

Mapping Document

Project 2010-5.3 Phase 3 of Protection Systems: Remedial Action Schemes

Reliability Standard: PRC-012-1

Existing Requirement in Reliability Standard	Translation to New Standard or Other Action	New or revised Requirement in Proposed Reliability Standard PRC-012-2
<p>R1. Each Regional Reliability Organization with a Transmission Owner, Generator Owner, or Distribution Providers that uses or is planning to use a RAS shall have a documented Regional Reliability Organization RAS review procedure to ensure that RAS comply with Regional criteria and NERC Reliability Standards. The Regional RAS review procedure shall include:</p> <p>R1.1. Description of the process for submitting a proposed RAS for Regional Reliability Organization review.</p> <p>R1.2. Requirements to provide data that describes design, operation, and modeling of a RAS.</p> <p>R1.3. Requirements to demonstrate that the RAS shall be designed so that a single RAS component failure, when the RAS was intended to operate, does not prevent the interconnected transmission system from meeting the performance requirements defined in Reliability Standards TPL-001-0, TPL-002-0, and TPL-003-0.</p>	<p><u>PRC-012-1 R.1.1:</u> Covered by Requirements R1, R2 and R3</p> <p><u>PRC-012-1 R.1.2:</u> Covered by Requirement R1, Attachment 1</p> <p><u>PRC-012-1 R.1.3:</u> Covered by Requirement R1, Attachments 1, Requirement R2, Attachment 2 and Requirement R4, Part 4.1.5</p> <p><u>PRC-012-1 R.1.4:</u> Covered by Requirement R1, Attachments 1, Requirement R2, Attachment 2, and Requirement R4, Part 4.1.4</p>	<p>R1. Prior to placing a new or functionally modified RAS in service or retiring an existing RAS, each RAS-entity shall provide the information identified in Attachment 1 for review to the Reliability Coordinator(s) where the RAS is located.</p> <p>R2. Each Reliability Coordinator that receives Attachment 1 information pursuant to Requirement R1 shall, within four full calendar months of receipt, or on a mutually agreed upon schedule, perform a review of the RAS in accordance with Attachment 2, and provide written feedback to each RAS-entity.</p> <p>R3. Prior to placing a new or functionally modified RAS in service or retiring an existing RAS, each RAS-entity that receives feedback from the reviewing Reliability Coordinator(s) identifying reliability issue(s) shall resolve each issue to obtain approval of the RAS from each reviewing Reliability Coordinator.</p> <p>R4. Each Planning Coordinator, at least once every five full calendar years, shall:</p>

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<p>R1.4. Requirements to demonstrate that the inadvertent operation of a RAS shall meet the same performance requirement (TPL-001-0, TPL-002-0, and TPL-003-0) as that required of the contingency for which it was designed, and not exceed TPL-003-0.</p> <p>R1.5. Requirements to demonstrate the proposed RAS will coordinate with other protection and control systems and applicable Regional Reliability Organization Emergency procedures.</p> <p>R1.6. Regional Reliability Organization definition of misoperation.</p> <p>R1.7. Requirements for analysis and documentation of corrective action plans for all RAS misoperations.</p> <p>R1.8. Identification of the Regional Reliability Organization group responsible for the Regional Reliability Organization’s review procedure and the process for Regional Reliability Organization approval of the procedure.</p> <p>R1.9. Determination, as appropriate, of maintenance and testing requirements.</p>	<p><u>PRC-012-1 R.1.5:</u> Covered by Requirement R1, Attachments 1, Requirement R2, Attachment 2 and Requirement R4, Part 4.1.2</p> <p><u>PRC-012-1 R.1.6:</u> Covered by Requirement R5</p> <p><u>PRC-012-1 R.1.7:</u> Covered by Requirements R5 and R6</p> <p><u>PRC-012-1 R.1.8:</u> PRC-012-2 NERC Standards Development Process</p> <p><u>PRC-012-1 R.1.9:</u> Covered by Requirement R8</p>	<p>4.1 Perform an evaluation of each RAS within its planning area to determine whether:</p> <p>4.1.1 The RAS mitigates the System condition(s) or Contingency(ies) for which it was designed.</p> <p>4.1.2 The RAS avoids adverse interactions with other RAS, and protection and control systems.</p> <p>4.1.3 For limited impact RAS, the inadvertent operation of the RAS or the failure of the RAS to operate does not cause or contribute to BES Cascading, uncontrolled separation, angular instability, voltage instability, voltage collapse, or unacceptably damped oscillations.</p> <p>4.1.4 Except for limited impact RAS, the possible inadvertent operation of the RAS, resulting from any single RAS component malfunction satisfies all of the following:</p> <p>4.1.4.1 The BES shall remain stable.</p> <p>4.1.4.2 Cascading shall not occur.</p> <p>4.1.4.3 Applicable Facility Ratings shall not be exceeded.</p> <p>4.1.4.4 BES voltages shall be within post-Contingency voltage limits and post-Contingency voltage deviation limits as</p>

