NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Industry Webinar

Project 2021-04 Modifications to PRC-002

June 4, 2024

RELIABILITY | RESILIENCE | SECURITY




Agenda

- Presenters
  - Standard Drafting Team
    - Chair, Manish Patel, Electric Power Research Institute, Inc. (EPRI)
    - Vice Chair, Chris Milan, CrestCura
    - Member, Bret Burford, American Electric Power
    - Member, Amy Key, MidAmerican Energy Company
  - NERC Staff
    - Ben Wu (Project Developer)
- Administrative Items
- Project 2021-04 Status and Background
- Proposed New Standard (PRC-028-1) and PRC-002 Revisions
- Next Steps
- Questions and Answers

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- For the official record
  - This presentation is not a part of the official project record
  - Comments must be submitted during the formal posting
- Q&A Session
  - Q/A feature

Drafting Team (DT)

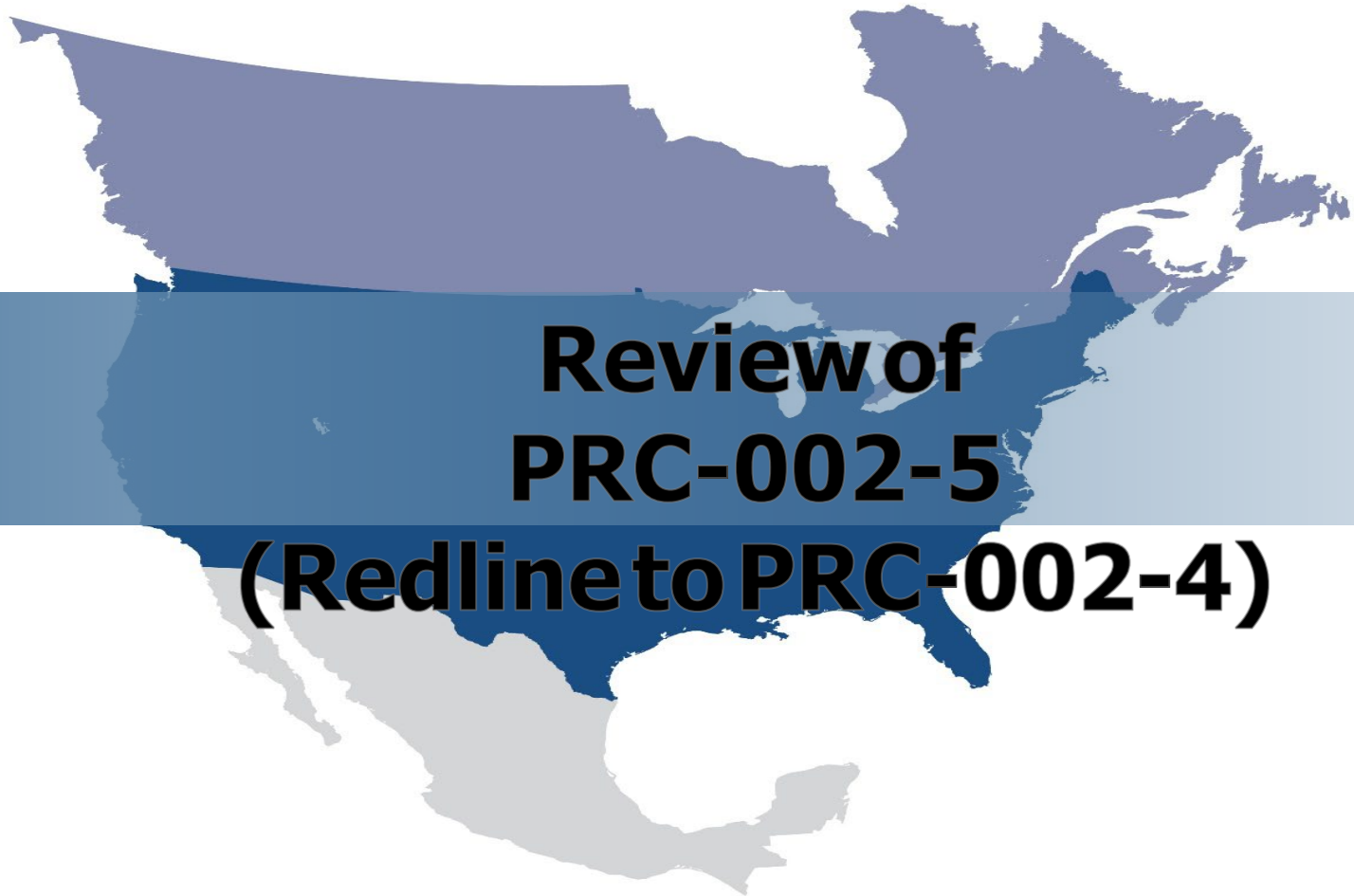
Name	Organization/ Company
Manish Patel (Chair)	Electric Power Research Institute, Inc. (EPRI)
Chris Milan (Vice Chair)	CrestCura
Bret Garner Burford	American Electric Power
Tracy Kealy	Bonneville Power Administration
Jacob Magee	Transmission Asset Management
Don Burkart	Consolidated Edition of New York
Amy Key	MidAmerican Energy Company
Terry Volkmann	Volkmann Consulting

