be within acceptable limits.

Requirement R5:

Deficiencies identified in 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 incorrect operation. To avoid this reliability risk, Requirement R5 mandates that the RAS-owner(s) submit a Corrective Action Plan that establishes the mitigation methods and timetable to address the deficiency. Submitting the Corrective Action Plan to the Reliability Coordinator (RC) within six full calendar months of receipt ensures any deficiencies are adequately addressed in a timely manner. If the Corrective Action Plan requires that a functional change be made to a RAS, the RAS-owner(s) will need to submit information identified in Attachment 1 to the RC(s) for review prior to placing RAS modifications in service per Requirement 1.

Requirement R6:

The correct operation of a RAS is important to maintaining the reliability and integrity of the Bulk Electric System (BES). Any incorrect operation of a RAS indicates the RAS effectiveness and/or coordination has been compromised. Therefore, all operations of a RAS and failures of a RAS to operate when expected should be analyzed. The purpose of the analysis is to determine whether the RAS operation was appropriately triggered; whether the RAS functioned as designed; whether the RAS actions were effective in producing the intended System response; and whether the RAS operation or non-operation resulted in any unintended or adverse System response. The 120 calendar day time frame aligns with the time frame established in Requirement R1 from PRC-004-4 regarding the investigation of a Protection System Misoperation.

Requirement R7:

Performance deficiencies identified in the analysis conducted by the RAS-owner(s), pursuant to Requirement R6, are likely to pose a reliability risk to the BES. To avoid this reliability risk, Requirement R7 mandates that the RAS-owner(s) submit a Corrective Action Plan that establishes the mitigation methods and timetable to address the deficiency. Submitting the Corrective Action Plan to the Reliability Coordinator (RC) within six full calendar months of receipt ensures any deficiencies are adequately addressed in a timely manner. If the Corrective Action Plan requires that a functional change be made to a RAS, the RAS-owner(s) will need to submit information identified in Attachment 1 to the RC(s) for review prior to placing RAS modifications in service per Requirement 1.

Requirement R8:

Requirement R8 mandates the RAS-owner(s) implement a Corrective Action Plan submitted to address any identified deficiency(ies) found in conjunction with the periodic evaluation pursuant to Requirement R4, and any identified incorrect operation found by the analysis of an actual RAS operation pursuant to Requirement R6. Implementing the Corrective Action Plan (CAP) submitted pursuant to either Requirement R5 or Requirement R7 ensures that any identified deficiency(ies) or incorrect operation(s) are addressed in a timely manner. The CAP identifies the work (corrective actions) as well as the work schedule (the time frame within which the corrective actions are to be taken).

A Corrective Action Plan (CAP) documents a RAS performance deficiency, the strategy to correct the deficiency with identified tasks, the responsible party assigned to each task, and the targeted completion date(s).

The following are examples situations of when a CAP is required:

a) A determination after a RAS operation/non-operation investigation that the RAS did not meet performance expectations. The RAS did not operate as designed.
b) Periodic planning assessment reveals RAS changes are necessary to satisfy performance effectiveness or to correct identified coordination issues.
c) Equipment failure detrimentally affects the dependability or security of the RAS.

Requirement R9:

The reliability objective of Requirement R9 is to test the non-Protection System components of a RAS (controllers such as PLCs) and to verify the overall performance of the RAS through functional testing. Functional tests validate RAS operation by ensuring system states are detected and processed, and that actions taken by the controls are correct and within the expected time frames using the in-service settings and logic.

Functional testing can be difficult to schedule and perform, but it is critical to ensure the proper functioning of RAS and the resulting BES reliability. Since the functional test operates the RAS under controlled conditions with known System states and expected results, testing and result analysis can be performed without impact to the BES. The RAS-owner is in the best position to determine the testing procedure and schedule due to their overall knowledge of the RAS design, installation, and expected operation. Periodic functional testing provides the RAS-owner

assurance that latent failures are not present in the RAS design and implementation, and also promotes identification of changes in System infrastructure could have introduced latent failures. The six calendar year interval was chosen to coincide with the maintenance intervals of various Protection System and Automatic Reclosing components established in PRC-005-3.