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		<p>established by the Transmission Planner and the Planning Coordinator.</p> <p>4.1.4.5 Transient voltage responses shall be within acceptable limits as established by the Transmission Planner and the Planning Coordinator.</p> <p>4.1.5 Except for limited impact RAS, a single component failure in the RAS, when the RAS is intended to operate does not prevent the BES from meeting the same performance requirements (defined in Reliability Standard TPL-001-4 or its successor) as those required for the events and conditions for which the RAS is designed.</p> <p>4.2 Provide the results of the RAS evaluation including any identified deficiencies to each reviewing Reliability Coordinator and RAS-entity, and each impacted Transmission Planner and Planning Coordinator.</p> <p>R5. Each RAS-entity, within 120 full calendar days of a RAS operation or a failure of its RAS to operate when expected, or on a mutually agreed upon schedule with its reviewing Reliability Coordinator(s), shall:</p> <p>5.1 Participate in analyzing the RAS operational performance to determine whether:</p>

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		<p>5.1.1 The System events and/or conditions appropriately triggered the RAS.</p> <p>5.1.2 The RAS responded as designed.</p> <p>5.1.3 The RAS was effective in mitigating BES performance issues it was designed to address.</p> <p>5.1.4 The RAS operation resulted in any unintended or adverse BES response.</p> <p>5.2 Provide the results of RAS operational performance analysis that identified any deficiencies to its reviewing Reliability Coordinator(s).</p> <p>R6. Each RAS-entity shall participate in developing a Corrective Action Plan (CAP) and submit the CAP to its reviewing Reliability Coordinator(s) within six full calendar months of:</p> <ul style="list-style-type: none"> • Being notified of a deficiency in its RAS pursuant to Requirement R4, or • Notifying the Reliability Coordinator of a deficiency pursuant to Requirement R5, Part 5.2, or • Identifying a deficiency in its RAS pursuant to Requirement R8. <p>R8. Each RAS-entity shall participate in performing a functional test of each of its RAS to verify the overall RAS</p>

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		performance and the proper operation of non-Protection System components: <ul style="list-style-type: none"> At least once every six full calendar years for all RAS not designated as limited impact, or At least once every twelve full calendar years for all RAS designated as limited impact
R2. The Regional Reliability Organization shall provide affected Regional Reliability Organizations and NERC with documentation of its RAS review procedure on request (within 30 calendar days).	Retired P81	N/A

Reliability Standard: PRC-013-1		
Existing Requirement in Reliability Standard	Translation to New Standard or Other Action	New or revised Requirement in Proposed Reliability Standard PRC-012-2
R1. The Regional Reliability Organization that has a Transmission Owner, Generator Owner, or Distribution Provider with a RAS installed shall maintain a RAS database. The database shall include the following types of information:	<p><u>PRC-013-1 R1:</u> Covered by Requirement R9</p> <p><u>PRC-013-1 R1.1, R1.2, R1.3:</u> Covered by Requirement R9, Attachment 3</p>	R9. Each Reliability Coordinator shall update a RAS database containing, at a minimum, the information in Attachment 3 at least once every twelve full calendar months.

Reliability Standard: PRC-013-1		
Existing Requirement in Reliability Standard	Translation to New Standard or Other Action	New or revised Requirement in Proposed Reliability Standard PRC-012-2
<p>R1.1. Design Objectives — Contingencies and system conditions for which the RAS was designed,</p> <p>R1.2. Operation — The actions taken by the RAS in response to Disturbance conditions, and</p> <p>R1.3. Modeling — Information on detection logic or relay settings that control operation of the RAS.</p>		
<p>R2. The Regional Reliability Organization shall provide to affected Regional Reliability Organization(s) and NERC documentation of its database or the information therein on request (within 30 calendar days).</p>	Retired P81	N/A

Reliability Standard: PRC-014-1		
Existing Requirement in Reliability Standard	Translation to New Standard or Other Action	New or revised Requirement in Proposed Reliability Standard PRC-012-2
<p>R1. The Regional Reliability Organization shall assess the operation, coordination, and effectiveness of all RAS installed in its Region at least once every five years</p>	<p>PRC-014-1 R1: Covered by Requirement R4</p>	<p>R4. Each Planning Coordinator, at least once every five full calendar years, shall:</p>

