

Standard Development Roadmap

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

Development Steps Completed:

1. SC approves SAR for posting on June 5, 2007.
2. The SAR was posted for comment from June 11, 2007–July 10, 2007.
3. The SC approves the members of the standard drafting team on October 11, 2007.

Description of Current Draft:

This is the initial draft of the Standard. This draft of the standard revises the previous PRC-001-1 Standard. It addresses the planning and non-operational issues identified by the System Protection and Control Task Force for PRC-001 as well as those identified in FERC Order 693. It also brings the standard into conformance with the “Standard Review Guidelines.”

The draft standard has refocused the requirements on the planning time frame and addressed important Protection System coordination issues that were not previously in the Standard. The draft standard has added requirements to ensure that Protection System designs and settings are communicated between and accepted by interconnecting entities which will assist Protection Systems to function in an integrated manner. Requirements that deal with operating issues are transferred to the appropriate drafting team(s) revising the operating standards. These previous requirements were R2, R5 and R6 which will be covered in TOP-001-2, TOP-003-1 and IRO-10-1 (currently covers part of R6). The old requirement R1 has been redeveloped into the new R6 and R7 which deal with providing Protection System information separately to the Transmission Operator and the Generator Operator. The training aspects of that requirement are properly addressed in the PER series of standards including PER-005-1.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Respond to comments from first posting of standard and post revision 2 of the standard if needed	4Q09
2. Respond to comments from second posting of standard and post revision 3 of the standard if needed	1Q10
3. Submit standard for balloting	2Q10
4. Submit standard to BOT	3Q10
5. Submit to regulatory authorities for approval	4Q10

Definitions of Terms Used in Standard

System Protection Coordination — the design and setting of Protection Systems so that they remove the minimum number of power system elements from service when clearing faults while meeting the performance requirements specified within the NERC Transmission Planning (TPL) reliability standards.

A. Introduction

1. **Title:** System Protection Coordination
2. **Number:** PRC-001-2
3. **Purpose:** To ensure that System Protection Coordination is achieved and to ensure that real-time operating personnel have the information needed to react to the operations of Protection Systems and Transmission Planners have Protection System information to perform planning functions.
4. **Applicability:**
 - 4.1. **Functional Entities:**
 - 4.1.1 Transmission Owners.
 - 4.1.2 Generator Owners.
 - 4.1.3 Distribution Providers that own transmission Protection Systems or that interconnect with Generator Owners.
 - 4.2. **Facilities:** All generation and transmission Protection Systems owned by the functional entities listed in 4.1 that require System Protection Coordination as defined in this standard.
5. **Proposed Effective Date:**

In those jurisdictions where no regulatory approval is required, the standard shall become effective on the first day of the first calendar quarter, three months after BOT adoption.

In those jurisdictions where regulatory approval is required, the standard shall become effective on the first day of the first calendar quarter, three months after applicable regulatory approval.

Requirement R5, Part 5.1 shall be retired six years after its initial effective date.

Requirement R6, Part 6.1 shall be retired six years after its initial effective date.

B. Requirements

- R1. Each Transmission Owner, Distribution Provider and Generator Owner shall provide its Protection System settings and scheme types (e.g. Directional Comparison Blocking, Permissive Overreaching Transfer Trip or Direct Underreaching Transfer Trip) within one month of receipt of request to other owners of Facilities to which they are interconnected for the purpose of ensuring that the existing Protection Systems are coordinated. [*Violation Risk Factor: Lower*]
- R2. Each Generator Owner shall complete the actions in accordance with PRC-001-Attachment 1 for any of the following to achieve System Protection Coordination:
 - 2.1. Installing any new Protection System
 - 2.2. Revising any existing Protection System

