

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

PRC-023-2 – Transmission Relay Loadability

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

**Registered Entity:**

**NCR Number:**

**Applicable Function(s):** DP, GO, PA\PC, TO

 **Compliance Assessment Date:**

**Compliance Monitoring Method:**

**Names of Auditors:**

**Subject Matter Experts**

Identify Subject Matter Expert(s) responsible for this Reliability Standard. (Insert additional rows if necessary)

**Registered Entity Response (Required):**

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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 use any one of the following criteria (Requirement R1, criteria 1 through 13) for any specific circuit terminal to prevent its phase protective relay settings from limiting transmission system loadability while maintaining reliable protection of the BES for all fault conditions. Each Transmission Owner, Generator Owner, and Distribution Provider shall evaluate relay loadability at 0.85 per unit voltage and a power factor angle of 30 degrees. *[Violation Risk Factor: High] [Time Horizon: Long Term Planning].*

Criteria:

* 1. Set transmission line relays so they do not operate at or below 150% of the highest seasonal Facility Rating of a circuit, for the available defined loading duration nearest 4 hours (expressed in amperes).
	2. Set transmission line relays so they do not operate at or below 115% of the highest seasonal 15-minute Facility Rating[[2]](#footnote-2) of a circuit (expressed in amperes).
	3. Set transmission line relays so they do not operate at or below 115% of the maximum theoretical power transfer capability (using a 90-degree angle between the sending-end and receiving-end voltages and either reactance or complex impedance) of the circuit (expressed in amperes) using one of the following to perform the power transfer calculation:
* An infinite source (zero source impedance) with a 1.00 per unit bus voltage at each end of the line.
* An impedance at each end of the line, which reflects the actual system source impedance with a 1.05 per unit voltage behind each source impedance.
	1. Set transmission line relays on series compensated transmission lines so they do not operate at or below the maximum power transfer capability of the line, determined as the greater of:
* 115% of the highest emergency rating of the series capacitor.
* 115% of the maximum power transfer capability of the circuit (expressed in amperes), calculated in accordance with Requirement R1, criterion 3, using the full line inductive reactance.
	1. Set transmission line relays on weak source systems so they do not operate at or below 170% of the maximum end-of-line three-phase fault magnitude (expressed in amperes).
	2. Set transmission line relays applied on transmission lines connected to generation stations remote to load so they do not operate at or below 230% of the aggregated generation nameplate capability.
	3. Set transmission line relays applied at the load center terminal, remote from generation stations, so they do not operate at or below 115% of the maximum current flow from the load to the generation source under any system configuration.
	4. Set transmission line relays applied on the bulk system-end of transmission lines that serve load remote to the system so they do not operate at or below 115% of the maximum current flow from the system to the load under any system configuration.
	5. Set transmission line relays applied on the load-end of transmission lines that serve load remote to the bulk system so they do not operate at or below 115% of the maximum current flow from the load to the system under any system configuration.
	6. Set transformer fault protection relays and transmission line relays on transmission lines terminated only with a transformer so that the relays do not operate at or below the greater of:
* 150% of the applicable maximum transformer nameplate rating (expressed in amperes), including the forced cooled ratings corresponding to all installed supplemental cooling equipment.
* 115% of the highest operator established emergency transformer rating

10.1 Set load responsive transformer fault protection relays, if used, such that the protection settings do not expose the transformer to a fault level and duration that exceeds the transformer’s mechanical withstand capability[[3]](#footnote-3).

* 1. For transformer overload protection relays that do not comply with the loadability component of Requirement R1, criterion 10 set the relays according to one of the following:
* Set the relays to allow the transformer to be operated at an overload level of at least 150% of the maximum applicable nameplate rating, or 115% of the highest operator established emergency transformer rating, whichever is greater, for at least 15 minutes to provide time for the operator to take controlled action to relieve the overload.
* Install supervision for the relays using either a top oil or simulated winding hot spot temperature element set no less than 100° C for the top oil temperature or no less than 140° C for the winding hot spot temperature[[4]](#footnote-4).
	1. When the desired transmission line capability is limited by the requirement to adequately protect the transmission line, set the transmission line distance relays to a maximum of 125% of the apparent impedance (at the impedance angle of the transmission line) subject to the following constraints:
1. Set the maximum torque angle (MTA) to 90 degrees or the highest supported by the manufacturer.
2. Evaluate the relay loadability in amperes at the relay trip point at 0.85 per unit voltage and a power factor angle of 30 degrees.
3. Include a relay setting component of 87% of the current calculated in Requirement R1, criterion 12 in the Facility Rating determination for the circuit.
	1. Where other situations present practical limitations on circuit capability, set the phase protection relays so they do not operate at or below 115% of such limitations.

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this Requirement.

**Registered Entity Evidence (Required):**

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| Provide the following for all evidence submitted (Insert additional rows if necessary): File Name, File Extension, Document Title, Revision, Date, Page(s), Section(s), Section Title(s), Description |
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**Audit Team Evidence Reviewed** **(This section must be completed by the Compliance Enforcement Authority):**

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**Compliance Assessment Approach Specific to PRC-023-2, R1**

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

Review the evidence to verify the Registered Entity has:

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|  | Verify each TO, GO and DP evaluated relay loadability at 0.85 per unit voltage and a power factor angle of 30 degrees. |
|  | Verify the TO, GO or DP used any one of the criteria (Requirement R1, criteria 1 through 13) for any specific circuit terminal to prevent its phase protective relay settings from limiting transmission system loadability while maintaining reliable protection of the Bulk Electric System for all fault conditions. |

**Auditor Notes:**

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# **R2 Supporting Evidence and Documentation**

**R2**. Each Transmission Owner, Generator Owner, and Distribution Provider shall set its out-of-step blocking elements to allow tripping of phase protective relays for faults that occur during the loading conditions used to verify transmission line relay loadability per Requirement R1. *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this Requirement.

