

# Mapping Document

## Project 2007-06.2 Phase 2 of System Protection Coordination

### Revisions or Retirements to Already Approved Standards

This mapping document explains how each of the existing Requirements (R1, R2, R5, and R6) of PRC-001-1.1(ii) (*System Protection Coordination*)<sup>1</sup> are being revised or retired. If a requirement is being proposed for revision, the revised, new, and/or supporting requirement(s) will be identified in the center column. If a requirement is being proposed for retirement, the center column will describe the proposed action and any requirement(s) used to support the action. Revisions and retirements will be accompanied by an explanation or justification listed in the right column. Capitalized terms, unless otherwise noted, are those found in the *Glossary of Terms Used in NERC Reliability Standards* (“NERC Glossary”).<sup>2</sup> References to regulatory directives are specifically related to Order No. 693 (“Order”).<sup>3</sup> Standards or definitions listed as “existing” are enforceable and those listed as “approved” have been adopted by the NERC Board of Trustees and approved by the Federal Energy Regulatory Commission (“FERC”). Check the NERC website for effective dates. The functional entities discussed in the mapping document are the Balancing Authority (BA), Generator Operator (GOP), Planning Coordinator (PC), Reliability Coordinator (RC), Transmission Operator (TOP), and Transmission Planner (TP). The term “TOP/IRO” refers to the Transmission Operations (TOP) and Interconnection Reliability Operations and Coordination (IRO) sets of Reliability Standards that were filed under NERC Project 2014-03 – Revisions to TOP and IRO Standards<sup>4</sup> and approved by FERC.<sup>5</sup> The explanation herein assumes that the term, “Special Protection

<sup>1</sup> Federal Energy Regulatory Commission (FERC) approved PRC-001-1.1(ii), effective May 29, 2015.

<sup>2</sup> *Glossary of Terms Used in NERC Reliability Standards*. December 7, 2015. ([http://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary\\_of\\_Terms.pdf](http://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf)).

<sup>3</sup> *Mandatory Reliability Standards for the Bulk-Power System*, Order No. 693, FERC Stats. & Regs. ¶ 31,242 (“Order No. 693”), *order on reh’g*, Order No. 693-A, 120 FERC ¶ 61,053 (2007).

<sup>4</sup> <http://www.nerc.com/pa/Stand/Pages/Project-2014-03-Revisions-to-TOP-and-IRO-Standards.aspx>

<sup>5</sup> *Transmission Operations Reliability Standards and Interconnection Reliability Operations and Coordination Reliability Standards*, Order 817, 153 FERC ¶ 61,178 (November 19, 2015).

System”<sup>6</sup> (SPS) will be replaced by the term “Remedial Action Scheme”<sup>7</sup> (RAS). In the referenced Reliability Standards herein the term SPS may be replaced by RAS; therefore, the term RAS will be used in the “Comments” column throughout.

Standard: PRC-001-1.1(ii) – System Protection Coordination		
Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p><b>PRC-001-1.1(ii) (Existing)<sup>8,9</sup></b></p> <p><b>R1.</b> Each Transmission Operator, Balancing Authority, and Generator Operator shall be familiar with the purpose and limitations of</p>	<p>PRC-001-1.1(ii), Requirement R1 is proposed for retirement.</p> <p>Being “familiar with the purpose and limitations of Protection System schemes”</p>	<p><b>Introduction</b></p> <p>The reliability objective of PRC-001-1.1(ii), Requirement R1 is to ensure that the BA, GOP, and TOP are “familiar with the purpose</p>

<sup>6</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a Special Protection System is defined as “[a]n automatic protection system designed to detect abnormal or predetermined system conditions, and take corrective actions other than and/or in addition to the isolation of faulted components to maintain system reliability. Such action may include changes in demand, generation (MW and Mvar), or system configuration to maintain system stability, acceptable voltage, or power flows. An SPS does not include (a) underfrequency or undervoltage load shedding or (b) fault conditions that must be isolated or (c) out-of-step relaying (not designed as an integral part of an SPS). Also called Remedial Action Scheme.”

<sup>7</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), the proposed definition of Remedial Action Scheme is defined as “[a] scheme designed to detect predetermined System conditions and automatically take corrective actions that may include, but are not limited to, adjusting or tripping generation (MW and Mvar), tripping load, or reconfiguring a System(s). RAS accomplish objectives such as: Meet requirements identified in the NERC Reliability Standards; Maintain Bulk Electric System (BES) stability; Maintain acceptable BES voltages; Maintain acceptable BES power flows; Limit the impact of Cascading or extreme events.” See definition for additional information on the definition of RAS.

<sup>8</sup> Order No. 693 at P 1418. “Protection and Control systems (PRC) on Bulk-Power System elements are an integral part of reliable grid operation. Protection systems are designed to detect and isolate faulty elements on a system, thereby limiting the severity and spread of system disturbances, and preventing possible damage to protected elements. The function, settings and limitations of a protection system are critical in establishing SOLs and IROLs. The PRC Reliability Standards apply to transmission operators, transmission owners, generator operators, generator owners, distribution providers and regional reliability organizations and cover a wide range of topics related to the protection and control of power systems.”

<sup>9</sup> Order No. 693 at P 1435. “Protection systems on Bulk-Power System elements are an integral part of reliable operations. They are designed to detect and isolate faulty elements on a power system, thereby limiting the severity and spread of disturbances and preventing possible damage to protected elements. If a protection system can no longer perform as designed because of a failure of its relays, system reliability is reduced or threatened. In deriving SOLs and IROLs, moreover, the functions, settings, and limitations of protection systems are recognized and integrated. Systems are only reliable when protection systems perform as designed. This is what PRC-001-1 means in linking a reduction in system reliability with a protection relay failure or other equipment failure.”

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p>Protection System schemes applied in its area.</p> <p><b>Operational Planning Analysis (Approved)</b></p> <p>An evaluation of projected system conditions to assess anticipated (pre-Contingency) and potential (post-Contingency) conditions for next-day operations. The evaluation shall reflect applicable inputs including, but not limited to, load forecasts; generation output levels; Interchange; known Protection System and Special Protection System status or degradation; Transmission outages; generator outages; Facility Ratings; and</p>	<p>will be clarified as (1) being “familiar with their purpose,” and (2) being “familiar with their limitations” as follows:</p> <ul style="list-style-type: none"> <li>• The phrase “Protection systems schemes” maps to the NERC Glossary terms of Protection Systems and Remedial Action Schemes.</li> <li>• Being “familiar with the purpose” is addresses by existing and proposed training standards.</li> <li>• Being “familiar with the limitations” together with the clarification found in Order No. 693 at P 1418 and P 1435 along with the revised definitions of NERC Glossary defined terms of Operational Planning</li> </ul>	<p>and limitations of Protection System<sup>12</sup> schemes applied in its area.” The reliability objective of the phrase “Protection System schemes” in PRC-001-1.1(ii), Requirement R1 is also intended to include RAS.</p> <p>The function, settings and limitations of a Protection Systems and RAS are critical in establishing System Operating Limits (SOL) and Interconnection Reliability Operating Limits (IROL) such that the Bulk Electric System<sup>13</sup> (BES) is operated within these limits. The following explains how being familiar with the purpose and limitations of Protection Systems and RAS will be</p>

<sup>12</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a Protection System is defined as:

“Protection System -

- Protective relays which respond to electrical quantities,
- Communications systems necessary for correct operation of protective functions
- Voltage and current sensing devices providing inputs to protective relays,
- Station dc supply associated with protective functions (including station batteries, battery chargers, and non-battery-based dc supply), and
- Control circuitry associated with protective functions through the trip coil(s) of the circuit breakers or other interrupting devices.”

<sup>13</sup> See *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015).

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p>identified phase angle and equipment limitations. (Operational Planning Analysis may be provided through internal systems or through third-party services.)</p> <p><b>Real-time Assessment (Approved)</b></p> <p>An evaluation of system conditions using Real-time data to assess existing (pre-Contingency) and potential (post-Contingency) operating conditions. The assessment shall reflect applicable inputs including, but not limited to: load, generation output levels, known Protection System and Special Protection System status or degradation, Transmission outages, generator outages, Interchange, Facility Ratings, and identified phase angle and equipment limitations. (Real-time Assessment may be provided through internal systems or through third-party services.)</p>	<p>Analysis and Real-time Assessment address the reliability objective of PRC-001-1.1(ii), Requirement R1 as explained in the Comments column to the right.</p> <p><b>PER-006-1 (New)</b></p> <p><b>4. Applicability:</b></p> <p><b>4.1. Functional Entities:</b></p> <p><b>4.1.1. Generator Operator that have:</b></p> <p><b>4.1.1.1. Plant personnel who are responsible for the Real-time control of a generator and receive direction from the Generator Operator’s Reliability Coordinator, Balancing Authority, Transmission Operator, or centrally located dispatch center. This does not include personnel at a centrally located dispatch center.</b></p> <p><b>R1. Each Generator Operator shall provide training to personnel identified in Applicability section 4.1.1.1. on the</b></p>	<p>addressed according to issue beginning with “familiarity with their limitations” and then “familiarity with their purpose.”</p> <p><b>Familiar with their limitations</b></p> <p>When the BA, GOP, and TOP are familiar with the settings and limits (i.e., limitations) of Protection Systems and RAS, the entities are able to operate the BES in such a manner that Protection Systems and RAS will be operated within their limits and be able to detect and isolate faulty Elements, thereby, limiting the severity and spread of system disturbances, and preventing possible damage to protected Elements.</p> <p>When the GOP is familiar with the limitations of Protection Systems and RAS by being trained on how Protection Systems operate and prevent possible damage to Elements, the GOP is capable of operating to its full capability within its area, meaning the output of its generation Facilities.</p> <p>When the BA is familiar with the limitations of Protection Systems and RAS, it is capable</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
	<p>operational functionality of Protection Systems and Remedial Action Schemes that affect output of a generating Facility.</p> <p><b>PER-003-1 (Existing)</b></p> <p><b>R1.</b> Each Reliability Coordinator shall staff its Real-time operating positions performing Reliability Coordinator reliability-related tasks with System Operators who have demonstrated minimum competency in the areas listed by obtaining and maintaining a valid NERC Reliability Operator certificate:</p> <p><b>1.1. Areas of Competency</b></p> <p><b>1.1.1.</b> Resource and demand balancing</p> <p><b>1.1.2.</b> Transmission operations</p> <p><b>1.1.3.</b> Emergency preparedness and operations</p> <p><b>1.1.4.</b> System operations</p> <p><b>1.1.5.</b> Protection and control</p> <p><b>1.1.6.</b> Voltage and reactive</p>	<p>of maintaining generation, Load, and Interchange balance. The BA ensures that RAS in its area are enabled when needed for system reliability.</p> <p>When the TOP is familiar with limitations of Protection Systems and RAS, it will be capable of identifying when system reliability is reduced or threatened. In operating to established SOLs and IROLs, it is important that the functions, settings, and limitations of Protection Systems and RAS are recognized and integrated by the TOP into operating the BES reliably. The BES is only reliable when Protection Systems and RAS perform within their limitations.</p> <p><b>Familiarity with the Purpose</b></p> <p>Familiarity with the purpose of Protection Systems and RAS is achieved through training as explained below according to each applicable entity.</p> <p><b>Familiarity with the Purpose (GOP)</b></p>