Project Status

- The DT completed the first phase of the Glencoe Light SAR in the Winter of 2022 with the development of Reliability Standard PRC-002-4.
- The DT submitted a revised SAR to create a new Standard (PRC-028-1) for monitoring requirements for IBRs and the SC authorized drafting revisions of the SAR on April 19, 2023.
- At the SC's July 19, 2023 meeting, the SC authorized initial posting for the IRPTF SAR.
- The initial draft of phase II was posted from August 1 through September 14, 2023 with 61.44% approval for PRC-002-5 and 43.33% approval of PRC-028-1 from the industry.
- The additional posting from March 18 through April 11, 2024 received 79.46% approval for PRC-002-5 and 50.03% approval for PRC-028-1.
- The third posting is currently posted from May 31 through June 14, 2024 with a waiver.

Background

- Industry Need
  - Have adequate data available to facilitate the analysis of BES disturbances
- Purpose/Goal
  - Ensure adequate data is available (including inverter-based resources) and periodically assessed to facilitate the analysis of BES disturbances, including in areas of the Bulk Power System (BPS) that may not be covered by the existing requirements
- Project Scope
  - Consider ways to ensure that the identification and periodic assessment of BES and/or BPS buses for which SER and FR data / Elements for which DDR data is required provide adequate monitoring of BES Disturbances
  - Consider other manners in which to add to, modify or clarify the existing requirements to ensure adequate monitoring of BES disturbances
  - Consider proposed IEEE P2800 monitoring requirements and NERC Odessa Disturbance Report recommendations
  - FERC Order 901



Review of PRC-002-5 (Redline to PRC-002-4)

Applicability

4. Applicability:

4.1. Functional Entities:

4.1.1. Reliability Coordinator

4.1.2. Transmission Owner

4.1.3. Generator Owner

4.2. Facilities: BES Elements, excluding inverter-based resources.[1]

[1] Disturbance monitoring and reporting requirements for inverter-based resources are addressed in PRC-028.

Requirements

R5. Each Reliability Coordinator shall: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

5.1. Identify BES Elements for which dynamic Disturbance recording (DDR) data is required, including the following:

5.1.1. Synchronous ~~G~~generating resource(s) with:

5.1.1.1. Gross individual nameplate rating greater than or equal to 500 MVA.

5.1.1.2. Gross individual nameplate rating greater than or equal to 300 MVA where the gross plant/facility aggregate nameplate rating is greater than or equal to 1,000 MVA.

Requirements

R11. Each Transmission Owner and Generator Owner shall provide, upon request, all SER and FR data for the BES buses identified in Requirement R1 and DDR data for the BES Elements identified in Requirement R5 to the Reliability Coordinator, Regional Entity, or NERC in accordance with the following: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

11.1. Data will be retrievable for the period of 10 calendar days, inclusive of the day the data was recorded.

11.2. Data subject to Part 11.1 will be provided within 30 calendar days of a request unless an extension is granted by the requestor.