**Registered Entity Evidence (Required):**

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| Provide the following for all evidence submitted (Insert additional rows if necessary): File Name, File Extension, Document Title, Revision, Date, Page(s), Section(s), Section Title(s), Description |
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**Audit Team Evidence Reviewed** **(This section must be completed by the Compliance Enforcement Authority):**

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**Compliance Assessment Approach Specific to PRC-023-2, R2**

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

Review the evidence to verify the Registered Entity has:

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|  | Verify the entity set its out-of-step blocking elements to allow tripping of phase protective relays for faults that occur during the loading conditions used to verify transmission line relay loadability per Requirement R1. |

**Auditor Notes:**

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# **R3 Supporting Evidence and Documentation**

**R3**. Each Transmission Owner, Generator Owner, and Distribution Provider that uses a circuit capability with the practical limitations described in Requirement R1, criterion 6, 7, 8, 9, 12, or 13 shall use the calculated circuit capability as the Facility Rating of the circuit and shall obtain the agreement of the Planning Coordinator, Transmission Operator, and Reliability Coordinator with the calculated circuit capability. [*Violation Risk Factor: Medium] [Time Horizon: Long Term Planning*]

**Question:** Did the TO, GO or DP use the circuit capability with the practical limitations described in Requirement 1, Criteria 6, 7, 8, 9, 12 or 13? If yes, provide details.

**Registered Entity Response** **to Question** **(Required):**

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this Requirement.

**Registered Entity Evidence (Required):**

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| Provide the following for all evidence submitted (Insert additional rows if necessary): File Name, File Extension, Document Title, Revision, Date, Page(s), Section(s), Section Title(s), Description |
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**Audit Team Evidence Reviewed** **(This section must be completed by the Compliance Enforcement Authority):**

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**Compliance Assessment Approach Specific to PRC-023-2, R3**

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

Review the evidence to verify the Registered Entity has:

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|  | Responded to the applicability Question and provided evidence of compliance if the response was yes. |
|  | Verify the entity that uses a circuit capability with the practical limitations described in Requirement R1, criterion 6, 7, 8, 9, 12, or 13, used calculated circuit capability as the Facility Rating of the circuit. |
|  | Verify the entity obtained the agreement of the PC, TOP and the RC with the calculated circuit capability. |

**Auditor Notes:**

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# **R4 Supporting Evidence and Documentation**

**R4**. Each Transmission Owner, Generator Owner, and Distribution Provider that chooses to use Requirement R1 criterion 2 as the basis for verifying transmission line relay loadability shall provide its Planning Coordinator, Transmission Operator, and Reliability Coordinator with an updated list of circuits associated with those transmission line relays at least once each calendar year, with no more than 15 months between reports. [*Violation Risk Factor: Lower] [Time Horizon: Long Term Planning*]

**Question:** Did the TO, GO or DP use the circuit capability with the practical limitations described in Requirement 1 Criterion 2? If yes, provide details.

**Registered Entity Response** **to Question** **(Required):**

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this Requirement.

**Registered Entity Evidence (Required):**

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| Provide the following for all evidence submitted (Insert additional rows if necessary): File Name, File Extension, Document Title, Revision, Date, Page(s), Section(s), Section Title(s), Description |
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**Audit Team Evidence Reviewed** **(This section must be completed by the Compliance Enforcement Authority):**

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**Compliance Assessment Approach Specific to PRC-023-2, R4**

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

Review the evidence to verify the Registered Entity has:

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|  | Responded to the applicability Question and provided evidence of compliance if the response was yes. |
|  | Verify that the entity that chooses to use Requirement R1 criterion 2 as their basis, provided the updated list of circuits associated with those transmission line relays to the PC, TOP and the RC. |
|  | Verify that the entity provided the updated list at least once each calendar year, with no more than 15 months between reports to the PC, TOP and the RC. |
|  | Note: The updated list may either be a full list, a list of incremental changes to the previous list, or a statement that there are no changes to the previous list. |
|  | Note: Effective date 1/1/2013. |

**Auditor Notes:**

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# **R5 Supporting Evidence and Documentation**

**R5**. Each Transmission Owner, Generator Owner, and Distribution Provider that sets transmission line relays according to Requirement R1 criterion 12 shall provide an updated list of the circuits associated with those relays to its Regional Entity at least once each calendar year, with no more than 15 months between reports, to allow the ERO to compile a list of all circuits that have protective relay settings that limit circuit capability. [*Violation Risk Factor: Lower] [Time Horizon: Long Term Planning*]

**Question:** Did the TO, GO or DP use the circuit capability with the practical limitations described in Requirement 1 Criterion 12? If yes, provide details.

**Registered Entity Response** **to Question** **(Required):**

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this Requirement.

**Registered Entity Evidence (Required):**

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| Provide the following for all evidence submitted (Insert additional rows if necessary): File Name, File Extension, Document Title, Revision, Date, Page(s), Section(s), Section Title(s), Description |
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**Audit Team Evidence Reviewed** **(This section must be completed by the Compliance Enforcement Authority):**

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**Compliance Assessment Approach Specific to PRC-023-2, R5**

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

Review the evidence to verify the Registered Entity has:

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|  | Responded to the applicability Question and provided evidence of compliance if the response was yes. |
|  | Verify that the entity that sets transmission line relays according to Requirement R1 criterion 12 provided the list of circuits associated with those relays to the Regional Entity.  |
|  | Verify that the entity provided the updated list at least once each calendar year, with no more than 15 months between reports, to the Regional Entity. |
|  | Notes: The updated list may either be a full list, a list of incremental changes to the previous list, or a statement that there are no changes to the previous list. |
|  | Note: Effective date 1/1/2013. |

**Auditor Notes:**

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# **R6 Supporting Evidence and Documentation**

**R6**. Each Planning Coordinator shall conduct an assessment at least once each calendar year, with no more than 15 months between assessments, by applying the criteria in Attachment B to determine the circuits in its Planning Coordinator area for which Transmission Owners, Generator Owners, and Distribution Providers must comply with Requirements R1 through R5. The Planning Coordinator shall: [Violation Risk Factor: High] [Time Horizon: Long Term Planning]

**6.1** Maintain a list of circuits subject to PRC-023-2 per application of Attachment B, including identification of the first calendar year in which any criterion in Attachment B applies.

**6.2**  Provide the list of circuits to all Regional Entities, Reliability Coordinators, Transmission Owners, Generator Owners, and Distribution Providers within its Planning Coordinator area within 30 calendar days of the establishment of the initial list and within 30 calendar days of any changes to that list.