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	<p><b>1.1.7.</b> Interchange scheduling and coordination</p> <p><b>1.1.8.</b> Interconnection reliability operations and coordination</p> <p><b>R2.</b> Each Transmission Operator shall staff its Real-time operating positions performing Transmission Operator reliability-related tasks with System Operators who have demonstrated minimum competency in the areas listed by obtaining and maintaining one of the following valid NERC certificates:</p> <p><b>2.1.</b> Areas of Competency</p> <p><b>2.1.1.</b> Transmission operations</p> <p><b>2.1.2.</b> Emergency preparedness and operations</p> <p><b>2.1.3.</b> System operations</p> <p><b>2.1.4.</b> Protection and control</p> <p><b>2.1.5.</b> Voltage and reactive</p> <p><b>2.2.</b> Certificates</p> <ul style="list-style-type: none"> <li>• Reliability Operator</li> </ul>	<p>For the GOP, the Reliability Standard PER-006-1 (<i>Specific Training for Personnel</i>) proposes to replace PRC-001-1.1(ii), Requirement R1. The PER-006-1 standard identifies applicable GOP personnel that are responsible for the Real-time control of a generator and that receive Operating Instructions from the Generator Operator’s Reliability Coordinator, Balancing Authority, Transmission Operator, or centrally located dispatch center. This applicability removes ambiguity over which personnel of the GOP are intended to be familiar with the purpose Protection Systems and RAS. Centrally located personnel are not included here because they are addressed by PER-005-2 (<i>Operations Personnel Training</i>). Personnel at centrally located dispatch centers will receive company-specific Protection System and RAS training, if identified, as a reliability-related task via the PER-005-2, Requirement R6. Here the GOP must use “...a systematic approach to develop and implement training to its personnel identified in Applicability</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
	<ul style="list-style-type: none"> <li>• Balancing, Interchange and Transmission Operator</li> <li>• Transmission Operator</li> </ul> <p><b>R3.</b> Each Balancing Authority shall staff its Real-time operating positions performing Balancing Authority reliability-related tasks with System Operators who have demonstrated minimum competency in the areas listed by obtaining and maintaining one of the following valid NERC certificate:</p> <p><b>3.1.</b> Areas of Competency</p> <p><b>3.1.1.</b> Resources and demand balancing</p> <p><b>3.1.2.</b> Emergency preparedness and operations</p> <p><b>3.1.3.</b> System operations</p> <p><b>3.1.4.</b> Interchange scheduling and coordination</p> <p><b>3.2.</b> Certificates</p> <ul style="list-style-type: none"> <li>• Reliability Operator</li> </ul>	<p>Section 4.1.5.1. of this standard, on how their job function(s) impact the reliable operations of the BES during normal and emergency operations.” Being trained using a systematic approach on the purpose (i.e., functions, including limits) Protection Systems and RAS will enable the GOP centrally located dispatch personnel to ensure reliable operation of its Facilities on the BES.</p> <p>The phrase “...purpose and limitations...” in PRC-001-1-1(ii), Requirement R1 is addressed in the proposed requirement through the use of “operational functionality.” The phrase “operational functionality” as described in the PER-006-1 – Application Guidelines describes that training is expected to cover how Protection Systems operate within their limits and prevent possible damage to Elements. It also addresses how RAS detect pre-determined BES conditions and automatically take corrective actions. The criteria that comprises operational functionality mirror</p>

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	<ul style="list-style-type: none"> <li>• Balancing, Interchange and Transmission Operator</li> <li>• Balancing and Interchange Operator</li> </ul> <p><b>PER-005-2 (Approved)</b></p> <p><b>R1.</b> Each Reliability Coordinator, Balancing Authority, and Transmission Operator shall use a systematic approach to develop and implement a training program for its System Operators as follows:</p> <p><b>1.1.</b> Each Reliability Coordinator, Balancing Authority, and Transmission Operator shall create a list of Bulk Electric System (BES) company-specific Real-time reliability-related tasks based on a defined and documented methodology.</p> <p><b>1.1.1.</b> Each Reliability Coordinator, Balancing Authority, and Transmission Operator shall review, and update if necessary, its list of BES company-specific Real-time reliability-related tasks identified in part 1.1 each calendar year.</p>	<p>the components listed under the NERC Glossary term “Protection System.” By doing so, reduces the ambiguity of the phrase “purpose and limitations.”</p> <p>The phrase “...applied in its area” is addressed by the PER-006-1 by using “...that affect output of a generating Facility.”</p> <p>Lastly, the proposed PER-006-1 Requirement R1 includes both Protection Systems and RAS to eliminate confusion over the phrase “Protection System schemes.”</p> <p><b>Familiarity with the Purpose (BA)</b></p> <p>For the BA, the PRC-001-1.1(ii), Requirement R1 is proposed for retirement on the basis that the BA obtains an appropriate level of familiarity with the purpose of Protection Systems and RAS under PER-003-1 (<i>Operating Personnel Credentials</i>), Requirement R3 and PER-005-2, Requirements R1, R3, R4, and R5 as explained below in detail.</p>



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	<p><b>1.2.</b> Each Reliability Coordinator, Balancing Authority, and Transmission Operator shall design and develop training materials according to its training program, based on the BES company-specific Real-time reliability-related task list created in part 1.1.</p> <p><b>1.3.</b> Each Reliability Coordinator, Balancing Authority, and Transmission Operator shall deliver training to its System Operators according to its training program.</p> <p><b>1.4.</b> Each Reliability Coordinator, Balancing Authority, and Transmission Operator shall conduct an evaluation each calendar year of the training program established in Requirement R1 to identify any needed changes to the training program and shall implement the changes identified.</p>	<p>The BA is certified under PRC-003-1 as a System Operator.<sup>14</sup> Although there is no specific area of competency for protection and control similar to the Reliability Coordinator and Transmission Operator certifications, the NERC <i>Balancing and Interchange Operator Certification Exam Content Outline 2015</i><sup>15</sup> (BI Exam) does contain the same five topics applicable to RC and less one topic applicable to the TOP. The topic that is not included is to “analyze relay targets, fault locaters and fault recorders to determine a proper restoration plan” and is not germane to BA operations. The job-task analyses (JTA) performed by entities are used to (1) develop the BI Exam topics that are evaluated by NERC and a NERC functional entity working group every three years, and (2) used to develop the training of</p>

<sup>14</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a System Operator is defined as: An individual at a Control Center of a Balancing Authority, Transmission Operator, or Reliability Coordinator, who operates or directs the operation of the Bulk Electric System (BES) in Real-time.

<sup>15</sup> <http://www.nerc.com/pa/Train/SysOpCert/System%20Operator%20Certification%20DL/Balancing%20and%20Interchange%20Operator%20Certification%20Exam%20Content%20Outline%202015.pdf> (December 9, 2014).