- 2.3. Making any system configuration change that is not on the interconnection and may impact System Protection Coordination
 - 2.4. Making any Protection System change that is not on the interconnection and may impact System Protection Coordination. *[Violation Risk Factor: Medium]*.
- R3.** Each Transmission Owner and Distribution Provider shall complete the actions in accordance with the applicable PRC-001-Attachment 2 and/or Attachment 3 for any of the following to achieve System Protection Coordination:
 - 3.1. Installing any new Protection System
 - 3.2. Revising any existing Protection System
 - 3.3. Making system configuration changes that are not on the interconnection and may impact System Protection Coordination
 - 3.4. Making Protection System changes that are not on the interconnection and may impact System Protection Coordination. *[Violation Risk Factor: Medium]*.
- R4.** Each Generator Owner, Distribution Provider, and Transmission Owner shall provide requested Protection System information to its Transmission Planner or Planning Coordinator within one month of receipt of the request from the Transmission Planner or Planning Coordinator to facilitate required planning studies. *[Violation Risk Factor: Medium]*
- R5.** Each Transmission Owner and Distribution Provider shall provide its Transmission Operator, as specified in Requirement R5, Parts 5.1, 5.2 and 5.3, information about its transmission Protection System schemes to promote informed operating decisions. *[Violation Risk Factor: Medium]*
 - 5.1. No later than six months following the effective date of the Standard the general description, purpose and limitations of each existing type of transmission Protection System scheme applied on its system
 - 5.2. A general description, purpose and limitations of any new type of transmission Protection System scheme applied on its system prior to the new Protection System's in-service date.
 - 5.3. Requested technical information concerning specific Protection Systems within one month of receipt of request.
- R6.** Each Generator Owner shall provide its Generator Operator, as specified in Requirement R6, Parts 6.1, 6.2 and 6.3, the information about its generator Protection System schemes to promote informed operating decisions. *[Violation Risk Factor: Medium]*
 - 6.1. No later than six months following the effective date of the Standard the general description, purpose and limitations of each existing type of generator Protection System scheme applied.
 - 6.2. A general description, purpose and limitations of its new type of generator Protection System scheme prior to the Protection System's in-service date.

- 6.3.** Requested technical information concerning its specific Protection Systems within one month of receipt of request from the Generator Operator.

C. Associated Documents

Measures and Compliance Elements will be added to a later draft.

The following document presents useful information for completing the requirements of the standard PRC-001-2.

PRC-001-2 System Protection Coordination Supplementary Reference — September 2009.

Version History

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New
0	August 8, 2005	Removed “Proposed” from Effective Date	Errata
0	August 25, 2005	Fixed Standard number in Introduction from PRC-001-1 to PRC-001-0	Errata
1	November 1, 2006	Adopted by Board of Trustees	Revised
1	April 4, 2007	Regulatory Approval — Effective Date	New
2		Complete revision for Project 2007-06	Revised

PRC-001 — Attachment 1

Procedure for Coordination of Generator Owner's New or Revised Protection Systems

Conditions:

At least six months¹ prior to the proposed in-service date of any of the following:

- A new or revised Protection System that is interconnected with a Transmission Owner's Facilities or a Distribution Provider's Facilities
- A system configuration change or Protection System change that is not on the interconnection but may impact System Protection Coordination on the interconnection

Note: Equipment replaced as a result of component failure with functional equivalents shall have its description and implemented settings provided within a month after the in service date.

Steps:

1. The Generator Owner shall, as a minimum, provide the following information to the affected Transmission Owner or Distribution Provider:

- Scheme type
- Drawing(s) showing the relay(s) and its (their) ac source(s)
- Applied instrument transformer ratio(s) and configuration(s)
- Type of relay(s) and communication equipment applied for protection

If requested, the Generator Owner shall also provide the affected Transmission Owner or Distribution Provider with following information if applicable to the proposed change:

- Generator off-nominal frequency and voltage operating limits
- Main transformer connection configuration
- Main transformer tap position(s) and impedance (positive and zero sequence) and neutral grounding impedances
- Transmission line impedances (positive and zero sequence) and mutual coupled impedances (zero sequence)
- Generator impedances (saturated and unsaturated reactances that include direct and quadrature axis, negative and zero sequence impedances and their associated time constants)
- The function of all protective elements that result in a generator trip

2. The affected Transmission Owner or Distribution Provider shall review the information provided in step 1 from the Generator Owner (for the purpose of Protection System Coordination) and respond regarding adequacy of the data in the submittal to the Generator Owner within one month¹ of having received the information.