Reliability Standard: PRC-014-1		
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for compliance with NERC Reliability Standards and Regional criteria.		<p>4.1 Perform an evaluation of each RAS within its planning area to determine whether:</p> <ul style="list-style-type: none"> 4.1.1 The RAS mitigates the System condition(s) or Contingency(ies) for which it was designed. 4.1.2 The RAS avoids adverse interactions with other RAS, and protection and control systems. 4.1.3 For limited impact RAS, the inadvertent operation of the RAS or the failure of the RAS to operate does not cause or contribute to BES Cascading, uncontrolled separation, angular instability, voltage instability, voltage collapse, or unacceptably damped oscillations. 4.1.4 Except for limited impact RAS, the possible inadvertent operation of the RAS, resulting from any single RAS component malfunction satisfies all of the following: <ul style="list-style-type: none"> 4.1.4.1 The BES shall remain stable. 4.1.4.2 Cascading shall not occur. 4.1.4.3 Applicable Facility Ratings shall not be exceeded. 4.1.4.4 BES voltages shall be within post-Contingency voltage limits and post-Contingency voltage deviation limits as

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		<p>established by the Transmission Planner and the Planning Coordinator.</p> <p>4.1.4.5 Transient voltage responses shall be within acceptable limits as established by the Transmission Planner and the Planning Coordinator.</p> <p>4.1.5 Except for limited impact RAS, a single component failure in the RAS, when the RAS is intended to operate does not prevent the BES from meeting the same performance requirements (defined in Reliability Standard TPL-001-4 or its successor) as those required for the events and conditions for which the RAS is designed.</p> <p>4.2 Provide the results of the RAS evaluation including any identified deficiencies to each reviewing Reliability Coordinator and RAS-entity, and each impacted Transmission Planner and Planning Coordinator.</p>
<p>R2. The Regional Reliability Organization shall provide either a summary report or a detailed report of its assessment of the operation, coordination, and effectiveness of all RAS installed in its Region to affected Regional Reliability Organizations or NERC on request (within 30 calendar days).</p>	<p>PRC-014-1 R2: Covered by Requirement R4</p>	<p>R4. Each Planning Coordinator, at least once every five full calendar years, shall:</p> <p>4.1 Perform an evaluation of each RAS within its planning area to determine whether:</p>

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		<p>4.1.1 The RAS mitigates the System condition(s) or Contingency(ies) for which it was designed.</p> <p>4.1.2 The RAS avoids adverse interactions with other RAS, and protection and control systems.</p> <p>4.1.3 For limited impact RAS, the inadvertent operation of the RAS or the failure of the RAS to operate does not cause or contribute to BES Cascading, uncontrolled separation, angular instability, voltage instability, voltage collapse, or unacceptably damped oscillations.</p> <p>4.1.4 Except for limited impact RAS, the possible inadvertent operation of the RAS, resulting from any single RAS component malfunction satisfies all of the following:</p> <ul style="list-style-type: none"> 4.1.4.1 The BES shall remain stable. 4.1.4.2 Cascading shall not occur. 4.1.4.3 Applicable Facility Ratings shall not be exceeded. 4.1.4.4 BES voltages shall be within post-Contingency voltage limits and post-Contingency voltage deviation limits as established by the Transmission Planner and the Planning Coordinator.

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		<p>4.1.4.5 Transient voltage responses shall be within acceptable limits as established by the Transmission Planner and the Planning Coordinator.</p> <p>4.1.5 Except for limited impact RAS, a single component failure in the RAS, when the RAS is intended to operate does not prevent the BES from meeting the same performance requirements (defined in Reliability Standard TPL-001-4 or its successor) as those required for the events and conditions for which the RAS is designed.</p> <p>4.2 Provide the results of the RAS evaluation including any identified deficiencies to each reviewing Reliability Coordinator and RAS-entity, and each impacted Transmission Planner and Planning Coordinator.</p>
<p>R3. The documentation of the Regional Reliability Organization’s RAS assessment shall include the following elements:</p> <p>R3.1. Identification of group conducting the assessment and the date the assessment was performed.</p> <p>R3.2. Study years, system conditions, and contingencies analyzed in the technical studies on which the</p>	<p><u>PRC-014-1 R3:</u> Covered by Requirement R4</p> <p><u>PRC-014-1 R3.1 - R3.4:</u> Covered by Requirement R4</p> <p><u>PRC-014-1 R3.5:</u> Covered by Requirement R6</p>	<p>R4. Each Planning Coordinator, at least once every five full calendar years, shall:</p> <p>4.1 Perform an evaluation of each RAS within its planning area to determine whether:</p> <p>4.1.1 The RAS mitigates the System condition(s) or Contingency(ies) for which it was designed.</p>