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	<p><b>R2.</b> (Omitted – Transmission Owner, not applicable)</p> <p><b>R3.</b> Each Reliability Coordinator, Balancing Authority, Transmission Operator, and Transmission Owner shall verify, at least once, the capabilities of its personnel, identified in Requirement R1 or Requirement R2, assigned to perform each of the BES company-specific Real-time reliability-related tasks identified under Requirement R1 part 1.1. or Requirement R2 part 2.1.</p> <p><b>3.1.</b> Within six months of a modification or addition of a BES company-specific Real-time reliability-related task, each Reliability Coordinator, Balancing Authority, Transmission Operator, and Transmission Owner shall verify the capabilities of each of its personnel identified in Requirement R1 or Requirement R2 to perform the new or modified BES company-specific Real-time reliability-related tasks identified in</p>	<p>personnel on company-specific reliability-related tasks under PER-005-2.</p> <p>Protection and control topics are addressed in the BI Exam outline under two areas: System Operations and Emergency Preparedness and Operations, and include the following five topics:</p> <ul style="list-style-type: none"> <li>• Analyze the impact of protection equipment outages on system reliability.</li> <li>• Ensure special protective systems and remedial action schemes are enabled when needed for system reliability.</li> <li>• Maintain adequate protective relaying during all phases of the system restoration.</li> <li>• Take action in response to alarms from special protective schemes.</li> <li>• Schedule system telecommunications, telemetering, protection, and control equipment outages to ensure system reliability.</li> </ul>

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	<p>Requirement R1 part 1.1. or Requirement R2 part 2.1.</p> <p><b>R4.</b> Each Reliability Coordinator, Balancing Authority, Transmission Operator, and Transmission Owner that (1) has operational authority or control over Facilities with established Interconnection Reliability Operating Limits (IROLs), or (2) has established protection systems or operating guides to mitigate IROL violations, shall provide its personnel identified in Requirement R1 or Requirement R2 with emergency operations training using simulation technology such as a simulator, virtual technology, or other technology that replicates the operational behavior of the BES.</p> <p><b>4.1.</b> A Reliability Coordinator, Balancing Authority, Transmission Operator, or Transmission Owner that did not previously</p>	<p>There is a fourth certification that includes an integrated certification of both the BA and TOP called the <i>Balancing, Interchange, and Transmission Operator Certification Exam Content Outline 2015</i><sup>16</sup> (BIT Exam). This BIT Exam outline does include protection and control as an area of competency and contains the same topics found in the <i>Transmission Operator Certification Exam Content Outline 2015</i>.</p> <p>Under PER-005-2, the System Operator and Operation Support Personnel of the BA are identified in the requirements. To address the reliability objective of “shall be familiar with the purpose and limitations of Protection System schemes applied in its area,” the BA uses its JTA to develop a list of its reliability-related tasks. Using its documented methodology, the BA must develop and implement training materials</p>

<sup>16</sup> <http://www.nerc.com/pa/Train/SysOpCert/System%20Operator%20Certification%20DL/Balancing%20Interchange%20Transmission%20Operator%20Certification%20Exam%20Content%20Outline%202015.pdf> (December 9, 2014).

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	<p>meet the criteria of Requirement R4, shall comply with Requirement R4 within 12 months of meeting the criteria.</p> <p><b>R5.</b> Each Reliability Coordinator, Balancing Authority, and Transmission Operator shall use a systematic approach to develop and implement training for its identified Operations Support Personnel on how their job function(s) impact those BES company-specific Real-time reliability-related tasks identified by the entity pursuant to Requirement R1 part 1.1.</p> <p><b>5.1</b> Each Reliability Coordinator, Balancing Authority, and Transmission Operator shall conduct an evaluation each calendar year of the training established in Requirement R5 to identify and implement changes to the training.</p> <p><b>R6.</b> Each Generator Operator shall use a systematic approach to develop and</p>	<p>according to its training program (R1) using a systematic approach to training. The BA is required to verify the capabilities of its System Operators under Requirement R3. Under Requirement R4, the BA “that (1) has operational authority or control over Facilities with established IROls, or (2) has established protection systems or operating guides to mitigate IROL violations, shall provide its personnel identified in Requirement R1<sup>17</sup> with emergency operations training using simulation technology such as a simulator, virtual technology, or other technology that replicates the operational behavior of the BES.”</p> <p>Requirement R5 addresses the Operations Support Personnel of the BA, which requires the BA to use a systematic approach to develop and implement training for its identified Operations Support Personnel on</p>

<sup>17</sup> Requirement R2 is omitted here because it is applicable to the Transmission Owner and is not within the scope of this project.

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	<p>implement training to its personnel identified in Applicability Section 4.1.5.1. of this standard, on how their job function(s) impact the reliable operations of the BES during normal and emergency operations.</p> <p><b>6.1.</b> Each Generator Operator shall conduct an evaluation each calendar year of the training established in Requirement R6 to identify and implement changes to the training.</p> <p><b>Operational Planning Analysis (OPA) (Revised)</b></p> <p>An evaluation of projected system conditions to assess anticipated (pre-Contingency) and potential (post-Contingency) conditions for next-day operations. The evaluation shall reflect applicable inputs including, but not limited to, load forecasts; generation output levels; Interchange; known Protection System and <b>Remedial Action Scheme</b> (status or</p>	<p>how their job function(s) impact those BES company-specific Real-time reliability-related tasks identified by the entity pursuant to Requirement R1 that are applicable to System Operators.</p> <p><b>Familiarity with the Purpose (TOP)</b></p> <p>The TOP will ensure that the BES is operated within SOLs and IROLs by integrating the “functions and limits” of Protection Systems and RAS into its OPA and RTA as proposed by the revisions to the definitions of OPA and RTA.</p> <p>For the TOP, the PRC-001-1.1(ii), Requirement R1 is proposed for retirement on the basis that the TOP obtains a sufficient level of knowledge (i.e. be familiar with the purpose of Protection System schemes applied in its area) under PER-003-1 (<i>Operating Personnel Credentials</i>), Requirement R1 and PER-005-2,</p>

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	<p>degradation, <b>functions, and limits</b>; Transmission outages; generator outages; Facility Ratings; and identified phase angle and equipment limitations. (Operational Planning Analysis may be provided through internal systems or through third-party services.)<sup>10</sup></p> <p><b>Real-time Assessment (RTA) (Revised)</b> An evaluation of system conditions using Real-time data to assess existing (pre- Contingency) and potential (post- Contingency) operating conditions. The assessment shall reflect applicable inputs including, but not limited to: load, generation output levels, known Protection System and <b>Remedial Action Scheme (status or degradation, and functions, and limits)</b>, Transmission outages, generator outages,</p>	<p>Requirements R1, R3, R4, and R5, as explained below in detail.</p> <p>The TOP is certified as a System Operator, and has an “area of competency” for “protection and control” as shown in the NERC <i>Transmission Operator Certification Exam Content Outline 2015</i>.<sup>18</sup> This represents a minimum competency in the area of protection and control. However, certified System Operators will receive company-specific training on Protection Systems and RAS through PER-005-2, Requirements. The job-task analyses (JTA) performed by entities are used to (1) develop the BI Exam topics that are evaluated by NERC and a NERC functional entity working group every three years, and (2) used to develop the training of personnel</p>

<sup>10</sup> Bolded text identifies the proposed revisions.

<sup>18</sup> <http://www.nerc.com/pa/Train/SysOpCert/System%20Operator%20Certification%20DL/Transmission%20Operator%20Certification%20Exam%20Content%20Outline%202015.pdf>  
(December 9, 2014).

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	<p>Interchange, Facility Ratings, and identified phase angle and equipment limitations. (Real-time Assessment may be provided through internal systems or through third-party services.)<sup>11</sup></p> <p><b>IRO-008-2 (Approved)</b></p> <p><b>R1.</b> Each Reliability Coordinator shall perform an Operational Planning Analysis that will allow it to assess whether the planned operations for the next-day will exceed System Operating Limits (SOLs) and Interconnection Operating Reliability Limits (IROLs) within its Wide Area.</p> <p><b>R2.</b> Each Reliability Coordinator shall have a coordinated Operating Plan(s) for next-day operations to address potential System Operating Limit (SOL) and Interconnection Reliability Operating Limit (IROL) exceedances identified as a result of its</p>	<p>on company-specific reliability-related tasks under PER-005-2.</p> <p>Under PER-005-2, System Operator and Operation Support Personnel of the TOP are identified in the requirements. To address the reliability objective of “shall be familiar with the purpose and limitations of Protection System schemes applied in its area,” the TOP uses its JTA to develop a list of its reliability-related tasks. Using its documented methodology, the TOP must develop and implement training materials according to its training program (R1) using a systematic approach to training. The TOP is required to verify the capabilities of its System Operators under Requirement R3. Under Requirement R4, the TOP “that (1) has operational authority or control over Facilities with established IROLs, or (2) has established protection systems or operating guides to mitigate IROL violations, shall</p>

<sup>11</sup> Bolded text identifies the proposed revisions.

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
	<p>Operational Planning Analysis as performed in Requirement R1 while considering the Operating Plans for the next-day provided by its Transmission Operators and Balancing Authorities.</p> <p><b>R4.</b> Each Reliability Coordinator shall ensure that a Real-time Assessment is performed at least once every 30 minutes.</p> <p><b>R5.</b> Each Reliability Coordinator shall notify impacted Transmission Operators and Balancing Authorities within its Reliability Coordinator Area, and other impacted Reliability Coordinators as indicated in its Operating Plan, when the results of a Real-time Assessment indicate an actual or expected condition that results in, or could result in, a System Operating Limit (SOL) or Interconnection Reliability Operating Limit (IROL) exceedance within its Wide Area.</p>	<p>provide its personnel identified in Requirement R1<sup>19</sup> with emergency operations training using simulation technology such as a simulator, virtual technology, or other technology that replicates the operational behavior of the BES.” Requirement R5 addresses the Operations Support Personnel of the TOP, which requires the TOP to use a systematic approach to develop and implement training for its identified Operations Support Personnel on how their job function(s) impact those BES company-specific Real-time reliability-related tasks identified by the entity pursuant to Requirement R1. Operations Support Personnel are among the personnel that perform Operational Planning Analyses (OPA) and Real-time Assessments (RTA).</p> <p>These reliability-related-tasks, include performing both an OPA and RTA and are</p>

<sup>19</sup> Requirement R2 is omitted here because it is applicable to the Transmission Owner and is not within the scope of this project.