¹ The time restrictions do not apply to changes that are a reaction to failures of components in Protection Systems if the replacement of components is with functional equivalents.

3. The Transmission Owner or Distribution Provider and the Generator Owner shall mutually agree on the scope and schedule for implementing the new or proposed revisions.
 - The Transmission Owner or Distribution Provider and the Generator Owner shall either mutually agree or begin a resolution process within two months¹ after completion of step 2.
 - If mutual agreement cannot be reached and there is a resolution process specified in an agreement, that process shall be followed; otherwise, the responsible regional reliability organization process shall be followed.
 - If no regional reliability organization resolution process is available, apply the Transmission Owner's Facilities connection requirements.
4. The Generator Owner shall provide the affected Transmission Owner or Distribution Provider the proposed new or revised device settings on Facilities interconnected with the Transmission Owner or Distribution Provider according to the agreed upon schedule or at least two months¹ prior to the in-service date of the new or proposed revisions to the Protection System.
5. The Transmission Owner or Distribution Provider shall review the information provided by the Generator Operator in step 4 (for the purpose of Protection System coordination) and respond regarding adequacy of the device settings according to the agreed upon schedule or within one month¹ of having received the information.
6. The Generator Owner and the affected Transmission Owner or Distribution Provider shall document agreement on the Protection System design and settings and shall implement any changes related to Protection System Coordination on the interconnected Facilities on an agreed upon schedule prior to the in-service date.

¹ The time restrictions do not apply to changes that are a reaction to failures of components in Protection Systems if the replacement of components is with functional equivalents.

PRC-001 — Attachment 2

Procedure for Coordination of Transmission Owner's and Distribution Provider's New or Revised Protection Systems with Generator Owner

Conditions:

At least six months¹ prior to the proposed in-service date of any of the following:

- A new or revised Protection System that is interconnected with a Generator Owner's Facilities.
- A system configuration change or Protection System change that is not on the interconnection but may impact System Protection Coordination on the interconnection.

Note: Equipment replaced as a result of component failure with functional equivalents shall have its description and implemented settings provided within a month after the in service date.

Steps:

1. The Transmission Owner or Distribution Provider shall, as a minimum, provide the following information to the affected Generator Owner:

- Scheme type
- Drawing(s) showing the relay(s) and its (their) ac source(s),
- Applied instrument transformer ratio(s) and configuration(s),
- Type of relay(s) and communication equipment applied for protection.

If requested, the Transmission Owner or Distribution Provider shall also provide the affected Generation Owner with following information if applicable to the proposed change:

- Regional Reliability Organization's off-nominal frequency plan
- Any transformer connection configuration with transformer tap position(s) and impedance (positive and zero sequence) and neutral grounding impedances
- Transmission line impedances (positive and zero sequence) and mutual coupled impedances (zero sequence)
- The function of all protective elements that trip the interconnected facility
- Results of fault study or short circuit model
- Results of stability studies
- Applied communication-aided protection schemes

¹ The time restrictions do not apply to changes that are a reaction to failures of components in Protection Systems if the replacement of components is with functional equivalents.

2. The affected Generator Owner shall review the information provided in step 1 from the Transmission Owner or Distribution Provider (for the purpose of Protection System Coordination) and respond regarding adequacy of the data in the submittal to the Generator Owner within one month¹ of having received the information.
3. The Transmission Owner or Distribution Provider and the Generator Owner shall mutually agree on the scope and schedule for implementing the new or proposed revisions.
 - The Transmission Owner or Distribution Provider and the Generator Owner shall either mutually agree or begin a resolution process within two months¹ after completion of step 2.
 - If mutual agreement cannot be reached and there is a resolution process specified in an agreement, that process shall be followed; otherwise, the responsible regional reliability organization process shall be followed.
 - If no regional reliability organization resolution process is available, apply the Transmission Owner's Facilities connection requirements.
4. The Transmission Owner or Distribution Provider shall provide the affected Generator Owner the proposed new or revised device settings on Facilities interconnected with the Transmission Owner or Distribution Provider according to the agreed upon schedule or at least two months¹ prior to the in-service date of the new or proposed revisions to the Protection System.
5. The Generator Owner shall review the information provided by the Transmission Owner or Distribution Provider in step 4 (for the purpose of Protection System coordination) and respond regarding adequacy of the device settings according to the agreed upon schedule or within one month¹ of having received the information.
6. The Transmission Owner or Distribution Provider and the affected Generator Owner shall document agreement on the Protection System design and settings and shall implement any changes related to Protection System Coordination on the interconnected Facilities on an agreed upon schedule prior to the in-service date.