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<p>assessment is based and when those technical studies were performed.</p> <p>R3.3. Identification of RAS that were found not to comply with NERC standards and Regional Reliability Organization criteria.</p> <p>R3.4. Discussion of any coordination problems found between a RAS and other protection and control systems.</p> <p>R3.5. Provide corrective action plans for non-compliant RAS.</p>		<p>4.1.2 The RAS avoids adverse interactions with other RAS, and protection and control systems.</p> <p>4.1.3 For limited impact RAS, the inadvertent operation of the RAS or the failure of the RAS to operate does not cause or contribute to BES Cascading, uncontrolled separation, angular instability, voltage instability, voltage collapse, or unacceptably damped oscillations.</p> <p>4.1.4 Except for limited impact RAS, the possible inadvertent operation of the RAS, resulting from any single RAS component malfunction satisfies all of the following:</p> <ul style="list-style-type: none"> 4.1.4.1 The BES shall remain stable. 4.1.4.2 Cascading shall not occur. 4.1.4.3 Applicable Facility Ratings shall not be exceeded. 4.1.4.4 BES voltages shall be within post-Contingency voltage limits and post-Contingency voltage deviation limits as established by the Transmission Planner and the Planning Coordinator. 4.1.4.5 Transient voltage responses shall be within acceptable limits as established by the

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		<p>Transmission Planner and the Planning Coordinator.</p> <p>4.1.5 Except for limited impact RAS, a single component failure in the RAS, when the RAS is intended to operate does not prevent the BES from meeting the same performance requirements (defined in Reliability Standard TPL-001-4 or its successor) as those required for the events and conditions for which the RAS is designed.</p> <p>4.2 Provide the results of the RAS evaluation including any identified deficiencies to each reviewing Reliability Coordinator and RAS-entity, and each impacted Transmission Planner and Planning Coordinator.</p> <p>R6. Each RAS-entity shall participate in developing a Corrective Action Plan (CAP) and submit the CAP to its reviewing Reliability Coordinator(s) within six full calendar months of:</p> <ul style="list-style-type: none"> • Being notified of a deficiency in its RAS pursuant to Requirement R4, or • Notifying the Reliability Coordinator of a deficiency pursuant to Requirement R5, Part 5.2, or • Identifying a deficiency in its RAS pursuant to Requirement R8.

Reliability Standard: PRC-015-1

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<p>R1. The Transmission Owner, Generator Owner, and Distribution Provider that owns a RAS shall maintain a list of and provide data for existing and proposed RAS as specified in Reliability Standard PRC-013-1 R1.</p>	<p><u>PRC-015-1 R1:</u> Covered by Requirement R1, Attachment 1</p>	<p>R1. Prior to placing a new or functionally modified RAS in service or retiring an existing RAS, each RAS-entity shall provide the information identified in Attachment 1 for review to the Reliability Coordinator(s) where the RAS is located.</p>
<p>R2. The Transmission Owner, Generator Owner, and Distribution Provider that owns a RAS shall have evidence it reviewed new or functionally modified RAS in accordance with the Regional Reliability Organization’s procedures as defined in Reliability Standard PRC-012-1_R1 prior to being placed in service.</p>	<p><u>PRC-015-1 R2:</u> Covered by Requirements R1, Attachment 1; R2, Attachment 2; and R3</p>	<p>R1. Prior to placing a new or functionally modified RAS in service or retiring an existing RAS, each RAS-entity shall provide the information identified in Attachment 1 for review to the Reliability Coordinator(s) where the RAS is located.</p> <p>R2. Each Reliability Coordinator that receives Attachment 1 information pursuant to Requirement R1 shall, within four full calendar months of receipt, or on a mutually agreed upon schedule, perform a review of the RAS in accordance with Attachment 2, and provide written feedback to each RAS-entity.</p> <p>R3. Prior to placing a new or functionally modified RAS in service or retiring an existing RAS, each RAS-entity that receives feedback from the reviewing Reliability Coordinator(s) identifying issue(s) shall resolve each issue to obtain approval of the RAS from each reviewing Reliability Coordinator.</p>
<p>R3. The Transmission Owner, Generator Owner, and Distribution Provider that owns a RAS shall provide</p>	<p>Retired P81</p>	<p>N/A</p>