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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
	<p><b>IRO-010-2 (Approved)</b></p> <p><b>R1.</b> The Reliability Coordinator shall maintain a documented specification for the data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. The data specification shall include but not be limited to:</p> <p><b>1.1.</b> A list of data and information needed by the Reliability Coordinator to support its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments including non-BES data and external network data, as deemed necessary by the Reliability Coordinator.</p> <p><b>1.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>1.3.</b> A periodicity for providing data.</p>	<p>proposed for modification to address the integration of Protection System and RAS limits to ensure the BES is operated within SOLs and IROLs. See the discussion below concerning the OPA and RTA for the explanation of how the revised definitions support the reliability object objective of PRC-001-1.1(ii), Requirement R1.</p> <p><b>Reliability Coordinator (RC)</b></p> <p>The standard PRC-001-1.1(ii) did not include the RC as an applicable functional entity; however, the RC is included here to further support the explanation on how the RC, along with the TOP, ensures the BES is operated within SOLs and IROLs by integrating the limits of Protection Systems and RAS into its OPA and RTA.</p> <p>The RC obtains a sufficient level of knowledge (i.e. be familiar with the purpose and limitations of Protection System schemes applied in its area) under PER-003-1 (<i>Operating Personnel Credentials</i>),</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
	<p><b>1.4.</b> The deadline by which the respondent is to provide the indicated data.</p> <p><b>TOP-001-3 (Approved)</b></p> <p><b>R13.</b> Each Transmission Operator shall ensure that a Real-time Assessment is performed at least once every 30 minutes.</p> <p><b>R14.</b> Each Transmission Operator shall initiate its Operating Plan to mitigate a SOL exceedance identified as part of its Real-time monitoring or Real-time Assessment.</p> <p><b>TOP-002-4 (Approved)</b></p> <p><b>R1.</b> Each Transmission Operator shall have an Operational Planning Analysis that will allow it to assess whether its planned operations for the next day within its</p>	<p>Requirement R1 and PER-005-2, Requirements R1, R3, R4, and R5.</p> <p>The RC is certified as a System Operator, and has an “area of competency” for “protection and control” as shown in the NERC <i>Reliability Coordinator Certification Exam Content Outline 2015</i>.<sup>20</sup> This represents a minimum competency in the area of protection and control. However, certified System Operators will receive company-specific training on Protection Systems and RAS through PER-005-2, Requirements.</p> <p>Under PER-005-2, System Operator and Operation Support Personnel of the RC are identified in the requirements. To similarly address the reliability objective of “shall be familiar with the purpose and limitations of Protection System schemes applied in its area” in PRC-001-1.1(ii), Requirement R1, the RC uses its JTA to develop a list of its</p>

<sup>20</sup> <http://www.nerc.com/pa/Train/SysOpCert/System%20Operator%20Certification%20DL/Reliability%20Coordinator%20Certification%20Exam%20Content%20Outline%202015.pdf> (December 9, 2014).

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
	<p>Transmission Operator Area will exceed any of its System Operating Limits (SOLs).</p> <p><b>R2.</b> Each Transmission Operator shall have an Operating Plan(s) for next-day operations to address potential System Operating Limit (SOL) exceedances identified as a result of its Operational Planning Analysis as required in Requirement R1.</p> <p><b>R3.</b> Each Transmission Operator shall notify entities identified in the Operating Plan(s) cited in Requirement R2 as to their role in those plan(s).</p>	<p>reliability-related tasks. Using its documented methodology, the RC must develop and implement training materials according to its training program (R1) using a systematic approach to training. The RC is required to verify the capabilities of its System Operators under Requirement R3. Under Requirement R4, the RC that (1) has operational authority or control over Facilities with established IROLs, or (2) has established protection systems or operating guides to mitigate IROL violations, shall provide its personnel identified in Requirement R1<sup>21</sup> with emergency operations training using simulation technology such as a simulator, virtual technology, or other technology that replicates the operational behavior of the BES.” Requirement R5 addresses the Operations Support Personnel of the RC, which requires the RC to use a systematic approach to develop and implement training</p>

<sup>21</sup> Requirement R2 is omitted because it is applicable to the Transmission Owner and is not within the scope of this project.

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
		<p>for its identified Operations Support Personnel on how their job function(s) impact those BES company-specific Real-time reliability-related tasks identified by the entity pursuant to Requirement R1. Operations Support Personnel are among the personnel that perform Operational Planning Analyses (OPA) and Real-time Assessments (RTA).</p> <p>These reliability-related tasks include performing both an OPA and RTA and are proposed for modification to address the integration of Protection System and RAS limits to ensure the BES is operated within SOLs and IROLs. See the discussion below concerning the OPA and RTA for the explanation of how the revised definitions support the reliability object objective of PRC-001-1.1(ii), Requirement R1.</p> <p><b>Operational Planning Analysis (OPA)</b></p> <p>The TOP, applicable to PRC-001-1.1(ii), Requirement R1, is required have an OPA that will allow it to assess whether its</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
		<p>planned operations for the next day within its Transmission Operator Area will exceed any of its SOLs (TOP-002-4, Requirement R1). The TOP is required to have an Operating Plan(s) for next-day operations to address potential SOL exceedances identified as a result of its OPA as required in Requirement R1 (TOP-002-4, Requirement R2) and notify others of their role in the Operating Plan(s) (TOP-002-4, Requirement R4). To accomplish this the TOP is required to maintain a documented data specification for the data necessary to perform its OPA that includes provisions for notification of current Protection System and RAS status or degradation (including failure) that impacts System reliability (TOP-003-3, Requirement R1, Part 1.2.).</p> <p>The RC is not applicable to PRC-001-1.1(ii) and is included here for additional support. The RC is required to perform an OPA that will allow it to assess whether the planned operations for the next-day will exceed SOLs and IROLs within its Wide Area (IRO-008-2,</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
		<p>Requirement R1). The RC is required to have a coordinated Operating Plan(s) for next-day operations to address potential SOL and IROL exceedances identified as a result of its OPA as performed in Requirement R1 (IRO-008-2) while considering the Operating Plans for the next-day provided by its TOPs and BAs (IRO-008-2, Requirement R2). To accomplish this the RC is required to maintain a documented data specification for the data necessary to perform its OPA that includes provisions for notification of current Protection System and RAS status or degradation (including failure) that impacts System reliability (IRO-010-2, Requirement R1, Part 1.2.).</p> <p><b>Real-time Assessment (RTA)</b></p> <p>The TOP, applicable to PRC-001-1.1(ii), Requirement R1, is required ensure that an RTA is performed at least once every 30 minutes (TOP-001-3, Requirement R13). The TOP is required initiate its Operating Plan to mitigate a SOL exceedance identified as part</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
		<p>of its RTA (TOP-001-3, Requirement R14). To accomplish this the TOP is required to maintain a documented data specification for the data necessary to perform its RTA that includes provisions for notification of current Protection System and RAS status or degradation (including failure) that impacts System reliability (TOP-003-3, Requirement R1, Part 1.2.).</p> <p>The RC is not applicable to PRC-001-1.1(ii) and is included here for additional support. The RC is required to ensure that a RTA is performed at least once every 30 minutes (IRO-008-4, Requirement R4). The RC is required notify impacted Transmission Operators and Balancing Authorities within its RC Area, and other impacted RCs as indicated in its Operating Plan, when the results of a RTA indicate an actual or expected condition that results in, or could result in, a SOL or IROL exceedance within its Wide Area (IRO-008-2, Requirement R5). To accomplish this the RC is required to maintain a documented data specification</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
		<p>for the data necessary to perform its RTA that includes provisions for notification of current Protection System and RAS status or degradation (including failure) that impacts System reliability (IRO-010-2, Requirement R1, Part 1.2.).</p>
<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:</p> <p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.</p> <p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its</p>	<p>PRC-001-1.1(ii), Requirements R2, R2.1., and R2.2. are proposed for retirement. The subsequent sections are organized in the following manner:</p> <ul style="list-style-type: none"> <li>• Corrective Action,</li> <li>• Time Frame for corrective actions</li> <li>• Time Frame for notifications,</li> <li>• Shall notify, and</li> <li>• Protection System Inputs for notification</li> </ul>	<p><b>Introduction</b></p> <p><b>Requirement PRC-001-1.1(ii), Requirement R2</b></p> <p>The reliability objective of Requirement R2 and its sub-requirements ensure that the GOP and TOP take corrective action, as soon as possible, if a protective relay or equipment failure reduces system reliability.</p> <p>The subsequent explanation provides detail on how the TOP/IRO set of Reliability Standards (e.g., IRO-001-4, IRO-008-2, IRO-010-2, TOP-001-3, and TOP-003-3) that were developed since the Order was issued achieve the reliability objectives of PRC-001-</p>



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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p>Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p>		<p>1.1(ii), Requirement R2 and its sub-requirements.</p> <p><b>Directives</b></p> <p>Included in the explanation below is how these Reliability Standards address the directives in the Order at P 1441, 1444, 1445 and 1449 (#2 and #3).</p> <p><b>Other</b></p> <p>Additionally, PER-005-3, Requirements R7 and R8 include RAS to ensure full coverage of the “operational functionality.”</p> <p>The phrase “relay or equipment” in PRC-001-1.1(ii), Requirement R2 is clarified by the use of the defined NERC Glossary term, “Protection System” and “RAS.”</p>
<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:</p>	<p>PRC-001-1.1(ii), Requirements R2, R2.1., and R2.2. are proposed for retirement. Corrective action in Requirements R2, R2.1. and R2.2. is covered by:</p>	<p><b>Introduction – Corrective Action</b></p> <p>The directive at P 1449 (#3) of the Order states that: “...transmission operators must carry out corrective control actions, i.e., return a system to a stable state that</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.</p> <p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p>	<p><b>TOP-001-3 (Approved)</b></p> <p><b>R1.</b> Each Transmission Operator shall act to maintain the reliability of its Transmission Operator Area via its own actions or by issuing Operating Instructions.</p> <p><b>R2.</b> Each Balancing Authority shall act to maintain the reliability of its Balancing</p>	<p>respects system requirements...” This directive is addressed in the TOP/IRO standards that were developed since the Order was issued because the BA, RC, and TOP can issue Operating Instructions<sup>22</sup> to maintain the reliability of its respective area. The following describes how the TOP/IRO Reliability Standards achieve the reliability objective with regard to “corrective actions.”</p> <p><b>Corrective Action by the GOP – R2.1.</b></p> <p>TOP-003-3 (<i>Operations Reliability Data</i>) Requirement R1 and part 1.2. that was developed since the Order was issued addresses corrective action by the GOP because the TOP will be aware of current Protection System and SPS status (change in status is implied) or degradation (including failure) that impacts System reliability. See</p>

<sup>22</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), an Operating Instruction is defined as “[a] command by operating personnel responsible for the Real-time operation of the interconnected Bulk Electric System to change or preserve the state, status, output, or input of an Element of the Bulk Electric System or Facility of the Bulk Electric System. (A discussion of general information and of potential options or alternatives to resolve Bulk Electric System operating concerns is not a command and is not considered an Operating Instruction.)”