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this Requirement.

**Registered Entity Evidence (Required):**

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| Provide the following for all evidence submitted (Insert additional rows if necessary): File Name, File Extension, Document Title, Revision, Date, Page(s), Section(s), Section Title(s), Description |
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**Audit Team Evidence Reviewed** **(This section must be completed by the Compliance Enforcement Authority):**

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**Compliance Assessment Approach Specific to PRC-023-2, R6**

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

Review the evidence to verify the Registered Entity has:

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|  | Verify that the Planning Coordinator conducted an assessment by applying the criteria in Attachment B to determine the circuits in its Planning Coordinator area for which Transmission Owners, Generator Owners, and Distribution Providers must comply with Requirements R1 through R5. |
|  | Transmission lines operated at 100 kV to 200 kV and transformers with low voltage terminals connected at 100 kV to 200 kV and, |
|  | Transmission lines operated below 100 kV and transformers with low voltage terminals connected below 100 kV that are part of the BES. |
|  | Verify that the PC has conducted the assessment at least once each calendar year, with no more than 15 months between assessments. |
|  | Verify that the PC has a current list of such circuits subject to PRC-023-2, including identification of the first calendar year in which any criterion in Attachment B applies. |
|  | Verify the PC provided the list to the appropriate RCs, TOs, GOs and DPs within: |
|  | 30 calendar days of establishment of the list. |
|  | 30 calendar days of any changes to the list. |
|  | Note: Effective date 1/1/2014. |

**Auditor Notes:**

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# **Compliance Finding Summary** [Author to update table based on number of Requirements in the standard]

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

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| --- | --- | --- | --- | --- | --- |
| **Req.** | **NF** | **PV** | **OEA** | **NA** | **Statement** |
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# **Additional Information:**

**Reliability Standard**

1. Introduction
2. **Title: Transmission Relay Loadability**
3. **Number:** PRC-023-2
4. **Purpose:** Protective relay settings shall not limit transmission loadability; not interfere with system operators’ ability to take remedial action to protect system reliability and; be set to reliably detect all fault conditions and protect the electrical network from these faults.
5. **Applicability**
	1. **Functional Entity**

Transmission Owners with load-responsive phase protection systems as described in PRC-023-2 - Attachment A, applied to circuits defined in 4.2.1 *(Circuits Subject to Requirements R1 – R5)*.

Generator Owners with load-responsive phase protection systems as described in PRC-023-2 - Attachment A, applied to circuits defined in 4.2.1 *(Circuits Subject to Requirements R1 – R5)*.

Distribution Providers with load-responsive phase protection systems as described in PRC-023-2 - Attachment A, applied to circuits defined in 4.2.1*(Circuits Subject to Requirements R1 – R5)*, provided those circuits have bi-directional flow capabilities.

Planning Coordinators

* 1. **Circuits**

**Circuits Subject to Requirements R1 – R5**

Transmission lines operated at 200 kV and above.

Transmission lines operated at 100 kV to 200 kV selected by the Planning Coordinator in accordance with R6.

Transmission lines operated below 100 kV that are part of the BES and selected by the Planning Coordinator in accordance with R6.

Transformers with low voltage terminals connected at 200 kV and above.

Transformers with low voltage terminals connected at 100 kV to 200 kV selected by the Planning Coordinator in accordance with R6.

Transformers with low voltage terminals connected below 100 kV that are part of the BES and selected by the Planning Coordinator in accordance with R6.

**Circuits Subject to Requirement R6**

Transmission lines operated at 100 kV to 200 kV and transformers with low voltage terminals connected at 100 kV to 200 kV

Transmission lines operated below100 kV and transformers with low voltage terminals connected below 100 kV that are part of the BES

1. **Effective Dates**

The effective dates of the requirements in the PRC-023-2 standard corresponding to the applicable Functional Entities and circuits are summarized in the following table:

1. Requirements
2. Each Transmission Owner, Generator Owner, and Distribution Provider shall use any one of the following criteria (Requirement R1, criteria 1 through 13) for any specific circuit terminal to prevent its phase protective relay settings from limiting transmission system loadability while maintaining reliable protection of the BES for all fault conditions. Each Transmission Owner, Generator Owner, and Distribution Provider shall evaluate relay loadability at 0.85 per unit voltage and a power factor angle of 30 degrees. *[Violation Risk Factor: High] [Time Horizon: Long Term Planning].*

Criteria:

* 1. Set transmission line relays so they do not operate at or below 150% of the highest seasonal Facility Rating of a circuit, for the available defined loading duration nearest 4 hours (expressed in amperes).
	2. Set transmission line relays so they do not operate at or below 115% of the highest seasonal 15-minute Facility Rating[[5]](#footnote-5) of a circuit (expressed in amperes).
	3. Set transmission line relays so they do not operate at or below 115% of the maximum theoretical power transfer capability (using a 90-degree angle between the sending-end and receiving-end voltages and either reactance or complex impedance) of the circuit (expressed in amperes) using one of the following to perform the power transfer calculation:
* An infinite source (zero source impedance) with a 1.00 per unit bus voltage at each end of the line.
* An impedance at each end of the line, which reflects the actual system source impedance with a 1.05 per unit voltage behind each source impedance.
	1. Set transmission line relays on series compensated transmission lines so they do not operate at or below the maximum power transfer capability of the line, determined as the greater of:
* 115% of the highest emergency rating of the series capacitor.
* 115% of the maximum power transfer capability of the circuit (expressed in amperes), calculated in accordance with Requirement R1, criterion 3, using the full line inductive reactance.
	1. Set transmission line relays on weak source systems so they do not operate at or below 170% of the maximum end-of-line three-phase fault magnitude (expressed in amperes).
	2. Set transmission line relays applied on transmission lines connected to generation stations remote to load so they do not operate at or below 230% of the aggregated generation nameplate capability.
	3. Set transmission line relays applied at the load center terminal, remote from generation stations, so they do not operate at or below 115% of the maximum current flow from the load to the generation source under any system configuration.
	4. Set transmission line relays applied on the bulk system-end of transmission lines that serve load remote to the system so they do not operate at or below 115% of the maximum current flow from the system to the load under any system configuration.
	5. Set transmission line relays applied on the load-end of transmission lines that serve load remote to the bulk system so they do not operate at or below 115% of the maximum current flow from the load to the system under any system configuration.
	6. Set transformer fault protection relays and transmission line relays on transmission lines terminated only with a transformer so that the relays do not operate at or below the greater of:
* 150% of the applicable maximum transformer nameplate rating (expressed in amperes), including the forced cooled ratings corresponding to all installed supplemental cooling equipment.
* 115% of the highest operator established emergency transformer rating

10.1 Set load responsive transformer fault protection relays, if used, such that the protection settings do not expose the transformer to a fault level and duration that exceeds the transformer’s mechanical withstand capability[[6]](#footnote-6).

