

**Reliability Standard Audit Worksheet[[1]](#footnote-2)**

PRC-027-1 – Coordination of Protection System Performance During Faults

***This section to be completed by the Compliance Enforcement Authority.***

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| **Audit ID:** | Audit ID if available; or REG-NCRnnnnn-YYYYMMDD |
| **Registered Entity:**  | Registered name of entity being audited |
| **NCR Number:**  | NCRnnnnn |
|  **Compliance Enforcement Authority:** | Region or NERC performing audit |
| **Compliance Assessment Date(s)[[2]](#footnote-3):** | Month DD, YYYY, to Month DD, YYYY |
| **Compliance Monitoring Method:**  | [On-site Audit | Off-site Audit | Spot Check] |
| **Names of Auditors:**  | Supplied by CEA |

# **Applicability of Requirements**

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| **R1** |  | X[[3]](#footnote-4) | X |  |  |  |  |  |  |  |  | X |  |  |  |
| **R2** |  | X3 | X |  |  |  |  |  |  |  |  | X |  |  |  |
| **R3** |  | X3 | X |  |  |  |  |  |  |  |  | X |  |  |  |

**Legend:**

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| Text with blue background: | Fixed text – do not edit |
| Text entry area with Green background: | Entity-supplied information |
| Text entry area with white background: | Auditor-supplied information |

Findings

**(This section to be completed by the Compliance Enforcement Authority)**

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| **Req.** | **Finding** | **Summary and Documentation** | **Functions Monitored** |
| **R1** |  |  |  |
| **R2** |  |  |  |
| **R3** |  |  |  |

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| **Req.** | **Areas of Concern** |
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| **Req.** | **Recommendations** |
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| **Req.** | **Positive Observations** |
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Subject Matter Experts

Identify the Subject Matter Expert(s) responsible for this Reliability Standard.

**Registered Entity Response (Required; Insert additional rows if needed):**

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| **SME Name** | **Title** | **Organization** | **Requirement(s)** |
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R1 Supporting Evidence and Documentation

1. Each Transmission Owner, Generator Owner, and Distribution Provider shall establish a process for developing new and revised Protection System settings for BES Elements, such that the Protection Systems operate in the intended sequence during Faults. The process shall include:
	1. A review and update of short-circuit model data for the BES Elements under study.
	2. A review of the developed Protection System settings.
	3. For Protection System settings applied on BES Elements that electrically join Facilities owned by separate functional entities (Transmission Owners, Generator Owners, and Distribution Providers), provisions to:
		1. Provide the proposed Protection System settings to the owner(s) of the electrically joined Facilities.
		2. Respond to any owner(s) that provided its proposed Protection System settings pursuant to Requirement R1, Part 1.3.1 by identifying any coordination issue(s) or affirming that no coordination issue(s) were identified.
		3. Verify that identified coordination issue(s) associated with the proposed Protection System settings for the associated BES Elements are addressed prior to implementation.
		4. Communicate with the other owner(s) of the electrically-joined Facilities regarding revised Protection System settings resulting from unforeseen circumstances that arise during implementation or commissioning, Misoperation investigations, maintenance activities, or emergency replacements required as a result of Protection System component failure.
2. Acceptable evidence may include, but is not limited to, dated electronic or hard copy documentation to demonstrate that the responsible entity established a process to develop settings for its Protection Systems, in accordance with Requirement R1.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Evidence Requested[[4]](#endnote-2):

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| **Provide the following evidence, or other evidence to demonstrate compliance.**  |
| The entity’s documented process (that includes Part 1.1 through Part 1.3) to develop new and revised Protection System settings for its BES Protection Systems to operate in the intended sequence during Faults. |

Registered Entity Evidence (Required):

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| **The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.** |
| **File Name** | **Document Title** | **Revision or Version** | **Document Date** | **Relevant Page(s) or Section(s)** | **Description of Applicability of Document** |
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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to PRC-027-1, R1