PRC-001 — Attachment 3

Procedure for Coordination of Transmission Owner's and Distribution Provider's New or Revised Protection Systems with another Transmission Owner or Distribution Provider.

Conditions:

At least six months¹ prior to the proposed in-service date of any of the following:

- A new or revised Protection System that is interconnected with a Transmission Owner's or Distribution Provider's Facilities.
- A system configuration change or Protection System change that is not on the interconnection but may impact System Protection Coordination on the interconnection.

Note: Equipment replaced as a result of component failure with functional equivalents shall have its description and implemented settings provided within a month after the in service date.

Steps:

1. The Transmission Owner or Distribution Provider shall, as a minimum, provide the following information to the affected Transmission Owner or Distribution Provider:
 - Scheme type
 - Drawing(s) showing the relay(s) and its (their) ac source(s),
 - Applied instrument transformer ratio(s) and configuration(s),
 - Type of relay(s) and communication equipment applied for protection.

If requested, the Transmission Owner or Distribution Provider shall also provide the affected Transmission Owner or Distribution Provider with the following information if applicable to the proposed change:

- Regional Reliability Organization's off-nominal frequency plan
- Any transformer connection configuration with transformer tap position(s) and impedance (positive and zero sequence) and neutral grounding impedances
- Transmission line impedances (positive and zero sequence) and mutual coupled impedances (zero sequence)
- The function of all protective elements that trip the interconnected facility
- Results of fault study or short circuit model
- Results of stability studies
- Applied communication-aided protection schemes

¹ The time restrictions do not apply to changes that are a reaction to failures of components in Protection Systems if the replacement of components is with functional equivalents.

2. The affected Transmission Owner or Distribution Provider shall review the information provided in step 1 from the Transmission Owner or Distribution Provider (for the purpose of Protection System Coordination) and respond regarding adequacy of the data in the submittal to the Transmission Owner or Distribution Provider within one month¹ of having received the information.
3. The Transmission Owner or Distribution Provider and the other Transmission Owner or Distribution Provider shall mutually agree on the scope and schedule for implementing the new or proposed revisions.
 - The Transmission Owner or Distribution Provider and the other Transmission Owner or Distribution Provider shall either mutually agree or begin a resolution process within two months¹ after completion of step 2.
 - If mutual agreement cannot be reached, then a resolution process as specified in the applicable agreements, by the responsible reliability organization, or by the appropriate regulatory authority shall be followed.
4. The Transmission Owner or Distribution Provider shall provide the affected Transmission Owner or Distribution Provider the proposed new or revised device settings on Facilities interconnected with the Transmission Owner or Distribution Provider according to the agreed upon schedule or at least two months¹ prior to the in-service date of the new or proposed revisions to the Protection System.
5. The affected Transmission Owner or Distribution Provider shall review the information provided by the Transmission Owner or Distribution Provider in step 4 (for the purpose of Protection System coordination) and respond regarding adequacy of the device settings according to the agreed upon schedule or within one month¹ of having received the information.
6. The Transmission Owner or Distribution Provider and the affected Transmission Owner or Distribution Provider shall document agreement on the Protection System design and settings and shall implement any changes related to Protection System Coordination on the interconnected Facilities on an agreed upon schedule prior to the in-service date.

¹ The time restrictions do not apply to changes that are a reaction to failures of components in Protection Systems if the replacement of components is with functional equivalents.