* 1. For transformer overload protection relays that do not comply with the loadability component of Requirement R1, criterion 10 set the relays according to one of the following:
* Set the relays to allow the transformer to be operated at an overload level of at least 150% of the maximum applicable nameplate rating, or 115% of the highest operator established emergency transformer rating, whichever is greater, for at least 15 minutes to provide time for the operator to take controlled action to relieve the overload.
* Install supervision for the relays using either a top oil or simulated winding hot spot temperature element set no less than 100° C for the top oil temperature or no less than 140° C for the winding hot spot temperature[[7]](#footnote-7).
	1. When the desired transmission line capability is limited by the requirement to adequately protect the transmission line, set the transmission line distance relays to a maximum of 125% of the apparent impedance (at the impedance angle of the transmission line) subject to the following constraints:
1. Set the maximum torque angle (MTA) to 90 degrees or the highest supported by the manufacturer.
2. Evaluate the relay loadability in amperes at the relay trip point at 0.85 per unit voltage and a power factor angle of 30 degrees.
3. Include a relay setting component of 87% of the current calculated in Requirement R1, criterion 12 in the Facility Rating determination for the circuit.
	1. Where other situations present practical limitations on circuit capability, set the phase protection relays so they do not operate at or below 115% of such limitations.
4. Each Transmission Owner, Generator Owner, and Distribution Provider shall set its out-of-step blocking elements to allow tripping of phase protective relays for faults that occur during the loading conditions used to verify transmission line relay loadability per Requirement R1. *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*
5. Each Transmission Owner, Generator Owner, and Distribution Provider that uses a circuit capability with the practical limitations described in Requirement R1, criterion 6, 7, 8, 9, 12, or 13 shall use the calculated circuit capability as the Facility Rating of the circuit and shall obtain the agreement of the Planning Coordinator, Transmission Operator, and Reliability Coordinator with the calculated circuit capability. *[Violation Risk Factor: Medium] [Time Horizon: Long Term Planning]*
6. Each Transmission Owner, Generator Owner, and Distribution Provider that chooses to use Requirement R1 criterion 2 as the basis for verifying transmission line relay loadability shall provide its Planning Coordinator, Transmission Operator, and Reliability Coordinator with an updated list of circuits associated with those transmission line relays at least once each calendar year, with no more than 15 months between reports. *[Violation Risk Factor: Lower] [Time Horizon: Long Term Planning]*
7. Each Transmission Owner, Generator Owner, and Distribution Provider that sets transmission line relays according to Requirement R1 criterion 12 shall provide an updated list of the circuits associated with those relays to its Regional Entity at least once each calendar year, with no more than 15 months between reports, to allow the ERO to compile a list of all circuits that have protective relay settings that limit circuit capability. *[Violation Risk Factor: Lower] [Time Horizon: Long Term Planning]*
8. Each Planning Coordinator shall conduct an assessment at least once each calendar year, with no more than 15 months between assessments, by applying the criteria in Attachment B to determine the circuits in its Planning Coordinator area for which Transmission Owners, Generator Owners, and Distribution Providers must comply with Requirements R1 through R5. The Planning Coordinator shall: *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*
	1. Maintain a list of circuits subject to PRC-023-2 per application of Attachment B, including identification of the first calendar year in which any criterion in Attachment B applies.
	2. Provide the list of circuits to all Regional Entities, Reliability Coordinators, Transmission Owners, Generator Owners, and Distribution Providers within its Planning Coordinator area within 30 calendar days of the establishment of the initial list and within 30 calendar days of any changes to that list.
9. Measures
10. Each Transmission Owner, Generator Owner, and Distribution Provider shall have evidence such as spreadsheets or summaries of calculations to show that each of its transmission relays is set according to one of the criteria in Requirement R1, criterion 1 through 13 and shall have evidence such as coordination curves or summaries of calculations that show that relays set per criterion 10 do not expose the transformer to fault levels and durations beyond those indicated in the standard. (R1)
11. Each Transmission Owner, Generator Owner, and Distribution Provider shall have evidence such as spreadsheets or summaries of calculations to show that each of its out-of-step blocking elements is set to allow tripping of phase protective relays for faults that occur during the loading conditions used to verify transmission line relay loadability per Requirement R1. (R2)
12. Each Transmission Owner, Generator Owner, and Distribution Provider with transmission relays set according to Requirement R1, criterion 6, 7, 8, 9, 12, or 13 shall have evidence such as Facility Rating spreadsheets or Facility Rating database to show that it used the calculated circuit capability as the Facility Rating of the circuit and evidence such as dated correspondence that the resulting Facility Rating was agreed to by its associated Planning Coordinator, Transmission Operator, and Reliability Coordinator. (R3)
13. Each Transmission Owner, Generator Owner, or Distribution Provider that sets transmission line relays according to Requirement R1, criterion 2 shall have evidence such as dated correspondence to show that it provided its Planning Coordinator, Transmission Operator, and Reliability Coordinator with an updated list of circuits associated with those transmission line relays within the required timeframe. The updated list may either be a full list, a list of incremental changes to the previous list, or a statement that there are no changes to the previous list. (R4)
14. Each Transmission Owner, Generator Owner, or Distribution Provider that sets transmission line relays according to Requirement R1, criterion 12 shall have evidence such as dated correspondence that it provided an updated list of the circuits associated with those relays to its Regional Entity within the required timeframe. The updated list may either be a full list, a list of incremental changes to the previous list, or a statement that there are no changes to the previous list. (R5)
15. Each Planning Coordinator shall have evidence such as power flow results, calculation summaries, or study reports that it used the criteria established within Attachment B to determine the circuits in its Planning Coordinator area for which applicable entities must comply with the standard as described in Requirement R6. The Planning Coordinator shall have a dated list of such circuits and shall have evidence such as dated correspondence that it provided the list to the Regional Entities, Reliability Coordinators, Transmission Owners, Generator Owners, and Distribution Providers within its Planning Coordinator area within the required timeframe.
16. Compliance