***This section to be completed by the Compliance Enforcement Authority***

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|  | Review entity’s documented process to develop new and revised Protection System settings for its BES Protection Systems to operate in the intended sequence during Faults, and verify that it includes: |
|  | (Part 1.1) A review and update of short-circuit models for the BES Elements under study. |
|  | (Part 1.2) A review of the developed Protection System settings. |
|  | (Part 1.3) For Protection System settings applied on BES Elements that electrically join Facilities owned by separate functional entities (Transmission Owners, Generator Owners, and Distribution Providers), provisions to:  |
|  | (Part 1.3.1) Provide the owners of the electrically joined Facilities the proposed Protection System settings. |
|  | (Part 1.3.2) Respond to the owners regarding the proposed Protection System settings. The response shall identify any coordination issue(s) or affirm that no coordination issue(s) were identified. |
|  | (Part 1.3.3) Verify that any identified coordination issue(s) associated with the proposed Protection System settings for the associated Elements are addressed prior to implementation. |
|  | (Part 1.3.4) Communicate with the other owners of the electrically-joined Facilities regarding revised Protection System settings resulting from unforeseen circumstances that arise during: |
|  | Implementation or commissioning. |
|  | Misoperation investigations. |
|  | Maintenance activities. |
|  | Emergency replacements required as a result of Protection System component failure. |
| **Note to Auditor:** In cases where a single protective relaying group performs coordination work for separate functional entities within an organization, the communication aspects of Requirement R1, Part 1.3 can be demonstrated by internal documentation. |

Auditor Notes:

R2 Supporting Evidence and Documentation

1. Each Transmission Owner, Generator Owner, and Distribution Provider shall, for each BES Element with Protection System functions identified in Attachment A:
* Option 1: Perform a Protection System Coordination Study in a time interval not to exceed six-calendar years; or
* Option 2: Compare present Fault current values to an established Fault current baseline and perform a Protection System Coordination Study when the comparison identifies a 15 percent or greater deviation in Fault current values (either three phase or phase to ground) at a bus to which the BES Element is connected, all in a time interval not to exceed six-calendar years;[[5]](#footnote-5) or,
* Option 3: Use a combination of the above.
1. Acceptable evidence may include, but is not limited to, dated electronic or hard copy documentation to demonstrate that the responsible entity performed Protection System Coordination Study(ies) and/or Fault current comparisons in accordance with Requirement R2.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Evidence Requestedi:

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| **Provide the following evidence, or other evidence to demonstrate compliance.**  |
| Evidence of either (1) a review of existing Protection Systems demonstrated by a Protection System Coordination Study (PSCS) for each BES Element with Protection System functions identified in Attachment A performed within the six-calendar year time frame, or (2) the Fault current comparison and results for each BES Element with Protection System functions identified in Attachment A performed within a six-calendar year time frame, as well as any resulting PSCS when the Fault current comparison deviated by 15% or more, or a combination of the two. |

Registered Entity Evidence (Required):

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| **The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.** |
| **File Name** | **Document Title** | **Revision or Version** | **Document Date** | **Relevant Page(s) or Section(s)** | **Description of Applicability of Document** |
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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to PRC-027-1, R2

***This section to be completed by the Compliance Enforcement Authority***

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|  | For all, or a sample of BES Elements with Protection System functions identified in Attachment A, review evidence and verify each associated Protection System Coordination Study was performed according to one of the required options. |
| **Note to Auditor:** For each option under Requirement R2, the six-calendar-year interval begins on the effective date of PRC-027-1. The initial Protection System Coordination Study(ies) for Option 1, and the Fault current comparison(s) and any Protection System Coordination Study(ies) required as a result of the Fault current comparison(s) in Option 2 must be completed in accordance with Requirement R2 no later than six-calendar years after the effective date of PRC-027-1. However, applicable entities using Option 2 for their initial performance of Requirement R2 must establish an initial Fault current baseline by the effective date of PRC-027-1. |

Auditor Notes:

R3 Supporting Evidence and Documentation

1. Each Transmission Owner, Generator Owner, and Distribution Provider shall utilize its process established in Requirement R1 to develop new and revised Protection System settings for BES Elements.
2. Acceptable evidence may include, but is not limited to, dated electronic or hard copy documentation to demonstrate that the responsible entity utilized its settings development process established in Requirement R1, as specified in Requirement R3.