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:</p> <p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the</p>	<p>Authority Area via its own actions or by issuing Operating Instructions.</p> <p><b>TOP-003-3 (Approved)</b></p> <p><b>R1.</b> Each Transmission Operator shall maintain a documented specification for the data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. The data specification shall include, but not be limited to:</p> <p><b>1.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>R2.</b> Each Balancing Authority shall maintain a documented specification for the data</p>	<p>the “shall notify” section(s) below for a full description of how the TOP receives such notification.</p> <p>TOP-001-3 (<i>Transmission Operations</i>)</p> <p>Furthermore, the TOP will act to maintain the reliability of its Transmission Operator Area<sup>23</sup> (TOP Area) by issuing Operating Instructions to the GOP under TOP-001-3, Requirement R1.</p> <p>TOP-003-3 (<i>Operations Reliability Data</i>)</p> <p>Similarly, TOP-003-3, Requirement R2 and part 2.2. that was developed since the Order was issued addresses corrective action by the GOP because the BA (i.e., Host BA<sup>24</sup>) will be aware of current Protection System and SPS status (change in status is implied) or</p>

<sup>23</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a Transmission Operator Area is defined as “[t]he collection of Transmission assets over which the Transmission Operator is responsible for operating.”

<sup>24</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a Host Balancing Authority is defined as:

1. A Balancing Authority that confirms and implements Interchange Transactions for a Purchasing Selling Entity that operates generation or serves customers directly within the Balancing Authority’s metered boundaries.
2. The Balancing Authority within whose metered boundaries a jointly owned unit is physically located.

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p>Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.</p> <p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p> <p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:</p>	<p>necessary for it to perform its analysis functions and Real-time monitoring. The data specification shall include, but not be limited to:</p> <p><b>2.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p>	<p>degradation (including failure) that impacts System reliability. See the “shall notify” section(s) below for a full description of how the BA receives such notification. The BA will act to maintain the reliability of its Balancing Authority Area<sup>25</sup> (BA Area) by issuing Operating Instructions to the GOP under TOP-001-3, Requirement R2.</p> <p><b>Corrective Action by the TOP – R2.2.</b></p> <p>TOP-003-3 (<i>Operations Reliability Data</i>) Requirement R1 and part 1.2. that was developed since the Order was issued addresses corrective action by the TOP because the TOP will be aware of current Protection System and RAS status (change in status is implied) or degradation (including failure) that impacts System reliability. See the “shall notify” section(s) below for a full</p>

<sup>25</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a Balancing Authority Area is defined as “[t]he collection of generation, transmission, and loads within the metered boundaries of the Balancing Authority. The Balancing Authority maintains load-resource balance within this area.”

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<p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.</p> <p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p> <p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability</p>		<p>description of how the TOP receives such notification.</p> <p>TOP-001-3 (<i>Transmission Operations</i>)</p> <p>The TOP will act to maintain the reliability of its TOP Area by issuing Operating Instructions under TOP-001-3, Requirement R2.</p> <p>TOP-003-3 (<i>Operations Reliability Data</i>)</p> <p>Similarly, TOP-003-3, Requirement R2 and part 2.2. that was developed since the Order was issued addresses corrective action by the BA because the BA will be aware of current Protection System and RAS status (change in status is implied) or degradation (including failure) that impacts System reliability. See the “shall notify” section(s) below for a full description of how the TOP receives such notification. The BA will act to maintain the reliability of its BA Area by issuing Operating Instructions under TOP-001-3, Requirement R2.</p>

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<p>entities of relay or equipment failures as follows:</p> <p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.</p> <p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p>	<p><b>IRO-010-2 (Approved)</b></p> <p><b>R1.</b> The Reliability Coordinator shall maintain a documented specification for the data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. The data specification shall include but not be limited to:</p> <p><b>1.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>IRO-001-4 (Approved)</b></p> <p><b>R1.</b> Each Reliability Coordinator shall act to address the reliability of its Reliability Coordinator Area via direct actions or by issuing Operating Instructions.”</p>	<p>IRO-010-2 (<i>Reliability Coordinator Data Specification and Collection</i>)</p> <p>Requirement R1 and part 1.2. that was developed since the Order was issued addresses corrective action by the RC because the RC will be aware of current Protection System and RAS status (change in status is implied) or degradation (including failure) that impacts System reliability. See the “shall notify” section(s) below for a full description of how the RC receives such notification.</p> <p>IRO-001-4 (<i>Reliability Coordination - Responsibilities and Authorities</i>)</p> <p>Under Requirement R1, the RC will act to address the reliability of its Reliability Coordinator Area<sup>26</sup> (RC Area) by issuing Operating Instructions.</p>

<sup>26</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a Balancing Authority Area is defined as “[t]he collection of generation, transmission, and loads within the boundaries of the Reliability Coordinator. Its boundary coincides with one or more Balancing Authority Areas.”

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<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:</p> <p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.</p> <p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p>	<p>PRC-001-1.1(ii), Requirements R2, R2.1, and R2.2. are proposed for retirement. The time frame for corrective action in Requirements R2, R2.1. and R2.2. is covered by:</p>	<p><b>Introduction – Time frame for corrective actions</b></p> <p>The directive at P 1441 directs the ERO to clarify the term “corrective action” consistent with the discussion in the Order when it modifies PRC-001-1 in the Reliability Standards development process. The reasoning for addressing a time frame for corrective actions is amplified in P 1443 of the Order, which states that: “As explained above [<i>in the previous paragraphs of the Order</i>], the requirement for system operators to take corrective control action when protective relay or equipment failure reduces system reliability should be treated the same as the requirement for returning a system to a secure and reliable state after an Interconnection Reliability Operating Limit (IROL) violation, i.e., as soon as possible, but no longer than 30 minutes after a violation. A longer time limit would place an entity in</p>

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<p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:</p> <p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.</p> <p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected</p>		<p>violation of relevant IROL or TOP Reliability Standards.”<sup>27</sup></p> <p>At P 1444 of the Order, FERC directed NERC to consider the comments of the California PUC regarding the term “as soon as possible” as applicable to the maximum time frame for corrective action through the Standards development process.</p> <p>At P 1445 of the Order, FERC directed NERC, through the Reliability Standards development process, to determine the appropriate amount of time after the detection of relay failures, in which relevant transmission operators must be informed of such failures.</p> <p>The Order at P 1449 (#3) directs NERC to clarify that, after being informed of failures in relays or protection system elements that threaten reliability of the Bulk-Power</p>

<sup>27</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), an Interconnection Reliability Operating Limit is defined as “[a] System Operating Limit that, if violated, could lead to instability, uncontrolled separation, or Cascading outages that adversely impact the reliability of the Bulk Electric System.”



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<p>Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p>	<p><b>TOP-001-3 (Approved)</b></p> <p><b>R1.</b> Each Transmission Operator shall act to maintain the reliability of its Transmission Operator Area via its own actions or by issuing Operating Instructions.</p> <p><b>R13.</b> Each Transmission Operator shall ensure that a Real-time Assessment is performed at least once every 30 minutes.</p>	<p>System, transmission operators must carry out corrective control actions, i.e., return a system to a stable state that respects system requirements as soon as possible and no longer than 30 minutes after they receive notice of the failure.</p> <p><b>PRC-001-1.1(ii), R2.1. &amp; R2.2. (time frame for corrective actions)</b></p> <p>For the reasons explained below, a less than one-hour time frame criteria for corrective action will achieve the reliability objective directed in the Order at P 1441, 1444, 1445, and 1449 (#2 and #3).</p> <p>TOP-001-3 (<i>Transmission Operations</i>)</p> <p>Requirement R13 requires the TOP to ensure that a Real-time Assessment<sup>28</sup> (“RTA”) is performed at least once every 30 minutes</p>

<sup>28</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a Real-time Assessment is defined as “[a]n evaluation of system conditions using Real-time data to assess existing (pre-Contingency) and potential (post Contingency) operating conditions. The assessment shall reflect applicable inputs including, but not limited to: load, generation output levels, known Protection System and Special Protection System status or degradation, Transmission outages, generator outages, Interchange, Facility Ratings, and identified phase angle and equipment limitations. (Real-time Assessment may be provided through internal systems or through third-party services.)”

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:</p> <p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.</p>	<p><b>R14.</b> Each Transmission Operator shall initiate its Operating Plan to mitigate a SOL exceedance identified as part of its Real-time monitoring or Real-time Assessment.</p>	<p>and initiate its Operating Plan<sup>29</sup> to mitigate a System Operating Limit<sup>30</sup> (SOL) exceedance identified as part of its Real-time<sup>31</sup> monitoring or RTA in TOP-001-3, Requirement R14. The RTA requires inputs to include current Protection System and RAS status (change in status is implied) or degradation (including failure) from a BA, GOP, and/or TOP. Under TOP-003-3 notification of these inputs must occur within a 30 minute time frame; otherwise, an RTA cannot be performed once every 30 minutes.</p>

<sup>29</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), an Operating Plan is defined as “[a] document that identifies a group of activities that may be used to achieve some goal. An Operating Plan may contain Operating Procedures and Operating Processes. A company-specific system restoration plan that includes an Operating Procedure for black-starting units, Operating Processes for communicating restoration progress with other entities, etc., is an example of an Operating Plan.”