**Compliance Monitoring Process**

* 1. **Compliance Monitoring Responsibility**
* For entities that do not work for the Regional Entity, the Regional Entity shall serve as the Compliance Enforcement Authority.
* For functional entities that work for their Regional Entity, the ERO shall serve as the Compliance Enforcement Authority.
	1. **Data Retention**

The Transmission Owner, Generator Owner, Distribution Provider and Planning Coordinator 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 Transmission Owner, Generator Owner, and Distribution Provider shall each retain documentation to demonstrate compliance with Requirements R1 through R5 for three calendar years.

The Planning Coordinator shall retain documentation of the most recent review process required in R6. The Planning Coordinator shall retain the most recent list of circuitsin its Planning Coordinator area for which applicable entities must comply with the standard, as determined per R6.

If a Transmission Owner, Generator Owner, Distribution Provider or Planning Coordinator is found non-compliant, it shall keep information related to the non-compliance until found compliant or for the time specified above, whichever is longer.

The Compliance Monitor shall keep the last audit record and all requested and submitted subsequent audit records.

* 1. **Compliance Monitoring and Assessment Processes**
* Compliance Audit
* Self-Certification
* Spot Checking
* Compliance Violation Investigation
* Self-Reporting
* Complaint\
	1. **Additional Compliance Information**

None.

PRC-023 — Attachment A

This standard includes any protective functions which could trip with or without time delay, on load current, including but not limited to:

Phase distance.

Out-of-step tripping.

Switch-on-to-fault.

Overcurrent relays.

Communications aided protection schemes including but not limited to:

Permissive overreach transfer trip (POTT).

Permissive under-reach transfer trip (PUTT).

Directional comparison blocking (DCB).

Directional comparison unblocking (DCUB).

Phase overcurrent supervisory elements (i.e., phase fault detectors) associated with current-based, communication-assisted schemes (i.e., pilot wire, phase comparison, and line current differential) where the scheme is capable of tripping for loss of communications.

The following protection systems are excluded from requirements of this standard:

Relay elements that are only enabled when other relays or associated systems fail. For example:

* + - Overcurrent elements that are only enabled during loss of potential conditions.
		- Elements that are only enabled during a loss of communications except as noted in section 1.6

Protection systems intended for the detection of ground fault conditions.

Protection systems intended for protection during stable power swings.

Generator protection relays that are susceptible to load.

Relay elements used only for Special Protection Systems applied and approved in accordance with NERC Reliability Standards PRC-012 through PRC-017 or their successors.

Protection systems that are designed only to respond in time periods which allow 15 minutes or greater to respond to overload conditions.

Thermal emulation relays which are used in conjunction with dynamic Facility Ratings.

Relay elements associated with dc lines.

Relay elements associated with dc converter transformers.

PRC-023 — Attachment B

**Circuits to Evaluate**

* Transmission lines operated at 100 kV to 200 kV and transformers with low voltage terminals connected at 100 kV to 200 kV.
* Transmission lines operated below 100 kV and transformers with low voltage terminals connected below 100 kV that are part of the BES.

**Criteria**

If any of the following criteria apply to a circuit, the applicable entity must comply with the standard for that circuit.

1. The circuit is a monitored Facility of a permanent flowgate in the Eastern Interconnection, a major transfer path within the Western Interconnection as defined by the Regional Entity, or a comparable monitored Facility in the Québec Interconnection, that has been included to address reliability concerns for loading of that circuit, as confirmed by the applicable Planning Coordinator.
2. The circuit is a monitored Facility of an IROL, where the IROL was determined in the planning horizon pursuant to FAC-010.
3. The circuit forms a path (as agreed to by the Generator Operator and the transmission entity) to supply off-site power to a nuclear plant as established in the Nuclear Plant Interface Requirements (NPIRs) pursuant to NUC-001.
4. The circuit is identified through the following sequence of power flow analyses[[8]](#footnote-8) performed by the Planning Coordinator for the one-to-five-year planning horizon:
5. Simulate double contingency combinations selected by engineering judgment, without manual system adjustments in between the two contingencies (reflects a situation where a System Operator may not have time between the two contingencies to make appropriate system adjustments).
6. For circuits operated between 100 kV and 200 kV evaluate the post-contingency loading, in consultation with the Facility owner, against a threshold based on the Facility Rating assigned for that circuit and used in the power flow case by the Planning Coordinator.
7. When more than one Facility Rating for that circuit is available in the power flow case, the threshold for selection will be based on the Facility Rating for the loading duration nearest four hours.
8. The threshold for selection of the circuit will vary based on the loading duration assumed in the development of the Facility Rating.
	1. If the Facility Rating is based on a loading duration of up to and including four hours, the circuit must comply with the standard if the loading exceeds 115% of the Facility Rating.
	2. If the Facility Rating is based on a loading duration greater than four and up to and including eight hours, the circuit must comply with the standard if the loading exceeds 120% of the Facility Rating.
	3. If the Facility Rating is based on a loading duration of greater than eight hours, the circuit must comply with the standard if the loading exceeds 130% of the Facility Rating.
9. Radially operated circuits serving only load are excluded.
10. The circuit is selected by the Planning Coordinator based on technical studies or assessments, other than those specified in criteria B1 through B4, in consultation with the Facility owner.
11. The circuit is mutually agreed upon for inclusion by the Planning Coordinator and the Facility owner.

**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](http://www.nerc.com/pa/comp/Documents/Sampling%20Methodology%20Guidelines%20and%20Criteria_PDF.pdf), 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.