Functional testing is not synonymous with end-to-end testing. Each segment of a RAS should be tested but the segments can be tested individually negating the need for complex maintenance schedules. If System conditions do not allow a complete end-to-end system test or a RAS is implemented across many locations and uses a wide variety of components, functional testing of small zones within a larger RAS, such that all controls in overlapping zones are tested over time constitute an acceptable functional testing approach. The goal of the functional test procedure is inclusion of all conditions the RAS uses for detection, arming, operating, and data collection that will address the System condition(s) for which the RAS is designed.

As an example, consider a RAS implemented using one control component not addressed in the Protection System definition but used regularly in RAS: a programmable logic controller (PLC). The PLC does not meet the definition of a Protection System and will have no required maintenance as part of PRC-005. In this simplified example, the PLC based RAS is sensing System conditions such as loading and line status from many locations, and implements breaker tripping at multiple locations to alleviate an overload condition. At one of these locations, a line protective relay, included in a RAS-owner's Protection System Maintenance Plan as a Protection System component, is used to operate a breaker upon receipt an operate command from the remote RAS PLC. The relay sends data and receives commands from the RAS PLC over non-Protection System communications infrastructure. A functional test would simulate via external signals to the PLC system conditions requiring an operate command to the protective relay, operating its associated breaker. This action verifies RAS action, verifies PLC control logic, and verifies the RAS communications from the PLC to the relay. To complete this portion of a functional test, application of external testing signals to the protective relay, verified at the PLC are necessary to confirm full functioning of the RAS zone being tested. In this example the RAS is implemented across several locations, and the testing described would only constitute one zone of a full RAS functional test. The remaining zones based on the RAS design would also require testing.

IEEE C37.233, "IEEE Guide for Power System Protection Testing," section 8 (particularly 8.3-8.5), provides a very good overview of functional testing. The following opens section 8.3:

> "Proper implementation requires a well-defined and coordinated test plan for performance evaluation of the overall system during agreed maintenance intervals. The maintenance test plan, also referred to as functional system testing, should include inputs, outputs, communication, logic, and throughput timing tests. The functional tests are generally not component-level testing, rather overall system testing. Some of the input tests may need to be done ahead of overall system testing to the extent that the tests affect the overall performance. The test coordinator or coordinators need to have full knowledge of the intent of the scheme, isolation points, simulation scenarios, and restoration to normal procedures.

> The concept is to validate the overall performance of the scheme, including the logic where applicable, to validate the overall throughput times against system modeling for different types of contingencies, and to verify scheme performance as well as the inputs and outputs."

Requirement R10:

The RAS database is a comprehensive record of all RAS existing in a Reliability Coordinator's area. The database enables the RC to provide other entities with a reliability need the ability to attain high level information on existing RAS that potentially impact the entities' operational and/or planning activities. Attachment 3 lists the minimum information required for the RAS database. This information allows an entity to evaluate the need for requesting more detailed information (e.g., modeling information - Requirement R11) from the RAS-entity. The Reliability Coordinator (RC) is the appropriate entity to maintain the database because the RC receives the required database information when a new or modified RAS is submitted for review.

Requirement R11:

Other registered entities may have a reliability-related need for modeling RAS operations and will require additional information beyond what is listed in Attachment 3. Such information may be needed to address one or more of the following reliability-related needs:

- Periodic RAS evaluations
- Planning assessment studies
- Operations planning and/or real-time analyses
- BES event analyses
- Coordination of RAS among entities

Requirement R11 mandates that each RAS-entity provide the requester with either the detailed information required to model a RAS, or a written response specifying the basis for denying the request. Thirty (30) calendar days is a reasonable amount of time for each RAS-entity to respond to a request.