<sup>30</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a System Operating Limit is defined as “The value (such as MW, MVar, Amperes, Frequency or Volts) that satisfies the most limiting of the prescribed operating criteria for a specified system configuration to ensure operation within acceptable reliability criteria. System Operating Limits are based upon certain operating criteria. These include, but are not limited to:

- Facility Ratings (Applicable pre- and post-Contingency equipment or facility ratings)
- Transient Stability Ratings (Applicable pre- and post-Contingency Stability Limits)
- Voltage Stability Ratings (Applicable pre- and post-Contingency Voltage Stability)
- System Voltage Limits (Applicable pre- and post-Contingency Voltage Limits)”

<sup>31</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), Real-time is defined as “[p]resent time as opposed to future time. (From Interconnection Reliability Operating Limits standard.)”

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p>	<p><b>IRO-008-2 (Approved)</b></p> <p><b>R4.</b> Each Reliability Coordinator shall ensure that a Real-time Assessment is performed at least once every 30 minutes.</p> <p><b>TOP-003-3 (Approved)</b></p> <p><b>R1.</b> Each Transmission Operator shall maintain a documented specification for the</p>	<p>Given the periodicity for obtaining the data and performing the RTA, the exposure (i.e., time frame) for taking corrective action “as soon as possible” is expected to be less than an hour. The TOP may issue Operating Instructions to maintain reliability upon the notification of Protection System or RAS status (change in status is implied) or degradation (including failure) because the exposure is not expected to exceed an hour. The TOP must act under TOP-001-3, Requirement R1 to maintain the reliability of its TOP Area via its own actions or by issuing Operating Instructions.</p> <p><i>IRO-008-2 (Reliability Coordinator Operational Analyses and Real-time Assessments)</i>, Requirement R4 requires the RC to ensure that an RTA is performed at least once every 30 minutes. The RTA requires inputs to include current Protection System and RAS status (change in status is implied) or degradation (including failure) from a BA, GOP, and/or TOP.</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
	<p>data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. The data specification shall include, but not be limited to:</p> <p><b>1.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>R2.</b> Each Balancing Authority shall maintain a documented specification for the data necessary for it to perform its analysis functions and Real-time monitoring. The data specification shall include, but not be limited to:</p> <p><b>2.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>IRO-010-2 (Approved)</b></p> <p><b>R1.</b> The Reliability Coordinator shall maintain a documented specification for the</p>	<p>TOP-003-3 (<i>Operations Reliability Data</i>)</p> <p>IRO-010-2 (<i>Reliability Coordinator Data Specification and Collection</i>)</p> <p>Under TOP-003-3 (TOP and BA) and IRO-010-2 (RC) notification of these inputs must occur within a 30 minute time frame; otherwise, an RTA cannot be performed once every 30 minutes.</p> <p>Given the periodicity for obtaining the data and performing the RTA, the exposure (i.e., time frame) for taking corrective action as soon as possible is expected to be less than an hour. The RC may issue Operating Instructions to maintain reliability upon the notification of Protection System or RAS status (change in status is implied) or degradation (including failure) because the exposure is not expected to exceed an hour.</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
	<p>data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments.</p> <p><b>1.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>IRO-001-4 (Approved)</b></p> <p><b>R1.</b> Each Reliability Coordinator shall act to address the reliability of its Reliability Coordinator Area via direct actions or by issuing Operating Instructions.</p>	<p>IRO-001-4 (<i>Reliability Coordination - Responsibilities and Authorities</i>)</p> <p>The RC must act under IRO-001-4, Requirement R1 to maintain the reliability of its RC Area via its own actions or by issuing Operating Instructions.</p>
<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:</p> <p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the</p>	<p>PRC-001-1.1(ii), Requirements R2, R2.1., and R2.2 are proposed for retirement. The time frame for notification in Requirements R2, R2.1. and R2.2. is covered by:</p>	<p><b>Introduction – Time frame for notifications and shall notify</b></p> <p>The directive at P 1444 of the Order directed NERC to consider the comments of FirstEnergy about the time frame between actual failure and its discovery (i.e., notification) in relation to the maximum time frame for corrective action through the</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p>Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.</p> <p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p>	<p><b>IRO-008-2 (Approved)</b></p> <p><b>R4.</b> Each Reliability Coordinator shall ensure that a Real-time Assessment is performed at least once every 30 minutes.</p> <p><b>TOP-001-3 (Approved)</b></p> <p><b>R13.</b> Each Transmission Operator shall ensure that a Real-time Assessment is performed at least once every 30 minutes.</p> <p><b>R14.</b> Each Transmission Operator shall initiate its Operating Plan to mitigate a SOL exceedance identified as part of its Real-time monitoring or Real-time Assessment.</p> <p><b>TOP-003-3 (Approved)</b></p>	<p>Standards development process. The Order at P 1445 and 1449 (#2) directed NERC to determine an appropriate amount of time after the detection of relay failures and the time in which relevant generation and transmission operators must be informed of such failure.</p> <p><b>PRC-001-1.1(ii), R2.1. &amp; R2.2. (time frame for notifications)</b></p> <p>TOP-001-3 (<i>Transmission Operations</i>)</p> <p>For the reasons explained below concerning notification, it is inferred that the timeframe for notification must occur on at least a 30 minute interval because the a RTA performed by the RC (IRO-008-2) and TOP (TOP-001-3) once every 30 minutes requires the data to be availability on at least a 30 minute basis such that the exposure is less than one hour.</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:</p> <p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.</p> <p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its</p>	<p><b>R1.</b> Each Transmission Operator shall maintain a documented specification for the data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. The data specification shall include, but not be limited to:</p> <p><b>1.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>R2.</b> Each Balancing Authority shall maintain a documented specification for the data necessary for it to perform its analysis functions and Real-time monitoring. The data specification shall include, but not be limited to:</p> <p><b>2.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>R3.</b> Each Transmission Operator shall distribute its data specification to entities</p>	<p>TOP-003-3 (<i>Operations Reliability Data</i>)</p> <p>Notification in PRC-001-1.1(ii), Requirement R2.1. and R2.2. is addressed by TOP-003-3, Requirement R1, part 1.2. for TOP and Requirement R2, part 2.2. for BA that were developed since the Order was issued. Requirements R1 and R2 mandate that the TOP and BA to have provisions (i.e., inputs) for notification of Protection System and RAS status (change in status is implied) or degradation (including failures) that impacts System reliability.</p> <p><b>PRC-001-1.1(ii), R2.1. (shall notify)</b></p> <p>Based on the conclusions above (i.e., “time frame for corrective actions”), notifications of the inputs of Protection Systems and RAS by the GOP must be provided on at least a 30-minute basis. The TOP/IRO set of standards that were developed since the Order was issued achieve the reliability objective of ensuring that the BA (i.e., Host BA) and TOP are notified of protective relay and equipment failures.</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p>Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p> <p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R2.</b> Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:</p> <p><b>R2.1.</b> If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing</p>	<p>that have data required by the Transmission Operator’s Operational Planning Analyses, Real-time monitoring, and Real-time Assessment.</p> <p><b>R4.</b> Each Balancing Authority shall distribute its data specification to entities that have data required by the Balancing Authority’s analysis functions and Real-time monitoring.</p> <p><b>R5.</b> Each Transmission Operator, Balancing Authority, Generator Owner, Generator Operator, Load-Serving Entity, Transmission Owner, and Distribution Provider receiving a data specification in Requirement R3 or R4 shall satisfy the obligations of the documented specifications using:</p> <p><b>5.1.</b> A mutually agreeable format</p>	<p>TOP-003-3 (<i>Operations Reliability Data</i>)</p> <p>TOP-003-3, Requirement R1 mandates the TOP have a documented specification for the data necessary for the TOP to perform an Operational Planning Analysis (“OPA”),<sup>32</sup> Real-time monitoring, and RTA. Both the OPA and RTA, by definition, require an evaluation that reflects inputs from known Protection System and RAS status (change in status is implied) or degradation (including failure). TOP-003-3, Requirement R3 mandates the TOP distribute its documented specification to those entities that have the required data, which includes the GOP.</p> <p>TOP-003-3, Requirement R2 mandates the BA have a documented specification for the data necessary for the BA to perform its analysis functions and Real-time monitoring that include inputs from Protection System</p>

<sup>32</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), an Operational Planning Analysis is defined as “[a]n evaluation of projected system conditions to assess anticipated (pre-Contingency) and potential (post-Contingency) conditions for next-day operations. The evaluation shall reflect applicable inputs including, but not limited to, load forecasts; generation output levels; Interchange; known Protection System and Special Protection System status or degradation; Transmission outages; generator outages; Facility Ratings; and identified phase angle and equipment limitations. (Operational Planning Analysis may be provided through internal systems or through third-party services.)”