11.3. SER data will be provided in ASCII Comma Separated Value (CSV) format following Attachment 2.

11.4. FR ~~and DDR~~ data will be provided in electronic files that are formatted in conformance with C37.111, ~~(~~IEEE Standard Common Format for Transient Data Exchange (COMTRADE), revision C37.111-1999 or later.

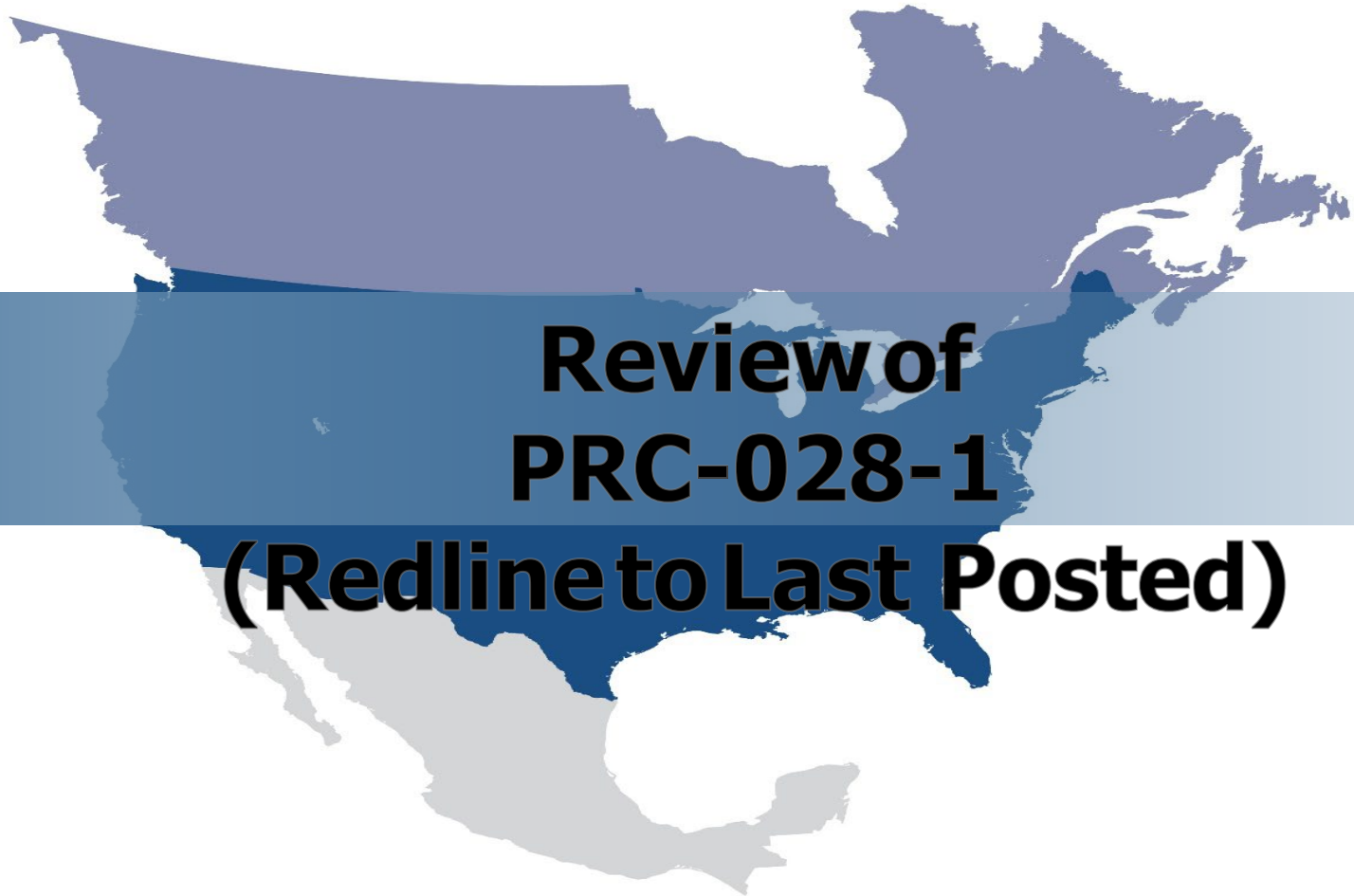
~~**11.4.**~~**11.5.** DDR data will be provided either in CSV format with appropriate headers or in electronic files that are formatted in conformance with C37.111, IEEE Standard Common Format for Transient Data Exchange (COMTRADE), revision C37.111-1999 or later.