There are two approaches to sampling: statistical and non-statistical, and choosing which to use depends on the objectives for sampling. (When the population sample to be reviewed is documentation, a statistical approach using [RAT‐STATS](http://oig.hhs.gov/compliance/rat-stats/index.asp) is expected.) Both are represented in the sample guideline in line with standard practices for their use. The Audit Team Lead may determine if the scope of the audit samples should be reduced to levels below those established in the sample guideline. In doing so, the audit team will document the rationale for reducing the scope of the of sample population in the RSAW or audit report.

Additionally, separate from the audit, the registered entity may use this methodology to determine the sample population to test in order to provide themselves reasonable assurance that management’s expectations are being met by the organization.

**Regulatory Language**

**Excerpts From FERC Orders -- For Reference Purposes Only**

**Updated Through October 3, 2012**

**PRC-023-2**

**Order 733 March 18, 2010**

15. Pursuant to section 215(d)(2) of the FPA,the Commission approves PRC-023-1 as just, reasonable, not unduly discriminatory or preferential, and in the public interest. The Commission finds that PRC-023-1 is a significant step toward improving the reliability of the Bulk-Power System in North America because it requires load-responsive phase protection relay settings to provide essential facility protection for faults, while allowing the Bulk-Power System to be operated in accordance with established facility ratings.

16. Also, pursuant to section 215(d)(5) of the FPA, the Commission adopts some of the proposed modifications in the NOPR and thus directs certain modifications to the Reliability Standard. Unless stated otherwise, the Commission directs the ERO to submit these modifications no later than one year from the date of this Final Rule. We will address each proposal and the specific comments received on each proposal in the remainder of this Final Rule.

18. Thus, in some instances, while we provide specific details regarding the Commission’s expectations, we intend by doing so to provide useful guidance to assist in the Reliability Standards development process, not to impede it. As we explained in Order No. 693, we find that this is consistent with statutory language that authorizes the Commission to order the ERO to submit a modification “that addresses a specific matter” if the Commission considers it appropriate to carry out section 215 of the FPA.In this Final Rule, we have considered commenters’ concerns and, where a directive for modification appears to be determinative of the outcome, the Commission provides flexibility by directing the ERO to address the underlying issue through the Reliability Consequently, consistent with Order No. 693, we clarify that where the Final Rule identifies a concern and offers a specific approach to address that concern, we will consider an equivalent alternative approach provided that the ERO demonstrates that the alternative will adequately address the Commission’s underlying concern or goal as efficiently and effectively as the Commission’s proposal.

***Order 733-A***, 134 FERC ¶ 61,127 (2011)

93. We deny rehearing and clarify that the Commission does not intend the Reliability Standard to apply to back-up protective relays connected to current transformers at the neutral end of the generator, as illustrated in Appendix 1. We disagree with NERC and the Trade Associations that the location of the relay should govern whether or not PRC-023-1 applies to a particular relay. There is nothing in the current Standard to support that interpretation. In its Applicability section, PRC-023-1 states that it applies to, among others, generation owners with load-responsive phase protection systems described in the Standard’s Attachment A and applied to certain facilities.Attachment A specifically excludes certain protection systems from the requirements of the Standard. One of these exclusions is for “[g]enerator protection relays that are susceptible to load.” Attachment A does not exclude any other type of relay physically located at the generator terminal on the low-voltage side of a generator step-up transformer. Thus, by the Standard’s terms it must apply to generator protection backup relays located at the generator step-up transformer.

94. Petitioners disagree with the Commission’s position described in Order No. 733 that backup relays located at the generator can be used to protect transmission elements.They argue that the primary function of all backup distance protection applied at the terminals of a generator is to provide thermal protection for the generator and backup protection for the generator step-up transformer, and not the connected transmission line. As discussed in Order No. 733, however, as drafted, PRC-023-1 applies to the relays intended to provide either primary or backup protection to transmission elements.The relays that the Commission described as being subject to Reliability Standard PRC-023-1, while they may be connected to current transformers located at the generator terminal or on the low-voltage side of the generator step-up transformer, are set to provide backup protection for Bulk-Power System elements.In such instances, the sensing of the relay will be solely in the direction of the Bulk-Power System, and such relays should be set in accordance with PRC-023-1. Backup protection, however, can also be connected to current transformers located at the neutral end of the generator, and such relays will sense in the direction of the generator and the Bulk-Power System.Relays in this second location may operate for faults on the generator or the Bulk-Power System, and Order No. 733 does not purport to make such protection relays subject to PRC-023-1. With this clarification, the Commission believes

that it resolves the apparent conflict in Order No. 733 identified by EEI.

95. The Commission agrees with the Trade Associations that backup relays set according to PRC-023-1 should be coordinated with other protection systems to ensure that systems protecting the generator and generator step-up transformer operate before protection systems that provide backup protection for the Bulk–Power System. We do not, however, agree with their assertion that this means that the current PRC-023-1 should be read not to apply to the loadability of generator step-up transformers because of such coordination. As discussed in Order No. 733, the Commission expects that the ERO will develop the Reliability Standard addressing generator loadability as a new Reliability Standard with its own individual timeline, and not as a revision to an existing Standard.

96. The Commission does not accept the Trade Associations’ assertion that the Reliability Standard was designed to prevent over-tripping of parallel paths and therefore has no applicability to generator equipment and auxiliaries. While we do not argue that our directive was intended to address anything beyond relays providing backup protection for elements of the Bulk-Power System, nothing in PRC-023-1 limits applicability to parallel paths or thermal cascading outages. The Standard is general and covers all possible topologies for Reliable Operations in real time.

97. We do agree that generators and their transformers assist in transient stability and voltage stability events. In the context of Reliability Standard PRC-023-1, loadresponsive phase relays must not trip due to transient stability and voltage events in order to allow operators to take remedial action. Moreover, the assistance provided by generators and their transformers, until addressed in other standard development activities, is presently addressed by PRC-001-1 and requires coordination of generation and transmission protection systems.

