

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Industry Webinar

Project 2021-05 Modifications to PRC-023

November 17, 2022

RELIABILITY | RESILIENCE | SECURITY



- Presenters
 - Standard Drafting Team
 - Chair, Gene Henneberg, NV Energy
 - Chris Koteles, Vice Chair
 - NERC Staff
 - Ben Wu (Project Developer)
- Administrative Items
- Project 2021-05 Status
- Proposed Revisions
- Next Steps
- Questions and Answers

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- **For the official record**
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 - Comments must be submitted during the formal posting
- **Q&A Session**
 - Q/A feature

Name	Organization/ Company
Gene Henneberg (Chair)	NV Energy
Chris Koteles (Vice Chair)	ITC
Manish Patel	Southern Company Services
Kandas Graham	Xcel Energy
Michael Thompson	SEL Engineering Services
Ding Lin	Manitoba Hydro
Rod Smith	Duke Energy

- Project 2021-05 SAR was submitted by NERC System Protection and Control Subcommittee to retire Requirement R2 and remove Attachment A exclusion 2.3.
- The Standards Committee (SC) accepted the SAR and authorized soliciting for members for the SAR DT on January 20, 2021 meeting.
- At the SC's September 23, 2021 meeting, the SC appointed members, chair, and vice chair to the SAR Drafting Team.
- The SAR Drafting Team started to work on the SAR in October 2021.
- The SC accepted the Project 2021-05 Modifications, authorized drafting revisions in the SAR and appointed the SAR DT as the Standard Drafting Team (SDT) on December 15, 2021.
- The SDT started their work in January 2022.
- At the SC's September 21, 2022 meeting, the SC authorized initial posting for industry comment and voting.

- Origin of the SAR
 - The original SAR was developed by the NERC SPCWG
 - This version was modified by the present drafting team
- Industry Need
 - R2 should be removed or modified because it has been interpreted to restrict the setting of PSB elements making determination of appropriate settings more difficult and making compliance with PRC-026 more difficult
- Purpose/Goal
 - Modifying or eliminating PRC-023-5 Requirement R2 to more effectively apply PSB when appropriate to improve BES reliability
 - Modify or remove an exclusion (Attachment A – 2.3) that may no longer be needed
 - Clarify compliance timing for Elements added via Requirement R6 and Attachment B

- A Technical Rationale document was developed during the drafting process to provide a detailed discussion of the SDT's reasoning for its recommended changes to PRC-023-5 and related documents. This presentation summarizes the reasoning in the Technical Rationale.

- **R1.** 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].*
[individual Criteria not listed, but do not change]
- **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].*

- The single fault condition regulated by R2 is a subset of faults regulated by R1 and requires the same entity response.
 - R1 includes the phrase “... prevent its phase protective relay settings from limiting transmission system loadability ***while maintaining reliable protection of the BES for all fault conditions.***” ... (emphasis added)
 - R2 singles out a specific fault condition when it specifies that the applicable entity “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.” (emphasis added)
- R2 adds nothing to the “... all fault conditions” identified in R1. So if an entity failed to comply with R2, they would also fail to comply with R1.

- *There are a few factors to consider regarding the history of R2 development:*
 - 1. An error in the “Determination and Application of Practical Relaying Loadability Ratings,” Appendix C, July 3, 2008 documentation of power swing blocking capabilities appears to have suggested development of R2. The wording in this Appendix relevant to this discussion has not changed since this 2008 version.

- *Appendix C concluded that “if (and as long as) a system load condition operates the out-of-step blocking relay, the distance relay will be prevented from operating for a subsequent fault condition! **A timer can be added such that the relay issues a trip if the out of step timer does not reset within a defined time.**” [emphasis added]*
 - Tripping should not occur during the identified load conditions unless a fault actually occurs on the element. A timer can’t detect such faults.
 - No discussion why the “... subsequent fault condition!” that became R2 is excluded from “... all fault conditions” that has always been part of R1. This left the impression that there is no acceptable alternate technical solution.
 - The incomplete discussion of power swings appears to have convinced FERC to direct a separate requirement on PSB.
 - The present SDT suggests adding a list of available methods that can reset PSB function during an event to allow trips during a “subsequent fault.”

- 2. An PRC-023-1 Attachment 2 reference to PSB schemes as “shall be evaluated” turned into the Requirement R2.
 - A commenter on PRC-023-1 was concerned that the SDT at the time did not recognize that the PSB can be reset to allow detection of faults after the PSB function asserts. The SDT response at the time did not acknowledge that resetting of the PSB function can be an option.
 - Comments on PRC-023-2 conceded FERC’s directive to develop a PSB requirement, and the SDT at the time agreed.
 - No one questioned whether “... all fault conditions” in R1 included the faults intended to be detected by the new R2.

- 3. More than 10 years of history and experience since PRC-023-2 came into effect have shown that neither compliance, system operations, nor system events regulated by R2 has had any significant impact on system reliability. In addition, the original risk addressed by Requirement R2 has been reduced due to subsequent Protection System upgrades.
 - Experience is not a perfect guide to judge the necessity of Requirement R2 but does provide useful perspective.
 - Two R2 compliance violations (about one year after the effective date) do not appear to have imposed any risk to the Bulk Power System.
 - None of the multiple event reports that are relevant to PSB operations on the NERC web site indicted that R2 either improved or detracted from system performance during any of these system disturbances.
 - Many entities have upgraded their limited capability PSB applications since 2011 with more advanced relays.

RETIRE Requirement R2

- **R2. Reserved** ~~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].~~

- Attachment A, Item 2.3 excludes “Protection systems intended for protection during stable power swings” and references “Protection systems installed specifically to separate portions of the system that are experiencing stable power swings relative to each other in order to maintain desirable performance relative to voltage, frequency, and power oscillations.”
 - PRC-026 covers stable power swings adequately. Since Item 2.3 is an exclusion, there is no overlap with PRC-026.
- The original drafting team comment response seems to say that exclusion 2.3 should never have been included
 - Where out of step tripping or blocking relays are applied independently within the system they must comply with the standard.

RETIRE Attachment A, Item 2.3

- **2.3. Reserved** ~~Protection systems intended for protection during stable power swings.~~

- Between Requirement R6 and Attachment B, it is not clear how much time an entity has after the Planning Coordinator identifies a BES element <200 kV that must comply with R1 through R5.

- For Retirement of R2 and Attachment A, Item 2.3
 - First day of first quarter after regulatory approvals

- Time an entity has to comply with R1-R5 for circuits identified under R6 is directly part of the revised standard making it easier to reference

- See Implementation Plan. [summary]
 - The entity has up to 39 months to comply if the PC newly identifies an element as needing to comply less than 39 months in the future.
 - Example: The PC identifies an element in Dec 2022 as needing to comply by June 2024. This is less than 39 months, so the entity has (39 months) until Feb 2026 to comply.
 - The entity must comply by the PC's identified date if that date is more than 39 months in the future.
 - Example: The PC identifies an element in Dec 2022 as needing to comply by June 2027. This is more than 39 months, so the entity has until June 2027 to comply.

- Posting
 - Project Page 2021-05
 - Comment period October 10 – December 2, 2022 and formal ballot for the final 10 days, November 23 – December 2, 2022
- 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