~~**11.5.**~~**11.6.** Data files will be named in conformance with C37.232, IEEE Standard for Common Format for Naming Time Sequence Data Files (COMNAME), revision C37.232-2011 or later.

Requirements

R12. Each Transmission Owner and Generator Owner shall, upon~~within 90 calendar days of~~ the discovery of a failure of the recording capability for the SER, FR or DDR data~~,~~ ~~either~~: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

- Restore the recording capability within 90 calendar days, or
- Submit a Corrective Action Plan (CAP) to the Regional Entity within 90 calendar days and then implement it according to CAP timeline.



Review of PRC-028-1 (Redline to Last Posted)

Title & Purpose

Title: Disturbance Monitoring and Reporting Requirements for ~~I~~inverter-~~B~~based ~~R~~resources

Number: PRC-028-1

Purpose: To have adequate data available from ~~I~~inverter-~~B~~based ~~R~~resources[1] ~~(IBR)~~ to evaluate ~~facilitate analysis of IBR~~inverter-based resource ride-through performance during Bulk Electric System (BES) Disturbances and to provide data for ~~IBR~~inverter-based resource model validation.

[1] For the purpose of this standard, "inverter-based resources" refers to a collection of individual solar photovoltaic (PV), Type 3 and Type 4 wind turbines, battery energy storage system (BESS), or fuel cells that operate as a single plant/resource. In case of offshore wind plants connecting via a dedicated voltage source converter high voltage direct current (VSC HVDC) line, the inverter-based resource includes VSC HVDC line.

Applicability

Applicability:

4.1. Functional Entities:

4.1.1. Transmission Owner that owns equipment as identified in section 4.2

4.1.2. Generator Owner that owns equipment as identified in section 4.2

~~**Facilities:**~~

4.2. ~~.The Elements associated with (1)~~ BES ~~I~~inverter-~~B~~based ~~R~~resources~~; and (2) Non-BES Inverter-Based Resources that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV~~.

Requirement R1

R1. Each Transmission Owner and Generator Owner shall have ~~sequence of event recording (SER) data for the following Elements~~ circuit breaker position (open/close) sequence of event recording (SER) data for circuit breakers that it owns associated with: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

1.1. ~~Circuit breaker position (open/close) for circuit breakers associated with the main~~ Main power transformer(s)[2]~~,~~

1.2. ~~c~~Collector bus(es), including collector feeder breakers~~, and~~

1.3. ~~s~~Shunt static or dynamic reactive device(s), including any filter banks~~.~~

,1.4. AC-DC and DC-AC converters, if any, in case of VSC HVDC line with a dedicated connection to inverter-based resources.

Requirement R1

1.2. For IBR Units in commercial operation after [the effective date of this standard]: at least one IBR Unit, per collector bus, on any of the collector feeders that is connected at a distance greater than or equal to 90% of the longest collector feeder. The following data shall be recorded when triggered by ride-through operation or tripping of an IBR Unit.

1.2.1. All fault codes.

1.2.2. All fault alarms.

1.2.3. High and low voltage ride-through mode status.

1.2.4. High and low frequency ride-through mode status.

1.3. For IBR Units in commercial operation prior to [the effective date of this standard]: at least one IBR Unit, per collector bus, on any of the collector feeders that is connected at a distance greater than or equal to 90% of the longest collector feeder. The following data shall be recorded, if capable of recording, when triggered by ride-through operation or tripping of an IBR Unit.