98. We agree with NERC that a generator’s higher loading angle and dynamic response to local disturbances are not addressed by PRC-023-1 and that the requirements of PRC-023-1 are insufficient to provide for secure operation of generator backup protection. We also agree with NERC that load-responsive relays applied at the terminal of a generator will respond to a maximum load and the resultant apparent impedance independent of whether it is set with a shorter reach to protect the generator and the generator step-up transformer or with a longer reach to additionally provide backup protection from transmission system faults. Our decision in the Final Rule is consistent with each of NERC’s assertions. As we discussed previously, the relays at issue, while they may be connected to current transformers located at the generator terminal or on the low-side of the generator step-up transformer, are set to provide backup protection for Bulk-Power System elements; not backup protection for the generator. For this reason, while the assertions NERC makes are appropriate, they are relevant to considerations and relays that do not fall within the scope of PREC-023-1. In addition, NERC makes the case that relays governed by PRC-023-1 on most generators or on transmission lines supplied totally or partially from generators will not be able to coordinate since they will not operate appropriately. Such observations underscore the need for generator and transmission protective systems to be coordinated as recommended in the Blackout Report.In sum, entities must first pick a relay that coordinates with their system. Having selected their protection relays, if load-responsive phase protection relays are used to provide backup protection to elements of the Bulk-Power System, then those relays should be set in accordance with PRC-023-1.

99. We know from event analysis that entities use load-responsive phase protection relays at the low-side of generator step-up transformers to provide backup protection to Bulk-Power System elements one or more buses away from the generator and that such relays have misoperated. It is not our intention to mandate a specific protection system, but we have determined that where an entity selects a phase protection relay to provide backup support to Bulk-Power System elements, such relay should be set in accordance with PRC-023-1. To do otherwise creates a gap in ensuring the reliability PRC-023-1 is intended to establish. If the ERO wishes to address such a gap by another means, we will accept an alternative method, provided that the ERO demonstrates that the alternative will adequately address the Commission’s underlying goal as efficiently and effectively as the Commission’s proposal.

***Order No. 759*,** 138 FERC ¶ 61,197 (2012).

REQUIREMENT 1

41. MISO contends that over-reliance on criterion R1.13 would adversely impact operations, reliability, flexibility, and transmission congestion costs, and lead to unnecessary transmission expansion in the future to comply with transmission planning standards. To avoid this result, MISO requests that the Commission clarify the applicability of the standard by narrowing the scope of the protection systems covered by the Standard under Attachment A. In particular, MISO requests the Commission clarify that the following protection systems are excluded from the standard: (a) differential current relays and negative sequence relays; (b) supervisory elements with unanimous consent logic; (c) redundant voting protective relay schemes; and (d) switch-on-to-fault protective relay schemes. We address MISO’s request below.

1. *Differential Current Relays*

42. MISO requests that we clarify that differential current relay elements and negative sequence relay elements should not be covered by the standard “as they would not trip with or without time delay on load current.”MISO argues that the exclusion of these specific relay elements from the proposed standard “would be consistent with the purpose and intent of the standard and would prevent an inappropriate and unnecessary expansion of the standard’s applicability.”

43. We grant MISO’s request for clarification in part. As noted by MISO, differential current relay elements and negative sequence relay elements, by their nature, are not load responsive. As the Commission noted previously, the exclusion of a protection system from Reliability Standard PRC-023 appears to be unnecessary if the system is not loadresponsive. Therefore, we grant MISO’s request for clarification to the extent that nonload responsive relays are not covered by Reliability Standard PRC-023-2, however we decline to direct NERC to include the assets in the exclusion list of Section 3 of Attachment A as the exclusion list should be limited to protection systems that would otherwise be subject to the Standard.

1. *Supervisory Relay Elements*

46. In its comments, MISO raises a concern that an interpretation of the term “phase overcurrent supervisory elements” in section 1.6 of Attachment A that includes elements in a unanimous consent scheme could lead to unnecessary facility limit reductions.MISO asks the Commission to clarify that it is acceptable to consider “unanimous consent” logic when evaluating transmission relay loadability. According to MISO, “[i]f a relay scheme contains multiple relay elements and requires ’unanimous consent’ among two or more of the relay elements in order to initiate a tripping action [of a circuit breaker], transmission relay loadability should be based solely on the relay element that is least sensitive to load so long as the relay elements could never initiate a tripping action without the operation of the relay element least sensitive to load.”

47. Giving due weight to NERC’s technical expertise on this issue, we approve NERC’s modification to Attachment A and find that NERC has developed an equally efficient and effective approach to addressing the Order No. 733 directive regarding supervisory relays. NERC’s proposal identifies a subset of supervisory relay elements, consistent with the Commission’s clarification in Order No. 733-B.

48. We deny MISO’s request for clarification. There are various types of protection schemes. MISO describes a specific protection scheme that uses unanimous consent logic and asks whether elements of the scheme are subject to Reliability Standard PRC-023-2. This is a fact intensive inquiry, and we will not rule on this matter based on the information provided in MISO’s comments. If MISO seeks further clarification of this issue, it should pursue the matter with NERC. The Commission will not make a determination on MISO’s specific scenario without a complete record and without it going through NERC’s Reliability Standards development process or interpretation process.

1. *Redundant Voting Schemes – The Most Load-Sensitive Relay*

49. MISO requests that we clarify how entities should handle certain redundant voting protective relay schemes.MISO explains that, in a redundant voting protective relay scheme for a transmission facility, there are three protective relay schemes and only two of the three must operate to initiate tripping. MISO argues that the most load sensitive of these three relay schemes should be exempt from the standard, “so long as the most load sensitive of the three protective relay scheme can never initiate a tripping action on its own with[out] a tripping output from one of the other two protective relay schemes.”

50. We decline to grant MISO’s request on this issue. MISO’s limited comments on this issue do not provide adequate information or technical support for its request. Without adequate support, the Commission cannot respond to MISO’s request.

1. *Switch-on-to-fault Protective Relay Schemes*

51. MISO requests that the Commission clarify that a switch-on-to-fault protective relay scheme, which is specifically included in section 1.3 of Attachment A, may be excluded from the requirements of the Reliability Standard if it meets each of three stated conditions presented by MISO.