Technical Justifications for Attachment 1 Content
Supporting Documentation for RAS Review

To perform an adequate review of the expected reliability implications of a remedial action scheme (RAS) it is necessary for the RAS owner(s) to provide a detailed list of information describing the RAS to the reviewing Reliability Coordinator (RC). While information may be needed from all owners of a RAS, a single RAS-owner (designated as the (RAS-entity)) is usually assigned the responsibility of compiling the RAS data and presenting it to the RC(s) review team. Other RAS-owners may participate in the review, if they choose.

The necessary data ranges from a general overview of the scheme to results of Transmission Planning studies that illustrate System performance before and after the RAS goes into service, as well as expected performance for unusual conditions, and whether certain adverse reliability impacts may occur. Possible adverse interactions, i.e. coordination between the RAS and other RAS and protection and control systems will be examined. This review can include wide ranging electrical design issues involving the specific hardware, logic, telecommunications and other relevant equipment and controls that make up the RAS.

Attachment 1

The following checklist identifies important RAS information for each new or functionally modified[3] RAS that the RAS-entity shall document and provide to the Reliability Coordinator (RC) for review pursuant to Requirement R1. When a RAS has been previously reviewed, only the proposed modifications to that RAS require review; however, it will be helpful to the reviewers if the RAS entity provides a summary of the previously approved RAS functionality.

I. General

- ❑ Information such as maps, one-line drawings, substation and schematic drawings that identify the physical and electrical location of the RAS and related facilities.
    - o Provide a description of the RAS to give an overall understanding of the functionality and a map showing the location of the RAS. Identify other protection and control systems requiring coordination with the RAS. See “RAS Design”, below, for additional information.
    - o Provide a single line drawing(s) showing all sites involved. The drawing(s) should provide sufficient information to allow the RC review team to assess design reliability, and should include information such as the bus arrangement, circuit breakers, the associated switches, etc. For each site, indicate whether detection, logic, action, or a combination of these is present.
- ❑ Functionality of new RAS or proposed functional modifications to existing RAS and documentation of the pre- and post-modified functionality of the RAS.

[3]Functionally Modified:
Any modification to a RAS beyond the replacement of components that preserve the original functionality is a functional modification.

- The Corrective Action Plan (CAP) if RAS modifications are proposed in a CAP.
  [Reference NERC Reliability Standard PRC-012-2, Requirements R5 and R7]
  - The CAP is required if the periodic evaluation pursuant to Requirement R4, or the analysis of an actual RAS operation pursuant to Requirement R6 identified any performance deficieny(ies).

II. Functional Description and Transmission Planning Information

- Contingencies and system conditions that the RAS is intended to remedy.
  [Reference NERC Reliability Standards PRC-012, R1.2 and PRC-013, R1.1]
  - The System conditions which would result if no RAS action occurred should be identified.
  - Include a description of the System conditions which should arm the RAS so as to be ready to take action upon subsequent occurrence of the critical system contingencies or other operating conditions when RAS action is intended to occur. If no arming conditions are required, this should also be stated.
  - Event based RAS are triggered by specific contingencies that initiate mitigating action. These contingencies should be identified. Condition based RAS may also be initiated by specific contingencies, but this is not always required.

- 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]
  - Mitigating actions are designed to result in acceptable System performance. These actions should be identified, including any time constraints and/or "backup" mitigating measures that may be required in case of a single RAS component failure.

- A summary of technical studies, if applicable, demonstrating that the proposed RAS actions satisfy System performance objectives for the scope of System events and conditions that the RAS is intended to remedy. The technical studies should include information such as the study year(s), system conditions, and contingencies analyzed on which the RAS design is based, and when those technical studies were performed.
  [Reference NEC Reliability Standard PRC-014, R3.2]
  - Review the scheme purpose and impact to ensure it is (still) necessary, serves the intended purposes, and meets current performance requirements.