1.3.1. All fault codes.

1.3.2. All fault alarms.

1.3.3. High and low voltage ride-through mode status.

High and low frequency ride-through mode status.

Requirement R2

R2. Each Transmission Owner and Generator Owner shall have triggered fault recording (FR) data to determine the following electrical quantities for Elements that it owns: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

2.1. High-side of the main power transformer FR data:

2.1.1. Phase-to-neutral voltage for each phase.

2.1.2. Each phase current and the residual or neutral current.

2.1.3. Real and reactive power expressed on a three-phase basis.

~~**2.2.** IBR Unit FR data from at least one IBR Unit, per collector bus, on any of the collector feeders that is connected at a distance greater than or equal to 90% of the longest collector feeder:~~

~~**2.2.1.** Each AC phase to neutral or phase to phase voltage, as applicable, at IBR Unit terminals or on high side of the IBR Unit transformer.~~

~~**2.2.2.** Each AC phase current and the residual or neutral current, as applicable, on IBR Unit terminals or on high side of the IBR Unit transformer.~~

~~**2.3.**~~**2.2.** Shunt dynamic reactive device data:

~~**2.3.1.**~~**2.2.1.** Phase-to-neutral voltage for each phase.

~~**2.3.2.**~~**2.2.2.** Each phase current and the residual or neutral current.

~~**2.3.3.**~~**2.2.3.** ~~Real and r~~Reactive power output expressed on a three-phase basis.

Requirement R3

R3. Each Transmission Owner and Generator Owner shall have FR data as specified in Requirement R2 that meets the following: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

3.1 High-side of the main power transformer FR data – No change

~~**3.2.** IBR Unit level data~~

~~**3.2.1.** A single record or multiple records that include a pre-trigger record length of at least two cycles and a total record length of at least 2 seconds for the same trigger point.~~

~~**3.2.2.** A minimum recording rate of 64 samples per cycle).~~

~~**3.2.3.** Trigger settings for at least the following:~~

~~**3.2.3.1.** AC Phase overvoltage and undervoltage.~~

~~**3.2.3.2.**~~**3.1.3.3.** ~~Overfrequency and underfrequency.~~

3.3 Shunt dynamic reactive device FR data – No change

Requirement R7

R7. Each Transmission Owner and Generator Owner shall provide all ~~, upon~~ requested~~, all~~ SER, FR, and DDR data to its Transmission Planner, Planning Coordinator, Transmission Operator, Balancing Authority, Reliability Coordinator, Regional Entity, or NERC in accordance with the following: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

7.1. Data shall be retrievable for the period of 20 calendar days, inclusive of the day the data was recorded.

7.2. Data subject to Part 7.1 shall be provided within ~~30~~ 15 calendar days of a request unless an extension is granted by the requestor.

7.3. SER data shall be provided in ASCII[3] Comma Separated Value (CSV) format following Attachment 1.

7.4. FR ~~and DDR~~ data shall be provided ~~either in CSV format or~~ in electronic files that are formatted in conformance with C37.111, IEEE Standard Common Format for Transient Data Exchange (COMTRADE), revision C37.111-1999 or later.

~~7.4.~~7.5. DDR data shall be provided either in CSV format with appropriate headers or in electronic files that are formatted in conformance with C37.111, IEEE Standard Common Format for Transient Data Exchange (COMTRADE), revision C37.111-1999 or later.

~~7.5.~~7.6. Data files shall be named in conformance with C37.232, IEEE Standard for Common Format for Naming Time Sequence Data Files (COMNAME), revision C37.232-2011 or later.

Requirement R8

R8. Each Transmission Owner and Generator Owner shall, upon~~within 90 calendar days of~~ the discovery of a failure of the recording capability for the SER, FR, or DDR data~~,~~ ~~either~~: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

- Restore the recording capability within 90 calendar days, or
- Submit a Corrective Action Plan (CAP) to the Regional Entity within 90 calendar days and then implement it according to CAP timeline.