52. Currently effective Reliability Standard PRC-023 explicitly addresses switch-onto-fault protective relay schemes. Switch-on-to-fault schemes are protection systems designed to trip a transmission line breaker when the breaker is closed into a fault. Because the current fault detectors for these systems must be set low enough to detect “zero-voltage” faults, i.e., close-in, three-phase faults, these systems may be susceptible to operate on load.We note that the System Protection and Control Task Force acknowledged, with regard to switch-on-to-fault schemes “…a concern, based on actual events which have occurred in connection with blackouts, for the undesired operation of [switch-on-to-fault] schemes when a breaker is closed into a line.”Because the relays applied in switch-on-to-fault schemes are load-responsive, the Commission agreed with the ERO’s technical decision to make such relays subject to the requirements of PRC- 023. As noted above, MISO proposed a set of conditions that would remove an otherwise load-responsive relay from the requirements of Reliability Standard PRC-023. MISO has not, however, provided any explanation or technical support for its proposed

conditions. Therefore, we decline to grant the requested clarification.

REQUIREMENT 3

54. MISO requests that the Commission clarify that Requirement R3 was not intended to create an obligation of the planning coordinator, transmission operator and reliability coordinator to independently verify or approve the calculated circuit capability provided by the transmission owner, generation owner or distribution provider…MISO argues that this obligation to obtain the agreement could impute an obligation on the planning coordinator, transmission operator and/or reliability coordinator to evaluate the calculated circuit capability without providing corresponding criteria that should be applied in the evaluation. MISO also requests that the Commission provide guidance on how such entities should resolve disputes over calculated circuit capabilities.

55. We deny MISO’s request for clarification. The Commission addressed MISO’s concern in Order No. 733.Specifically, in the Order No. 733 rulemaking, commenters argued that the use of the term “agreement” in PRC-023-1 simply meant that “the entity calculating the circuit capability is required to provide the circuit capability to the relevant functional entities” and that “planning coordinators, transmission operators, and

reliability coordinators must simply agree that they will use the circuit capability provided by the transmission owner, generator owner, or distribution owner.”The concerns raised at that time mirror the concerns raised by MISO; commenters indicated that the applicable parties did not want to be “responsible for reviewing and approving the calculated circuit capabilities under Requirement R[3].”

56. The Commission rejected the commenters’ arguments in Order No. 733, finding that the language “shall obtain the agreement” requires that “the entity calculating the circuit capability must reach an understanding with the relevant functional entity that the calculated circuit capability is capable of achieving the reliability goal of PRC-023-1.”In addition, the Commission clarified that since the Standard is “intended to ensure that protective relay settings do not limit transmission loadability or interfere with system operators’ ability to take remedial action to protect system reliability, and to ensure that relays reliably detect all fault conditions and protect the electrical network from these faults,” the agreement required under Requirement R3 should “center around achieving these purposes.”Having adequately addressed this matter in Order No. 733, it is

unnecessary to elaborate further in response to MISO and, accordingly, we deny MISO’s

request on this issue.

57. Further, to the extent that a dispute arises between responsible entities over the determination of a calculated circuit capability under Requirement R3, nothing precludes the responsible entities from raising the dispute with the applicable Regional Entity.

REQUIREMENT 6

59. MISO requests clarification regarding the application of Requirement R6 to sub-100 kV facilities.Specifically, MISO requests clarification “with regard to what final and FERC-approved process is used by the Regional Entities to identify sub-100 kV facilities ‘critical to the reliability of the bulk electric system.’”MISO further requests clarification on how planning coordinators will be provided access to the list of such sub-100 kV facilities, and, finally, MISO requests clarification whether the use of such a list of sub-100 kV facilities is adequate to demonstrate compliance with Requirement R6.

With regard to MISO’s request concerning the identification of sub-100 kV facilities, we note that bulk electric system facilities are currently identified through the application of NERC’s definition of bulk electric system and NERC’s registration process, as applied by the Regional Entities.Regional Entities should inform planning coordinators of such sub-100kV facilities that already may have been identified so that the planning coordinator is able to fulfill its responsibilities pursuant to Requirement R6.

61. We deny MISO’s request for clarification “that the use of such a list as/if provided by the Regional Entities is adequate to demonstrate compliance with a requirement to evaluate ‘Transmission lines operated below 100 kV and transformers with low voltage terminals connected below 100 kV that are part of the [bulk electric system].’”The identification of facilities is only the first step in the process of determining whether the Standard applies. Once a planning coordinator has been provided with a list of sub-100 kV facilities that are part of the bulk electric system, if any, it must apply the criteria in Attachment B to determine whether Requirements R1 through R5 of Reliability Standard PRC-023-2 will apply to the individual facilities.

**Revision History**

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| --- | --- | --- | --- |
| **Version** | **Date** | **Reviewers** | **Revision Description** |
| 1 | 08/02/2012 | RSAW Working Group | New Document |
| 1.1 | 10/03/2012 | NERC Legal | Regulatory Language Update |
| 1.2 | 10/10/2013 | NERC Compliance | Minor formatting changes and missing footer from prior document added. Legal review. |
|  |  |  |  |
|  |  |  |  |
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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-1)
2. When a 15-minute rating has been calculated and published for use in real-time operations, the 15-minute rating can be used to establish the loadability requirement for the protective relays. [↑](#footnote-ref-2)
3. As illustrated by the “dotted line” in IEEE C57.109-1993 - *IEEE Guide for Liquid-Immersed Transformer Through-Fault-Current Duration,* Clause 4.4, Figure 4 [↑](#footnote-ref-3)
4. IEEE standard C57.91, Tables 7 and 8, specify that transformers are to be designed to withstand a winding hot spot temperature of 180 degrees C, and Annex A cautions that bubble formation may occur above 140 degrees C. [↑](#footnote-ref-4)
5. When a 15-minute rating has been calculated and published for use in real-time operations, the 15-minute rating can be used to establish the loadability requirement for the protective relays. [↑](#footnote-ref-5)
6. As illustrated by the “dotted line” in IEEE C57.109-1993 - *IEEE Guide for Liquid-Immersed Transformer Through-Fault-Current Duration,* Clause 4.4, Figure 4 [↑](#footnote-ref-6)
7. IEEE standard C57.91, Tables 7 and 8, specify that transformers are to be designed to withstand a winding hot spot temperature of 180 degrees C, and Annex A cautions that bubble formation may occur above 140 degrees C. [↑](#footnote-ref-7)
8. Past analyses may be used to support the assessment if no material changes to the system have occurred since the last assessment [↑](#footnote-ref-8)