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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p>Authority. The Generator Operator shall take corrective action as soon as possible.</p> <p><b>R2.2.</b> If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.</p>	<p><b>5.2.</b> A mutually agreeable process for resolving data conflicts</p> <p><b>5.3.</b> A mutually agreeable security protocol.</p> <p><b>TOP-003-3 (Approved) (included again for reference)</b></p> <p><b>R1.</b> Each Transmission Operator shall maintain a documented specification for the data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. The data specification shall include, but not be limited to:</p> <p><b>1.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>R2.</b> Each Balancing Authority shall maintain a documented specification for the data necessary for it to perform its analysis</p>	<p>and RAS status (change in status is implied) or degradation that are necessary to maintain generation-Load-Interchange balance. TOP-003-3, Requirement R4 mandates the BA to distribute its documented specification to those entities that have the required data, which includes the GOP.</p> <p>TOP-003-3, Requirement R5 builds upon the previous Requirements R1, R2, R3, and R4 described above. Requirement R5 mandates that any GOP that receives a data specification (pursuant to Requirement R3 or R4) to satisfy the obligations of the documented specifications using: a mutually agreeable format, a mutually agreeable process for resolving data conflicts, and a mutually agreeable security protocol.</p> <p>Therefore, the reliability objective of PRC-001-1.1(ii) Requirement R2, R2.1 that mandates the GOP notify its TOP and Host BA of protective relay and equipment failures is addressed by the documented</p>

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	<p>functions and Real-time monitoring. The data specification shall include, but not be limited to:</p> <p><b>2.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>R3.</b> Each Transmission Operator shall distribute its data specification to entities that have data required by the Transmission Operator’s Operational Planning Analyses, Real-time monitoring, and Real-time Assessment.</p>	<p>specification for the data required in TOP-003-3, Requirement R1, part 1.2. for TOP and Requirement R2, part 2.2. for the BA. The documented data specifications is required to be distributed by the TOP and BA and mandates the GOP per TOP-003-3, Requirement R5 provide current Protection System and RAS status (change in status is implied) or degradation that impacts System reliability.</p> <p><b>PRC-001-1.1(ii), R2.2. (shall notify)</b></p> <p>Based on the conclusions above (i.e., “time frame for corrective actions), notifications of the inputs of Protection Systems and RAS by the TOP must be provided on at least a 30-minute basis. The TOP/IRO set of standards that were developed since the Order was issued achieve the reliability objective of ensuring that the RC and the BA and TOP (i.e., the affected BA and TOP) are notified of protective relay and equipment failures.</p> <p>TOP-003-3 (<i>Operations Reliability Data</i>)</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
	<p><b>TOP-003-3 (Approved) (included again for reference)</b></p> <p><b>R1.</b> Each Transmission Operator shall maintain a documented specification for the data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. The data specification shall include, but not be limited to:</p> <p><b>1.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p> <p><b>R2.</b> Each Balancing Authority shall maintain a documented specification for the data necessary for it to perform its analysis functions and Real-time monitoring. The data specification shall include, but not be limited to:</p> <p><b>2.2.</b> Provisions for notification of current Protection System and Special Protection</p>	<p>TOP-003-3, Requirement R1, mandates the TOP have a documented specification for the data necessary for the TOP to perform an OPA, Real-time monitoring, and RTA. Both the OPA and RTA, by definition, require an evaluation to reflect inputs from known Protection System and RAS status (change in status is implied) or degradation (including failure). TOP-003-3, Requirement R3 mandates the TOP distribute its documented specification to those entities that have the required data, which includes the BA, RC, and TOP.</p> <p>TOP-003-3, Requirement R2 mandates the BA have a documented specification for the data necessary for the BA to perform its analysis functions and Real-time monitoring, which would include inputs from Protection System and RAS status (change in status is implied) or degradation that are necessary to maintain generation-Load-Interchange balance. TOP-003-3, Requirement R4 mandates the BA distribute its documented specification to those entities that have the</p>

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	<p>System status or degradation that impacts System reliability.</p> <p><b>R3.</b> Each Transmission Operator shall distribute its data specification to entities that have data required by the Transmission Operator’s Operational Planning Analyses, Real-time monitoring, and Real-time Assessment.</p> <p><b>IRO-010-2 (Approved)</b></p> <p><b>R1.</b> The Reliability Coordinator shall maintain a documented specification for the data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments.</p>	<p>required data, which includes the BA, RC, and TOP.</p> <p>TOP-003-3, Requirement R5 builds upon the previous Requirements R1, R2, R3, and R4 described above. Requirement R5 mandates that any TOP that receives a data specification (pursuant to Requirement R3 or R4) to satisfy the obligations of the documented specifications using: a mutually agreeable format, a mutually agreeable process for resolving data conflicts, and a mutually agreeable security protocol.</p> <p><b>Common to both the GOP and TOP</b></p> <p><i>IRO-010-2 (Reliability Coordinator Data Specification and Collection)</i></p> <p>Requirement R1, mandates the RC have a documented specification for the data necessary for the RC to perform an OPA, Real-time monitoring, and RTA. Both the OPA and RTA, by definition, require an evaluation to reflect inputs from known Protection System and RAS status (change in status is implied) or degradation (including</p>

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	<p><b>1.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p>	<p>failure). IRO-010-2, Requirement R2 mandates the RC distribute its documented specification to those entities that have the required data, which includes the BA, RC, and TOP.</p> <p>IRO-010-2, Requirement R3 builds upon the previous Requirements R1 and R2 described above. Requirement R3 mandates that a TOP that receives a data specification (pursuant to Requirement R2) to satisfy the obligations of the documented specifications using: a mutually agreeable format, a mutually agreeable process for resolving data conflicts, and a mutually agreeable security protocol.</p> <p>Therefore, the reliability objective of PRC-001-1.1(ii) Requirement R2, R2.2. that mandates the TOP to notify its RC and affected BA and TOP of protective relay and equipment failures is addressed by the documented specification for the data required in TOP-003-3, Requirement R1, part 1.2. for TOP and Requirement R2, part 2.2.</p>

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
		for the BA, and IRO-010-2, Requirement R1 for the RC. The documented data specifications is required to be distributed by the TOP and will require the RC per IRO-010-2, Requirement R3 and the BA and TOP per TOP-003-3, Requirement R5 to provide current Protection System and RAS status (change in status is implied) or degradation that impacts System reliability.
<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R3.</b> A Generator Operator or Transmission Operator shall coordinate new protective systems and changes as follows.</p> <p><b>R3.1.</b> Each Generator Operator shall coordinate all new protective systems and all protective system changes with its Transmission Operator and Host Balancing Authority.</p> <ul style="list-style-type: none"> <li>Requirement R3.1 is not applicable to the individual generating units of dispersed power producing resources identified</li> </ul>	<p><b>PRC-027-1 (NERC Board approved)</b></p> <p>The mapping of PRC-001-1.1(ii), Requirements R3, R3.1 and R3.2 are addressed in a different project. See Project 2007-06 System Protection Coordination (i.e., Phase 1) concerning proposed Reliability Standard PRC-027-1.</p>	N/A

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p>through Inclusion I4 of the Bulk Electric System definition.</p> <p><b>R3.2.</b> Each Transmission Operator shall coordinate all new protective systems and all protective system changes with neighboring Transmission Operators and Balancing Authorities.</p>		
<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R4.</b> Each Transmission Operator shall coordinate Protection Systems on major transmission lines and interconnections with neighboring Generator Operators, Transmission Operators, and Balancing Authorities.</p>	<p><b>PRC-027-1 (NERC Board approved)</b></p> <p>The mapping of PRC-001-1.1(ii), Requirement R4 is addressed in a different project. See Project 2007-06 System Protection Coordination (i.e., Phase 1) concerning proposed Reliability Standard PRC-027-1.</p>	<p>N/A</p>
<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R5.</b> A Generator Operator or Transmission Operator shall coordinate changes in generation, transmission, load or operating</p>	<p>PRC-001-1.1(ii), Requirements R5, R5.1, and R5.2 are proposed for retirement. The notification in advance in Requirements R5, R5.1 and R5.2 is covered by:</p>	<p><b>Introduction – Shall notify in advance</b></p> <p>For the reasons explained under the “shall notify” sections above, the TOP will receive notifications of known current Protection Systems and RAS status (change in status is</p>

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<p>conditions that could require changes in the Protection Systems of others:</p> <p><b>R5.1.</b> Each Generator Operator shall notify its Transmission Operator in advance of changes in generation or operating conditions that could require changes in the Transmission Operator’s Protection Systems.</p> <p><b>R5.2.</b> Each Transmission Operator shall notify neighboring Transmission Operators in advance of changes in generation, transmission, load, or operating conditions that could require changes in the other Transmission Operators’ Protection Systems.</p>	<p><b>TPL-001-4 (Existing)</b></p> <p><b>R4.</b> For planning events shown in Table 1, when the analysis indicates an inability of the System to meet the performance</p>	<p>implied) or degradation (including failure) from the GOP and TOP under TOP-003-3 that was developed since the Order was issued. Advance notification to the TOP will occur through IRO-008-2, IRO-017-1 (<i>Outage Coordination</i>), and TOP-002-4 (<i>Operations Planning</i>) that were developed since the Order was issued, and through the existing TPL-001-4 (<i>Transmission System Planning Performance Requirements</i>).</p> <p><b>PRC-001-1.1(ii), R5.1 and R5.2 (shall notify in advance)</b></p> <p>The following explains how the reliability objective of the GOP and TOP coordinating changes in generation, transmission, load or operating conditions that could require changes in the Protection Systems of other TOPs.</p> <p>TPL-001-4 (<i>Transmission System Planning Performance Requirements</i>)</p> <p>Requirement R4 (Requirement R2 is inferred by reference) focuses on the Planning</p>



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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R5.</b> A Generator Operator or Transmission Operator shall coordinate changes in generation, transmission, load or operating conditions that could require changes in the Protection Systems of others:</p> <p><b>R5.1.</b> Each Generator Operator shall notify its Transmission Operator in advance of changes in generation or operating conditions that could require changes in the Transmission Operator’s Protection Systems.</p> <p><b>R5.2.</b> Each Transmission Operator shall notify neighboring Transmission Operators</p>	<p>requirements in Table 1, the Planning Assessment shall include Corrective Action Plan(s) addressing how the performance requirements will be met. Revisions to the Corrective Action Plan(s) are allowed in subsequent Planning Assessments but the planned System shall continue to meet the performance requirements in Table 1. Corrective Action Plan(s) do not need to be developed solely to meet the performance requirements for a single sensitivity case analyzed in accordance with Requirements R2, Parts 2.1.4. and 2.4.3. The Corrective Action Plan(s) shall:</p> <p><b>IRO-002-4 (Approved)</b></p> <p><b>R3.</b> Each Reliability Coordinator shall monitor Facilities, the status of Special Protection Systems, and non-BES facilities identified as necessary by the Reliability Coordinator, within its Reliability</p>	<p>Assessment<sup>33</sup> performed by either the PC or the TP with aspects Protection Systems and RAS. Additionally, the projected Contingency conditions that are evaluated under TPL-001-4 by the PC and TP are considered by the TOP in performing an OPA.</p> <p>IRO-002-4 (<i>Reliability Coordination — Monitoring and Analysis</i>)</p> <p>Requirement R3 supports the inclusion of the Reliability Coordinator in Requirement R8 of PER-005-3. This function also has a responsibility to have knowledge of Protection Systems and RAS since it is</p>

<sup>33</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a Planning Assessment is defined as a “[d]ocumented evaluation of future Transmission System performance and Corrective Action Plans to remedy identified deficiencies.”