Reliability Standard: PRC-015-1

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<p>documentation of RAS data and the results of Studies that show compliance of new or functionally modified RAS with NERC Reliability Standards and Regional Reliability Organization criteria to affected Regional Reliability Organizations and NERC on request (within 30 calendar days).</p>		

Reliability Standard: PRC-016-1		
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<p>R1. The Transmission Owner, Generator Owner, and Distribution Provider that owns a RAS shall analyze its RAS operations and maintain a record of all misoperations in accordance with the Regional RAS review procedure specified in Reliability Standard PRC-012-1_R1.</p>	<p><u>PRC-016-1 R1:</u> Covered by Requirement R5</p>	<p>R5. Each RAS-entity, within 120 full calendar days of a RAS operation or a failure of its RAS to operate when expected, or on a mutually agreed upon schedule with its reviewing Reliability Coordinator(s), shall:</p> <p>5.1 Participate in analyzing the RAS operational performance to determine whether:</p> <p>5.1.1 The System events and/or conditions appropriately triggered the RAS.</p> <p>5.1.2 The RAS responded as designed.</p> <p>5.1.3 The RAS was effective in mitigating BES performance issues it was designed to address.</p> <p>5.1.4 The RAS operation resulted in any unintended or adverse BES response.</p> <p>5.2 Provide the results of RAS operational performance analysis that identified any deficiencies to its reviewing Reliability Coordinator(s).</p>
<p>R2. The Transmission Owner, Generator Owner, and Distribution Provider that owns a RAS shall take corrective actions to avoid future misoperations.</p>	<p><u>PRC-016-1 R2:</u> Covered by Requirements R6 and R7</p>	<p>R6. Each RAS-entity shall participate in developing a Corrective Action Plan (CAP) and submit the CAP to its reviewing Reliability Coordinator(s) within six full calendar months of:</p>

Reliability Standard: PRC-016-1		
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		<ul style="list-style-type: none"> • Being notified of a deficiency in its RAS pursuant to Requirement R4, or • Notifying the Reliability Coordinator of a deficiency pursuant to Requirement R5, Part 5.2, or • Identifying a deficiency in its RAS pursuant to Requirement R8. <p>R7. Each RAS-entity shall, for each of its CAPs developed pursuant to Requirement R6:</p> <p style="padding-left: 40px;">7.1 Implement the CAP.</p> <p style="padding-left: 40px;">7.2 Update the CAP if actions or timetables change.</p> <p style="padding-left: 40px;">7.3 Notify each reviewing Reliability Coordinator if CAP actions or timetables change and when the CAP is completed.</p>
<p>R3. The Transmission Owner, Generator Owner, and Distribution Provider that owns a RAS shall provide documentation of the misoperation analyses and the corrective action plans to its Regional Reliability Organization and NERC on request (within 90 calendar days).</p>	<p>PRC-016-1 R3: Covered by Requirements R5, R6, and R7, Attachment 1</p>	<p>R5. Each RAS-entity, within 120 full calendar days of a RAS operation or a failure of its RAS to operate when expected, or on a mutually agreed upon schedule with its reviewing Reliability Coordinator(s), shall:</p> <p style="padding-left: 40px;">5.1 Participate in analyzing the RAS operational performance to determine whether:</p> <p style="padding-left: 80px;">5.1.1 The System events and/or conditions appropriately triggered the RAS.</p>

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		<p>5.1.2 The RAS responded as designed.</p> <p>5.1.3 The RAS was effective in mitigating BES performance issues it was designed to address.</p> <p>5.1.4 The RAS operation resulted in any unintended or adverse BES response.</p> <p>5.2 Provide the results of RAS operational performance analysis that identified any deficiencies to its reviewing Reliability Coordinator(s).</p> <p>R6. Each RAS-entity shall participate in developing a Corrective Action Plan (CAP) and submit the CAP to its reviewing Reliability Coordinator(s) within six full calendar months of:</p> <ul style="list-style-type: none"> • Being notified of a deficiency in its RAS pursuant to Requirement R4, or • Notifying the Reliability Coordinator of a deficiency pursuant to Requirement R5, Part 5.2, or • Identifying a deficiency in its RAS pursuant to Requirement R8. <p>R7. Each RAS-entity shall, for each of its CAPs developed pursuant to Requirement R6:</p> <p>7.1 Implement the CAP.</p>

Reliability Standard: PRC-016-1

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		<p>7.2 Update the CAP if actions or timetables change.</p> <p>7.3 Notify each reviewing Reliability Coordinator if CAP actions or timetables change and when the CAP is completed.</p>