Requirement R9

R9. Each Transmission Owner and Generator Owner of an applicable facility as specified in section A.4.2 that is in commercial operation before the effective date of this standard that is not able to install disturbance monitoring equipment in accordance with Requirements R1 through R7 in the time provided for compliance shall develop, maintain, and implement a Corrective Action Plan to provide the required capability. For each Corrective Action Plan, the Transmission Owner and Generator Owner shall: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

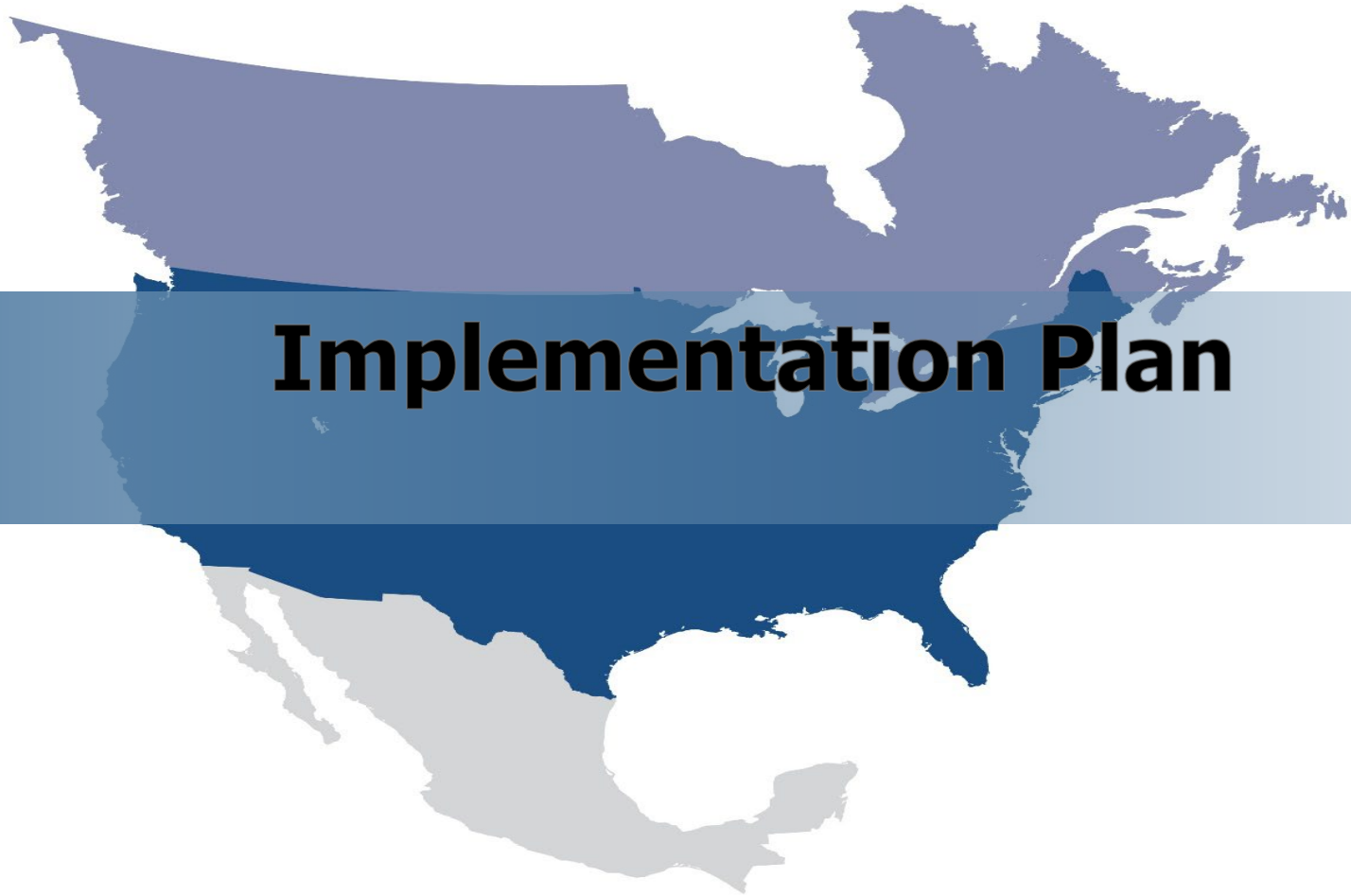
9.1. Identify corrective actions and a timetable for completion.