- Information regarding any future system plans that will impact the RAS.
  [Reference NERC Reliability Standard PRC-014, R3.2]
  - The RC's other responsibilities under the NERC Reliability Standards focus on the Operating Horizon, rather than the Planning Horizon. As such, the RC is less likely to be aware of any longer range Plans that may have an impact on the proposed RAS. Such knowledge of future Plans is helpful to provide perspective on the capabilities of the RAS.

- Documentation showing that inadvertent operation of the RAS satisfies the same performance requirements as those required for the contingency for which it was designed or, if no performance requirements apply, the inadvertent operation of the RAS satisfies the requirements of Category P7 in Table 1 of NERC Reliability Standard TPL-001-4, or its successor.

[Reference NERC Reliability Standard PRC-012, R1.4]

- An evaluation indicating that the RAS avoids adverse interactions with other RAS, and protection and control systems.
  [Reference NERC Reliability Standards PRC-012, R1.5 and PRC-014, R3.4]
  - RAS are complex schemes that typically take action which trips load or generation or re-configures the system. Many RAS depend on sensing specific system configurations to determine whether they need to arm or take actions. Examples include: overlapping actions among RAS that may have the potential to result in cascading, unless coordinated, RAS that reconfigure the System also change the available fault duty, which can affect distance relay overcurrent ("fault detector") supervision and ground overcurrent protection coordination.

- Identification of other affected RCs.
  - This information is needed to aid in information exchange among all affected entities and coordination of the RAS with other RAS and protection and control systems.

III. Implementation

- Documentation describing the equipment used for detection, telecommunications, transfer trip, logic processing, and monitoring, whichever are applicable.

Logic Processing

- All RAS require some form of logic processing to determine the action to take when the scheme is triggered. Required actions are always scheme dependent. Different actions may be required at different arming levels or for different contingencies. Scheme logic may be achievable by something as simple as wiring a few auxiliary relay contacts or by much more complex logic processing.

- Platforms that have been used reliably and successfully, include programmable logic controllers (PLCs) in various forms, personal computers (PCs), microprocessor protective relays, remote terminal units (RTUs), and logic processors. Single-function relays have been used historically to implement RAS, but this approach is now less common except for very simple new RAS or minor additions to existing RAS.

Communications Channels

- Communication channels used for sending and receiving RAS information between sites and/or transfer trip devices must meet at least the same criteria as for other relaying protection communication channels. Discuss performance of any non-deterministic communication systems used (such as Ethernet).

- The scheme logic should be designed so that loss of the channel, noise, or other channel failure will not result in a false operation of the scheme.

- It is highly desirable that the channel equipment and communications media (power line carrier, microwave, optical fiber, etc.) be owned and maintained by the RAS owner, or perhaps leased from another entity familiar with the necessary reliability

requirements. All channel equipment must be monitored and alarmed to the dispatch center so that timely diagnostic and repair action shall be taken place upon failure.

- Communication channels shall be well labeled or identified so that the personnel working on the channel can readily identify the proper circuit. Channels between entities shall be identified with a common name at all terminals.

- Information on detection logic and settings/parameters that control the operation of the RAS. [Reference NERC Reliability Standards PRC-012, R1.2 and PRC-013, R1.3]

  Detection and initiating devices must be designed to be as secure as possible. The following discussion identifies several types of devices that have been used as disturbance detectors:

  - Line open status (event detectors),
  - Protective relay inputs and outputs (event and parameter detectors),
  - Transducer and IED (analog) inputs (parameter and response detectors),
  - Rate of change (parameter and response detectors).

  Several methods to determine line open status are in common use, often in combination:

  - Auxiliary switch contacts from circuit breakers and disconnect switches (52b, 89b),
  - Undercurrent detection (a low level indicates an outage),
  - Breaker trip bus monitoring, and
  - Other detectors such as angle, voltage, power, frequency, rate of change of these, out of step, etc.

- Documentation showing that any 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.

