

## Standard Development Timeline

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

### Description of Current Draft

The System Protection Coordination (Phase 2) Standard Drafting Team (SPCP2SDT) is addressing Requirements R1, R2, R5, and R6 of PRC-001-1.1(ii). This proposed Reliability Standard TOP-009-1 specifically addresses Requirement R1 of PRC-001-1.1(ii). Requirements R2, R5, and R6 of PRC-001-1.1(ii) are proposed for retirement on the basis that these requirements are addressed by other Transmission Operations and Interconnection Reliability Operations (TOP/IRO) sets of Reliability Standards, as explained in the Project 2007-06.2 mapping document. Requirements R3 and R4 of PRC-001-1.1(ii) are currently being addressed by the System Protection Coordination Standard Drafting Team (SPCSDT) and are proposed to be incorporated into the new PRC-027-1 (*Coordination of Protection System Performance During Faults*) Reliability Standard. The proposed Reliability Standard TOP-009-1 is being posted for an initial 45-day formal comment period with a concurrent initial ballot to be held in the last ten days of the comment period.

Completed Actions	Date
Standard Authorization Request (SAR) posted for comment	June 11 – July 10, 2007
SAR approved by Standards Committee	August 13, 2007

Anticipated Actions	Date
45-day formal comment period with initial ballot	July 2015
45-day formal comment period with additional ballot	September 2015
10-day final ballot	November 2015
NERC Board (Board) adoption	December 2015

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

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

**Term(s):**

None.

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

## **A. Introduction**

- 1. Title:** Knowledge of Composite Protection Systems and Remedial Action Schemes and Their Effects
- 2. Number:** TOP-009-1
- 3. Purpose:** To ensure operating entities have the requisite knowledge of Composite Protection Systems and Remedial Action Schemes (RAS), and their effects, in order to operate and maintain the reliability of the Bulk Electric System (BES).
- 4. Applicability:**
  - 4.1. Functional Entities:**
    - 4.1.1.** Balancing Authority
    - 4.1.2.** Generator Operator
    - 4.1.3.** Transmission Operator
  - 4.2. Facilities:** Composite Protection Systems and Remedial Action Schemes (RAS) associated with Bulk Electric System Elements, except for the individual generating units of dispersed power producing resources identified through Inclusion I4 of the BES definition.
- 5. Effective Date:** See Project 2007-06.2 Implementation Plan

## **B. Requirements and Measures**

**Rationale for Requirement R1:** The requirement addresses the reliability objective of ensuring that the Transmission Operator (TOP) operating personnel understand Composite Protection Systems and Remedial Action Schemes (RAS) and their effects on the BES within their area.

Composite Protection Systems and RASs are an integral part of reliable BES operation. The applicable TOP personnel must understand how the Composite Protection Systems are expected to operate, limit the severity and spread of disturbances, and prevent possible damage to protected elements. Personnel are also expected to understand how RASs are expected to detect predetermined BES conditions and automatically take corrective actions.

- R1.** Each Transmission Operator shall ensure that its personnel responsible for Reliable Operation of its Transmission Operator Area have knowledge of operational functionality and effects of Composite Protection Systems and Remedial Action Schemes that are necessary to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments in order to maintain the reliability of the BES. *[Violation Risk Factor: High] [Time Horizon: Operations Planning, Same-Day Operations, Real-time Operations]*
- M1.** Each Transmission Operator shall have evidence that demonstrates the knowledge according to Requirement R1. Evidence may include, but is not limited to, the following: training (including the effects on the BES), operating guides, manuals, procedures, output of operational tools (e.g., databases or analysis programs), or outcomes of analyses, monitoring, and assessments that identify the impacts on the BES.

**Rationale for Requirement R2:** The requirement addresses the reliability objective of ensuring that the Balancing Authority (BA) operating personnel understand Composite Protection Systems and RASs and their effects on the BES within their area.

Composite Protection Systems and RASs are an integral part of reliable BES operation. The applicable BA personnel must understand how the Composite Protection Systems are expected to operate, limit the severity and spread of disturbances, and prevent possible damage to protected elements. Personnel are also expected to understand how RASs are expected to detect predetermined BES conditions and automatically take corrective actions.

- R2.** Each Balancing Authority shall ensure its personnel responsible for Reliable Operation of its Balancing Authority Area have knowledge of operational functionality and effects of Composite Protection Systems and Remedial Action Schemes that are necessary to perform its Real-time monitoring in order to maintain generation-Load-Interchange balance. *[Violation Risk Factor: High] [Time Horizon: Operations Planning, Same-Day Operations, Real-time Operations]*
- M2.** Each Balancing Authority shall have evidence that demonstrates the knowledge according to Requirement R2. Evidence may include, but is not limited to, the following: training (including the effects on the BES), operating guides, manuals, procedures, output of operational tools (e.g., databases or analysis programs), or outcomes of Real-time monitoring that identify the impacts on the BES.