**Registered Entity Response (Required):**

**Compliance Narrative:**

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Evidence Requestedi:

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| **Provide the following evidence, or other evidence to demonstrate compliance.**  |
| New and revised Protection System settings for BES Elements during the audit period. |
| Evidence the entity reviewed and updated the information required to develop new or revised Protection System settings for BES Elements in accordance with its process (identified in R1 Part 1.1). Such information required to coordinate Protection Systems may, but is not required to, include short-circuit databases, line and transformer impedances, station configurations, current and voltage transformer ratios, adjacent Protection System settings, and relay and control functional drawings. |
| Evidence, of entity’s review of Protection System settings (identified in R1 Part 1.2).  |
| A list of changes with interconnected entities applied on BES Elements that electrically join Facilities owned by separate functional entities. |
| Evidence proposed Protection System settings were provided to the owners of electrically joined Facilities |
| Identification of proposed Protection System settings provided by the owners of electrically joined Facilities |
| Responses to any owner(s) that provided its proposed Protection System settings pursuant to Requirement R1, Part 1.3.1 which identify any coordination issue(s) or affirming that no coordination issue(s) were identified |
| Evidence of verification of identified coordination issue(s) associated with the proposed Protection System settings for the associated BES Elements are addressed prior to implementation |
| Evidence of communication with the other owner(s) of the electrically joined Facilities regarding revised Protection System settings resulting from unforeseen circumstances |

Registered Entity Evidence (Required):

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| **The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.** |
| **File Name** | **Document Title** | **Revision or Version** | **Document Date** | **Relevant Page(s) or Section(s)** | **Description of Applicability of Document** |
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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to PRC-027-1, R3

***This section to be completed by the Compliance Enforcement Authority***

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|  | Review evidence and verify the entity utilized the following processes established in accordance with Requirement R1: |
|  | A review and update of short-circuit models for the BES Elements under study (identified in R1 Part 1.1). |
|  | A review of the developed Protection System settings. (identified in R1 Part 1.2). |
|  | For Protection System settings applied on BES Elements that electrically join Facilities owned by separate functional entities (Transmission Owners, Generator Owners, and Distribution Providers), procedures identified in Requirement R1 Part 1.3 to: |
|  | Provide the owners of the electrically-joined Facilities the proposed Protection System settings. |
|  | Respond to the owners regarding the proposed Protection System settings. The response shall identify any coordination issue(s) or affirm that no coordination issue(s) were identified. |
|  | Verify that any identified coordination issue(s) associated with the proposed Protection System settings for the associated Elements are addressed prior to implementation. |
|  | Communicate with the other owners of the electrically-joined Facilities regarding revised Protection System settings resulting from unforeseen circumstances that arise during:* + Implementation or commissioning.
	+ Misoperation investigations.
	+ Maintenance activities.
	+ Emergency replacements required due to Protection System component failure.
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| **Note to Auditor:** Evidence of utilization provides reasonable assurance that the processes established in Requirement R1 are occurring.In cases where a single protective relaying group performs coordination work for separate functional entities within an organization, the communication aspects of Requirement R1, Part 1.3 can be demonstrated by internal documentation. |

Auditor Notes:

Additional Information:

Reliability Standard



In addition to the Reliability Standard, there is an applicable Implementation Plan available on the NERC Web Site.

In addition to the Reliability Standard, there is background information available on the NERC Web Site.

Capitalized terms in the Reliability Standard refer to terms in the NERC Glossary, which may be found on the NERC Web Site.

Sampling Methodology

Sampling is essential for auditing compliance with NERC Reliability Standards since it is not always possible or practical to test 100% of either the equipment, documentation, or both, associated with the full suite of enforceable standards. The Sampling Methodology Guidelines and Criteria (see NERC website), or sample guidelines, provided by the Electric Reliability Organization help to establish a minimum sample set for monitoring and enforcement uses in audits of NERC Reliability Standards.

Regulatory Language

[FERC Order No. 847](https://www.nerc.com/FilingsOrders/us/FERCOrdersRules/Order%20No.%20847%20Approving%20PRC-027-1%20and%20PER-006-1.pdf):

Paragraph 15: “Reliability Standard PRC-027-1 improves on currently-effective Reliability Standard PRC-001-1.1(ii) by: (1) modifying the applicability section to include the appropriate functional entity types with the responsibilities, resources, and skill sets to conduct the studies required to coordinate protection systems, and (2) listing the protection system functions on all bulk electric system elements that require coordination….”