  - In this context, a multifunction device (e.g. microprocessor-based relay) is a single device that is used to perform the function of a RAS in addition to protective relaying and/or SCADA simultaneously. It is important that other applications in the multifunction device do not compromise the functionality of the RAS when the device is in service or when is being maintained. The following list outlines concerns to be addressed when the RAS function is applied in the same microprocessor-based relay as the protection function:

    - a) Describe how the multifunction device is applied in the RAS.
    - b) Show the general arrangement and describe how the multi-function device is labeled in the design and application, so as to identify the RAS and other device functions.
    - c) Describe the procedures used to isolate the RAS function from other functions in the device.

- d) Describe the procedures used when each multifunction device is removed from service and whether any other coordination with other protection is required.
- e) Describe how each multifunction device is tested, both for commissioning and during periodic maintenance testing, with regard to each function of the device.
- f) Describe how overall periodic RAS functional and throughput tests are performed if multifunction devices are used for both local protection and RAS.
- g) Describe how upgrades to the multifunction device, such as firmware upgrades, are accomplished. How is the RAS function taken into consideration?

- Other devices usually not considered multifunction devices such as auxiliary relays, control switches, and instrument transformers may serve multiple purposes such as protection and RAS. Similar concerns apply for these applications as noted above.

- Documentation showing that a single component failure in a RAS does not prevent the BES from meeting the same performance requirements as those required for the System events and conditions for which the RAS was designed. The documentation should describe or illustrate how the implementation design achieves this objective.
  [Reference NERC Reliability Standard PRC-012, R1.3]

The critical part of PRC-012 R1.3 philosophy is that a RAS should be designed so that a "single [RAS] component failure … does not prevent … meeting the performance requirements defined in Reliability Standards". The philosophy regarding "single component failure" from PRC-012-0 is carried over in to this standard. Redundancy is one way to implement the "single component failure" philosophy but other methods are acceptable.

The following list are examples of RAS components that could be considered in the single component failure analysis:

- Any single ac secondary current or voltage source and/or related inputs to the RAS.
- Any single device used to measure electrical quantities used by the RAS.
- 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.

Duplication of the listed components is a way to achieve redundancy and meet the "single component failure" requirement. For schemes performing distributed actions (e.g. load

shedding or generation rejection at multiple locations), over arming (providing extra corrective action to cover failure to operate of one critical component) can also be an effective option, as long as it does not compromise the performance of the system. Other coordinated Protection Systems, such as breaker failure, may be used as long as the System performance resulting from breaker failure is still acceptable under the original contingency the RAS was designed to mitigate

RAS Retirement

The following checklist identifies important RAS information for each existing RAS to be retired that the RAS-entity shall document and provide to the Reliability Coordinator for review pursuant to Requirement R1.

- Information necessary to ensure 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.

Technical Justifications for Attachment 3 Content
Database Information

Attachment 3 contains the minimum information the RC must consolidate into its database for each RAS in its area.

1. RAS name
   - The usual name used to identify the RAS.

2. RAS-entity and contact information
   - A reliable phone number or email address should be included to contact the RAS-entity if more information is needed (e.g. modeling information per requirement R11). At a minimum, the name of the RAS-entity responsible for the RAS information.

3. Expected or actual in-service date; most recent (Requirement R2) review date; 5-year (Requirement R4) evaluation date; and, date of retirement, if applicable
   - Specify each applicable date.

4. 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)
   - A short description of the reason for installing the RAS is sufficient, as long as the main system issues addressed by the RAS can be identify by someone with a reliablilty need.

5. Description of the contingencies or System conditions for which the RAS was designed (initiating conditions)
   - A high level summary of the conditions/contingencies is expected. Not all combinations of conditions are required to be listed.

6. Corrective action taken by the RAS
   - For schemes shedding load or generation, the maximum amount of MW should be included.

7. Any additional explanation relevant to high level understanding of the RAS
   - If deemed necessary, any additional information can be included in this section, but is not mandatory.