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Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p>in advance of changes in generation, transmission, load, or operating conditions that could require changes in the other Transmission Operators’ Protection Systems.</p>	<p>Coordinator Area and neighboring Reliability Coordinator Areas to identify any System Operating Limit exceedances and to determine any Interconnection Reliability Operating Limit exceedances within its Reliability Coordinator Area.</p> <p><b>TOP-002-4 (Approved)</b></p> <p><b>R1.</b> Each Reliability Coordinator shall have data exchange capabilities with its Balancing Authorities and Transmission Operators, and with other entities it deems necessary, for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments.</p>	<p>monitoring Facilities, the status of SPSs, and non-BES facilities.</p> <p>TOP-002-4 (<i>Operations Planning</i>)</p> <p>The approved TOP-002-4, Requirement R1 that was developed since the Order was issued requires the TOP to have an OPA that will allow the TOP to assess whether its planned operations for the next day (i.e., “in advance”) within its TOP Area will exceed any of its SOLs. The OPA requires inputs to assess anticipated (pre-Contingency<sup>34</sup>) and potential (post-Contingency) conditions for next-day operations. The TOP when performing its next-day planning through an OPA, will receive the necessary data “in advance” under TOP-003-3 and evaluate the projected system conditions to assess (using knowledge) anticipated pre-Contingency and potential post-Contingency conditions for</p>

<sup>34</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a Contingency is defined as “[t]he unexpected failure or outage of a system component, such as a generator, transmission line, circuit breaker, switch or other electrical element.”

Standard: PRC-001-1.1(ii) – System Protection Coordination

Requirement/Term in Standard	Translation to Standard or Other Action	Comments
<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R5.</b> A Generator Operator or Transmission Operator shall coordinate changes in generation, transmission, load or operating conditions that could require changes in the Protection Systems of others:</p> <p><b>R5.1.</b> Each Generator Operator shall notify its Transmission Operator in advance of changes in generation or operating conditions that could require changes in the Transmission Operator’s Protection Systems.</p> <p><b>R5.2.</b> Each Transmission Operator shall notify neighboring Transmission Operators in advance of changes in generation, transmission, load, or operating conditions that could require changes in the other Transmission Operators’ Protection Systems.</p>	<p><b>TOP-003-3 (Approved)</b></p> <p><b>R1.</b> Each Transmission Operator shall maintain a documented specification for the data necessary for it to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. The data specification shall include, but not be limited to:</p> <p><b>1.2.</b> Provisions for notification of current Protection System and Special Protection System status or degradation that impacts System reliability.</p>	<p>when generation, transmission, load, or operating conditions that could require changes in the other Transmission Operator’s Protection Systems.</p> <p>By definition, an OPA evaluation shall reflect applicable inputs including Protection System and RAS status (change in status is implied) or degradation, but is not limited to:</p> <ul style="list-style-type: none"> <li>• load forecasts,</li> <li>• generation output levels,</li> <li>• Interchange,</li> <li>• known Protection System and Special Protection System status or degradation,</li> <li>• Transmission outages,</li> <li>• generator outages,</li> <li>• Facility Ratings, and</li> <li>• identified phase angle and equipment limitations.</li> </ul>

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	<p><b>IRO-008-2 (Approved)</b></p> <p><b>R1.</b> Each Reliability Coordinator shall perform an Operational Planning Analysis that will allow it to assess whether the planned operations for the next-day will exceed System Operating Limits (SOLs) and Interconnection Operating Reliability Limits (IROLs) within its Wide Area.</p> <p><b>R2.</b> Each Reliability Coordinator shall have a coordinated Operating Plan(s) for next-day operations to address potential System Operating Limit (SOL) and Interconnection Reliability Operating Limit (IROL) exceedances identified as a result of its Operational Planning Analysis as performed in Requirement R1 while considering the Operating Plans for the next-day provided by its Transmission Operators and Balancing Authorities.</p>	<p>IRO-008-2 (<i>Reliability Coordinator Operational Analyses and Real-time Assessments</i>)</p> <p>IRO-008-2, Requirement R2 requires each RC to have coordinated Operating Plan(s) for next-day operations to address potential SOL and IROL exceedances. These exceedances are identified as a result of an OPA being performed in IRO-008-2, Requirement R1 while considering the Operating Plans for the next-day provided by each BA and TOP.</p> <p>Collectively, performing the OPA under TOP-002-4 using the necessary inputs from known Protection System and RAS status (change in status is implied) or degradation (including failure), the Planning Assessment conducted under TPL-001-4, the jointly developed solutions under IRO-017-2, communication from the RC to the TOP under IRO-005-4, and the coordinated Operating Plan(s) under IRO-008-2 achieve the reliability objective of both PRC-001-</p>

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	<p><b>IRO-017-1 (Approved)</b></p> <p><b>R3.</b> Each Planning Coordinator and Transmission Planner shall provide its Planning Assessment to impacted Reliability Coordinators.</p> <p><b>R4.</b> Each Planning Coordinator and Transmission Planner shall jointly develop solutions with its respective Reliability Coordinator(s) for identified issues or conflicts with planned outages in its Planning Assessment for the Near-Term Transmission Planning Horizon.</p>	<p>1.1(ii), Requirements R5.1 and R5.2 for “when changes in generation, transmission, load, or operating conditions could require changes in the other Transmission Operator’s Protection Systems.”</p> <p><i>IRO-017-1 (Outage Coordination)</i></p> <p>IRO-017-1, Requirement R3 requires each PC and TP to provide its Planning Assessment to an impacted RC. IRO-017-1, Requirement R4 requires each PC and TP to jointly develop solutions with each respective RC for identified issues or conflicts with planned outages in its Planning Assessment for the Near-Term Transmission Planning Horizon.<sup>35</sup></p>

<sup>35</sup> Per the *Glossary of Terms Used in NERC Reliability Standards* (updated December 7, 2015), a Near-Term Transmission Planning Horizon is defined as “[t]he transmission planning period that covers Year One through five.”

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<p><b>PRC-001-1.1(ii) (Existing)</b></p> <p><b>R6.</b> Each Transmission Operator and Balancing Authority shall monitor the status of each Remedial Action Scheme in their area, and shall notify affected Transmission Operators and Balancing Authorities of each change in status.</p>	<p>Requirement R6 is being proposed for retirement. The monitoring and notification in Requirement R6 is covered by:</p> <p><b>IRO-002-4 (Approved)</b></p> <p><b>R3.</b> Each Reliability Coordinator shall monitor Facilities, the status of Special Protection Systems, and non-BES facilities identified as necessary by the Reliability Coordinator, within its Reliability Coordinator Area and neighboring Reliability Coordinator Areas to identify any System Operating Limit exceedances and to determine any Interconnection Reliability Operating Limit exceedances within its Reliability Coordinator Area.</p> <p><b>TOP-001-3 (Approved)</b></p> <p><b>R10.</b> Each Transmission Operator shall perform the following as necessary for determining System Operating Limit (SOL) exceedances within its Transmission Operator Area:</p>	<p><b>PRC-001-1.1(ii), R6 (monitoring and notification of RAS)</b></p> <p>IRO-002-4 (<i>Reliability Coordination – Monitoring and Analysis</i>)</p> <p>The reliability objective for the monitoring of RAS is addressed by IRO-002-4, Requirement R3 for the Reliability Coordinator</p> <p>TOP-001-3 (<i>Transmission Operations</i>)</p> <p>The reliability objective for the monitoring of RAS is addressed by TOP-001-3, Requirements R10 and R11 for the BA and TOP because they are required to monitor the status of a RAS.</p>

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	<p><b>10.1.</b> Within its Transmission Operator Area, monitor Facilities and the status of Special Protection Systems, and</p> <p><b>10.2.</b> Outside its Transmission Operator Area, obtain and utilize status, voltages, and flow data for Facilities and the status of Special Protection Systems.</p> <p><b>R11.</b> Each Balancing Authority shall monitor its Balancing Authority Area, including the status of Special Protection Systems that impact generation or Load, in order to maintain generation-Load-interchange balance within its Balancing Authority Area and support Interconnection frequency</p> <p><b>TOP-003-3 (approved)</b> included by reference. See the section called, “shall notify.”</p>	<p>Notification of the change in status is addressed for the reasons explained under the “shall notify” sections above. In summary, the BA and TOP will receive notifications of inputs from known Protection System and RAS status (change in status is implied) or degradation (including failure) from the applicable GOP and/or TOP under TOP-003-3 that was developed since the Order was issued.</p>