**Rationale for Requirement R3:** The requirement addresses the reliability objective of ensuring that the Generator Operator (GOP) operating personnel understand Composite Protection Systems and RASs and their effects on their generating Facilities.

Composite Protection Systems and RASs are an integral part of reliable BES operation. The applicable GOP personnel must understand how the Composite Protection Systems are expected to operate, limit the severity and spread of disturbances, and prevent possible damage to protected elements. Personnel are also expected to understand how RASs are expected to detect predetermined BES conditions and automatically take corrective actions.

- R3.** Each Generator Operator shall ensure its personnel responsible for Reliable Operation of its generating Facilities have knowledge of operational functionality and effects of Composite Protection Systems and Remedial Action Schemes necessary to operate its generating Facilities in order to maintain BES reliability. *[Violation Risk Factor: High]*  
*[Time Horizon: Operations Planning, Same-Day Operations, Real-time Operations]*
- M3.** Each Generator Operator shall have evidence that demonstrates the knowledge according to Requirement R3. Evidence may include, but is not limited to, the following: training (including the effects on the generating Facilities), operating guides, manuals, procedures, interconnection agreements or studies, or access to third-party documentation.

## C. Compliance

### 1. Compliance Monitoring Process

#### 1.1. Compliance Enforcement Authority:

“Compliance Enforcement Authority” means NERC or the Regional Entity, or any entity as otherwise designated by an Applicable Governmental Authority, in their respective roles of monitoring and/or enforcing compliance with mandatory and enforceable Reliability Standards in their respective jurisdictions.

#### 1.2. Evidence Retention:

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

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

The Balancing Authority, Generator Operator, and Transmission Operator shall keep data or evidence for the current calendar year and one previous calendar year.

**1.3. Compliance Monitoring and Enforcement Program**

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

Violation Severity Levels

R #	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1.	N/A	N/A	Each Transmission Operator failed to ensure its personnel described in Requirement R1 have knowledge of operational functionality <b>or</b> effects of Composite Protection Systems and Remedial Action Schemes.	Each Transmission Operator failed to ensure its personnel described in Requirement R1 have knowledge of operational functionality <b>and</b> effects of Composite Protection Systems and Remedial Action Schemes.
R2.	N/A	N/A	The Balancing Authority failed to ensure its personnel described in Requirement R2 have knowledge of operational functionality <b>or</b> effects of Composite Protection Systems and Remedial Action Schemes.	The Balancing Authority failed to ensure its personnel described in Requirement R2 have knowledge of operational functionality <b>and</b> effects of Composite Protection Systems and Remedial Action Schemes.
R3.	N/A	N/A	The Generator Operator failed to ensure its personnel described in Requirement R3 have knowledge of operational functionality <b>or</b> effects of Composite Protection Systems and Remedial Action Schemes.	The Generator Operator failed to ensure its personnel described in Requirement R3 have knowledge of operational functionality <b>and</b> effects of Composite Protection Systems and Remedial Action Schemes.

**D. Regional Variances**

None.

**E. Associated Documents**

None.

**Version History**

<b>Version</b>	<b>Date</b>	<b>Action</b>	<b>Change Tracking</b>
1		Adopted by the NERC Board of Trustees	New standard developed under Project 2007-06.2



### Applicable Entities

The requirements of the standard apply to those personnel of the Balancing Authority, Generator Operator, and Transmission Operator that have responsibility for the Reliable Operation of their Bulk Electric System (BES) Facilities. In order to operate these Facilities reliably, personnel must have knowledge of operational functionality and effects of Composite Protection System scheme(s) and Remedial Action Schemes (RAS) applied within their purview.

The Balancing Authority, Generator Operator, and Transmission Operator will identify personnel that are required to have the requisite knowledge of Protection System scheme(s) and RASs and their effects on the BES. The entity must determine how it will ensure personnel responsible for operating and maintaining the reliability of BES Facilities have the requisite knowledge.

### Composite Protection Systems and Remedial Action Schemes

For the Transmission Operator, the set of Composite Protection Systems and RASs, for which it must have a requisite knowledge of, is linked to the protection equipment that provides operational reliability data inputs necessary to perform its Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. Other NERC Reliability Standards require the Transmission Operator to have provisions for notification of current Protection System and RAS status or degradation that impacts System reliability. Additional inputs that influence the analyses, monitoring, and assessments of Composite Protection Systems and RASs are those that have been logged into operational tools or using other methods. Composite Protection Systems and RASs that are in an abnormal or temporary state due to some issue would be inputs into the analyses, monitoring, and assessments used in Real-time operations by Transmission Operator personnel. The term “Composite Protection System” is used in the requirement to clarify that it is the complement of Protection System(s) that function collectively to protect an Element.