9.2. Specify the circumstances causing the delay for fully or partially implementing Requirements R1 through R7 and explain how those circumstances are beyond the control of the responsible entity.

9.3. Identify revisions to the selected actions in Part 9.1, if any.

9.4. Identify updates to the timetable for implementing the selected actions in Part 9.1, if any.

9.5. Submit the Corrective Action Plan, and any revisions, to the Regional Entity, with a request to extend the time provided for compliance.



Implementation Plan

Compliance Date for PRC-028-1 Requirements R1-R7

For inverter-based resources ~~Plants/Ffacilities~~ in commercial operation on or before the effective date:

Entities shall comply with Requirements R1 through R7 at 50% of their ~~generating plants/Facilitie~~inverter-based resources within three (3) calendar years of the effective date of PRC-028-1 and 100% of their ~~generating plant/Facilitie~~inverter-based resources by January 1, 2030.

Entities that are required to monitor only one (1) ~~generating plant/Facility~~inverter-based resource shall comply with Requirements R1 through R7 within three (3) calendar years of the effective date of Reliability Standard PRC-028-1.

Compliance Date for PRC-028-1 Requirements R1-R7

For inverter-based resources~~facilities~~ entering commercial operation after the effective date: Entities shall comply with Requirements R1 through R7 within 15 calendar months following the effective date of the standard or the commercial operation date, whichever is later.

~~**For Plants/Facilities entering commercial operation within one year after the effective date:**~~
~~Entities shall comply with Requirements R1 through R7 by the end of the first calendar year that is 12 months following the effective date of the standard.~~

~~**For Plants/Facilities entering commercial operation one year or later after the effective date:**~~
~~Entities shall comply with Requirements R1 through R7 at the date of entering commercial operation.~~

Process for Seeking an Extension from Compliance Dates

Each GO and TO that owns one or more applicable inverter-based resources that are in commercial operation before the effective date of Reliability Standard PRC-028-1 may seek an extension from the above-listed compliance dates if circumstances beyond its control prevent the installation of Disturbance Monitoring Equipment on one or more of its inverter-based resources.

To seek an extension, the entity shall develop and submit to its Regional Entity[2] a request for extension that contains at a minimum the following information:

1.1. Identification of the inverter-based resource(s) for which the entity seeks the extension;

1.2. A plan for installing the Disturbance Monitoring Equipment and a timetable for completion;

1.3. A description of the circumstances precluding the timely installation of Disturbance Monitoring Equipment and how those circumstances are beyond the control of the entity; and

1.4. Any other information the entity deems relevant to the Regional Entity's consideration of its request.

The entity shall provide any information requested by the Regional Entity in connection with its request, including any information specified in a supporting process document. If the request is granted, the entity shall implement the plan in accordance with the provided timetable. Should additional time be required, the entity shall submit an updated request to its Regional Entity.

Requests should be submitted as soon as the entity identifies circumstances prescribing the timely implementation of Reliability Standard PRC-028-1, but no later than three months prior to the compliance date for which the entity seeks an extension.

Next Steps

Next Steps

- Posting
  - Project Page 2021-04
  - 15-day comment period and formal ballot May 31 – June 14, 2024
- Point of contact
  - Ben Wu, Senior Standards Developer
  - Ben.Wu@nerc.net or call 470-542-6882
- Webinar posting
  - Three business days
  - Standards Bulletin

Questions and Answers