Paragraph 28: “…The record in this proceeding supports the NOPR’s conclusion that mis-coordination of protection systems may pose a potential reliability risk and, as currently drafted, Reliability Standard PRC-027-1, Requirement R2, Option 2 permits applicable entities to forego protection system coordination studies under certain circumstances. However, we are persuaded by the statements from NERC and other commenters that applicable entities generally perform, or will choose to perform for their significant facilities, protection system coordination studies even in the absence of a Reliability Standard requirement. We also recognize the concern raised by commenters regarding the burden of compliance. Specifically, we recognize the concern that were the NOPR directive adopted, applicable entities could be required to re-run protection system coordination studies for the sole purpose of generating compliance documentation, even if such entities already performed protection system coordination studies that remain valid but lack documentation to substantiate compliance. Accordingly, pursuant to 215(d)(2) of the FPA, we approve Reliability Standard PRC-027-1 and do not direct modifications to the Reliability Standard.”

Selected Glossary Terms

The following Glossary terms are provided for convenience only. Please refer to the NERC web site for the current enforceable terms.

**Fault** - An event occurring on an electric system such as a short circuit, a broken wire, or an intermittent connection.

**Protection** **System** - 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.

**Protection System Coordination Study** - An analysis to determine whether Protection Systems operate in the intended sequence during Faults.

Revision History for RSAW

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| **Version** | **Date** | **Reviewers** | **Revision Description** |
| 1 | 06/19/2019 | RSAW Task Force, Compliance Assurance | New Document |
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1. NERC developed this Reliability Standard Audit Worksheet (RSAW) language in order to facilitate NERC’s and the Regional Entities’ assessment of a registered entity’s compliance with this Reliability Standard. The NERC RSAW language is written to specific versions of each NERC Reliability Standard. Entities using this RSAW should choose the version of the RSAW applicable to the Reliability Standard being assessed. While the information included in this RSAW provides some of the methodology that NERC has elected to use to assess compliance with the requirements of the Reliability Standard, this document should not be treated as a substitute for the Reliability Standard or viewed as additional Reliability Standard requirements. In all cases, the Regional Entity should rely on the language contained in the Reliability Standard itself, and not on the language contained in this RSAW, to determine compliance with the Reliability Standard. NERC’s Reliability Standards can be found on NERC’s website. Additionally, NERC Reliability Standards are updated frequently, and this RSAW may not necessarily be updated with the same frequency. Therefore, it is imperative that entities treat this RSAW as a reference document only, and not as a substitute or replacement for the Reliability Standard. It is the responsibility of the registered entity to verify its compliance with the latest approved version of the Reliability Standards, by the applicable governmental authority, relevant to its registration status.

The NERC RSAW language contained within this document provides a non‑exclusive list, for informational purposes only, of examples of the types of evidence a registered entity may produce or may be asked to produce to demonstrate compliance with the Reliability Standard. A registered entity’s adherence to the examples contained within this RSAW does not necessarily constitute compliance with the applicable Reliability Standard, and NERC and the Regional Entity using this RSAW reserves the right to request additional evidence from the registered entity that is not included in this RSAW. Additionally, this RSAW includes excerpts from FERC Orders and other regulatory references. The FERC Order cites are provided for ease of reference only, and this document does not necessarily include all applicable Order provisions. In the event of a discrepancy between FERC Orders, and the language included in this document, FERC Orders shall prevail. [↑](#footnote-ref-2)
2. Compliance Assessment Date(s): The date(s) the actual compliance assessment (on-site audit, off-site spot check, etc.) occurs. [↑](#footnote-ref-3)
3. Distribution Provider that owns Protection Systems installed to detect and isolate Faults on BES Elements under Section 4.2 of the Standard. [↑](#footnote-ref-4)
4. Items in the Evidence Requested section are suggested evidence that may, but will not necessarily, demonstrate compliance. These items are not mandatory and other forms and types of evidence may be submitted at the entity’s discretion. [↑](#endnote-ref-2)
5. The initial Fault current baseline(s) shall be established by the effective date of this Reliability Standard and updated each time a Protection System Coordination Study is performed. If an initial baseline was not established by the effective date of this Reliability Standard because of the previous use of an alternate option or the installation of a new Element, the entity may establish the baseline by performing a Protection System Coordination Study. [↑](#footnote-ref-5)