For the Balancing Authority, the set of Composite Protection Systems and RASs, for which it must have a requisite knowledge of, is linked to the protection equipment that provides operational reliability data inputs necessary to perform its Real-time monitoring. Other NERC Reliability Standards require the Balancing Authority to have provisions for notification of current Protection System and RAS status or degradation that impacts System reliability. Additional inputs that influence the analyses, monitoring, and assessments of Composite Protection Systems and RASs are those that have been logged into operational tools or using other methods. Composite Protection Systems and RASs that are in an abnormal or temporary state due to some issue would be inputs into the Real-time monitoring used in Real-time operations by Balancing Authority personnel. The term “Composite Protection System” is used in the requirement to clarify that it is the complement of Protection System(s) that function collectively to protect an Element.

For the Generator Operator, the set of Composite Protection Systems and RASs, for which it must have a requisite knowledge of, pertains to Composite Protection Systems and RASs that are necessary to reliably operate generating Facilities. Composite Protection Systems and RASs that are in an abnormal or temporary state due to some issue would be part of the Real-time operations knowledge of Generator Operator personnel. The term “Composite Protection

System” is used in the requirement to clarify that it is the complement of Protection System(s) that function collectively to protect an Element.

### Ownership

The personnel of each applicable entity must have knowledge of Composite Protection Systems and RASs that affect Reliable Operation of its area regardless of ownership.

### Personnel Responsible for Reliable Operations

The intent of using the phrase “personnel responsible for Reliable Operation” is to allow each entity the flexibility to identify the appropriate personnel responsible for ensuring that the BES Facilities will operate within equipment and electric system thermal, voltage, and stability limits so that instability, uncontrolled separation, or cascading failures of such system will not occur as a result of a sudden disturbance, or unanticipated failure of system elements. Personnel include those responsible for Real-time operation of the BES and those who ensure the planned Real-time reliable operation of BES Facilities. Having the ability to call upon a resource, such as a protection and control person, would not be an example of having the requisite knowledge intended by the standard.

### Requirement R1

The Transmission Operator operates the BES in Real-time to maintain reliability. To accomplish this, the Transmission Operator must have an understanding of those Composite Protection Systems and RASs that are important to reliability. This includes understanding the operational functionality of how the Composite Protection Systems and RASs are applied, and how each affects Real-time operation of the BES. Additionally, this would include an understanding whether the Composite Protection System or RAS functions as expected or fails to operate. Operational functionality is not intended to be handled to the specificity of Reliability Standards that address coordination of Protection Systems during faults. Rather, the requirement addresses the overall operational functionality needed and the effects when operating to maintain the reliability of the BES.

For example, the knowledge and their effects on the BES include, but are not limited to, the following items:

- RAS intended function
- RAS failure to operate when intended
- RAS operates when not intended
- Composite Protection System susceptibility to trip on load
- Composite Protection System trip for out of section faults
- Composite Protection System failure to trip for in section faults
- Composite Protection System impact on loading limits, including System Operating Limits (SOL) and Interconnection Reliability Operating Limits (IROL)
- Composite Protection System impact when failed or out of service
- Composite Protection System function for loss of inputs (current, potential, communication path)
- Operational Planning Analysis

### Requirement R2

The Balancing Authority is responsible for maintaining resource-demand balance within its Balancing Authority Area. In order to accomplish this, the Balancing Authority personnel must have an understanding of Composite Protection Systems and RASs. This includes understanding the operational functionality of how the Composite Protection Systems and RASs are applied, and how they affect balancing of load and resources. Additionally, this would include an understanding whether the Composite Protection System or RAS functions as expected or fails to operate. Operational functionality is not intended to be handled to the specificity of Reliability Standards that address coordination of Protection System performance during faults. Rather, the requirement addresses the overall operational functionality needed and the effects when operating to maintain the reliability of the BES. An example of having knowledge would be a RAS operation resulting in a generating unit trip or ramp that affects the BES.

### Requirement R3

The Generator Operator supports the needs of the BES up to the limits of the generating Facilities within its purview. It is essential for the Generator Operator to have knowledge of Composite Protection Systems and RASs in its generating Facilities, and the extent of their effect on the BES. This includes understanding the operational functionality of how the Composite Protection Systems and RASs are applied and their effects on Real-time operation of generating units. Additionally, this would include whether the Composite Protection System or RAS functions as expected or failed to operate.

For example, the knowledge and their effects on the BES include, but is not limited to, the following items:

- RAS intended function
- RAS failure to operate when intended
- RAS operates when not intended
- Composite Protection System impact when failed or out of service
- Composite Protection System function for loss of inputs (current, potential, communication path)

Examples of Composite Protection Systems and RASs to consider include, but are not limited to:

- RAS that initiates trip or ramp of a generating unit
- Generator unit differential scheme
- Generator step-up (GSU) transformer differential scheme
- Generator connected to a transmission line with a line-differential scheme
- Direct Transfer Trip Schemes
- Generator connected to a bus with a differential scheme

## **Rationale**

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