NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Standard Authorization Request (SAR)

Complete and submit this form, with attachment(s) to the NERC Help Desk. Upon entering the Captcha, please type in your contact information, and attach the SAR to your ticket. Once submitted, you will receive a confirmation number which you can use to track your request.

The North American Electric Reliability Corporation (NERC) welcomes suggestions to improve the reliability of the bulk power system through improved Reliability Standards.

Requested information			
SAR Title:	PRC-002-2 Disturbance Monitoring and Reporting Requirements		
Date Submitted:	April 8, 2021 (Revised on November 16, 2021)		
SAR Requester			
Name:	Terry Volkmann (Revised by Project 2021-04 SAR Drafting Team)		
Organization:	Glencoe Light and Power NCR11444		
Telephone:	612-419-0672	Email:	terrylvolkmann@gmail.com
SAR Type (Check as many as apply)			
☐ New Standard ☒ Revision to Existing Standard ☐ Add, Modify or Retire a Glossary Term ☐ Withdraw/retire an Existing Standard		☐ Imminent Action/ Confidential Issue (SPM Section 10) ☐ Variance development or revision ☐ Other (Please specify)	
Justification for this proposed standard development project (Check all that apply to help NERC prioritize development)			
☐ Regulatory Initiation ☐ Emerging Risk (Reliability Issues Steering Committee) Identified ☐ Reliability Standard Development Plan		☐ NERC Standing Committee Identified ☐ Enhanced Periodic Review Initiated ☒ Industry Stakeholder Identified	
Industry Need (What Bulk Electric System (BES) reliability benefit does the proposed project provide?):			
The purpose of PRC-002-2[1] is to have adequate sequence of events recording (SER) and fault recording (FR) data available to facilitate analysis of Bulk Electric System[2] (BES) disturbances. Requirement R1, Part 1.2 infers that the notified BES Element owner is required to have FR data without regard to the identified BES bus owner having a connected BES Element for which FR data would be required for an applicable transformer or transmission line. By virtue of this notification, the transformer or transmission line BES Element owner is burdened with an obligation to have FR data andimplicitly obligates these transformer or transmission line BES Element owners to either:			

[1] NERC Reliability Standard PRC-002-2 Disturbance Monitoring and Reporting Requirements (https://www.nerc.com/_layouts/15/PrintStandard.aspx?standardnumber=PRC-002-2&title=Disturbance%20Monitoring%20and%20Reporting%20Requirements&Jurisdiction=United%20States) .

[2] See Glossary of Terms Used in NERC Reliability Standards (https://www.nerc.com/files/glossary_of_terms.pdf).

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1. Ww~~w~~ork with other BES Element (i.e., circuit breaker) owners to provide the data and data recording specification for which the transformer or transmission line owners must rely on forcompliance, or
2. ~~the transformer or transmission line BES Element owner must i~~Install its own equipment that isduplicative to the identified BES Bus recording equipment.

Below is Requirement R1 for reference:

R1. Each Transmission Owner shall: [Violation Risk Factor: Lower] [Time Horizon: Long-termPlanning]

1.1. Identify BES buses for which sequence of events recording (SER) and fault recording(FR) data is required by using the methodology in PRC-002-2, Attachment 1.

1.2. Notify other owners of BES Elements connected to those BES buses, if any, within90-calendar days of completion of Part 1.1, that those BES Elements **require** SER dataand/or FR data.

1.3. Re-evaluate all BES buses at least once every five calendar years in accordance with Part 1.1 and notify other owners, if any, in accordance with Part 1.2, and implement there-evaluated list of BES buses as per the Implementation Plan.

Notifications for FR data are being sent to BES Element owners that extend well beyond the BES bus boundary described in PRC-002-2 Attachment 1 as “a single BES bus includes physical buses with breakers connected at the same voltage level within the same physical location sharing a common ground grid.” Notifying BES Element owners beyond this boundary unnecessarily obligates the BES Element (i.e., transformer or transmission line) owner to Requirement R3, including joint owners.

The PRC-002-2 implementation plan states “Entities shall be 100 percent compliant with a re-evaluated list from Requirement R1 and R5 within three (3) years following the notification by the TO or the Responsible Entity that re-evaluated the list.” This requires PRC-002-2 Registered Entities to continue to reference the current PRC-002-2 implementation plan. Moving the three-year requirement from the PRC-002-2 implementation plan to the standard as a requirement language itself will provide clarity to Responsible Entities.

Requirement R1.3 requires re-evaluation of BES buses at least once every five calendar years in accordance with R1.1. Depending on results of this re-evaluation, location at which SER/FR data is required could change due to minor change in three phase ~~SC~~short circuit MVA. This is especially true for small Transmission Owners which are only required to have SER/FR data for one (1) BES bus per allowance based on methodology in Attachment 1. The standard currently does not give any guidance on what is considered a substantial change in three phase ~~SC~~short circuit MVA. Adding a criterion that constitutes a substantial change in fault current levels which would require changing SER and FR data recording locations would help with associated cost and compliance burden.

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If appropriate, ~~A~~add Planning Coordinator to the Western Interconnection in Section 4.1.3 as a Responsible Entity.
Purpose or Goal (How does this proposed project provide the reliability-related benefit described above?):
The goal of the proposed project is to: • ~~-C~~clarify the necessary notifications in Requirement R1, Part 1.2 relative to the SER/FR data, and clearly identify the BES Element owners that need to have SER/FR data for transformers and transmission lines with the associated identified bus. • ~~-~~Move requirement to be 100 percent compliant within three (3) years following notification of a re-evaluated list by the responsible entity from the implementation plan to the standard itself. • Add a criterion that constitutes a substantial change in fault current levels which would require changing SER/FR data recording locations. • If appropriate, ~~A~~add Planning Coordinator to the Western Interconnection in Section 4.1.3 as a possible Responsible Entity.
Project Scope (Define the parameters of the proposed project):
The scope should include: • M~~m~~odifying Requirement R1, Part 1.2 to clarify notifications, which may include but is not limited to separating the notifications for SER data and/or FR data ~~regarding notification~~. Additionally, Requirement R3 should be modified so that it is abundantly clear to the applicable Transmission Owner and Generator Owner when their BES Element must have FR data for an applicable transformer or transmission line. • C~~c~~larifying various terms such as “connected” and “directly connected” BES Elements and as necessary, ensure consistent usage of terms such as “BES bus” and “BES Element” in the standard. • Codifying the three (3) year implementation period of newly identified buses in the re-evaluation performed per Requirement R1, Part 1.3 and R5.4 of the standard. The SDT should also clarify if this implementation period is three calendar years or three years from the notification from the responsible entity. • Adding a criterion that constitutes a substantial change in fault current levels which would require changing SER and FR data recording locations. • If appropriate, ~~A~~adding Planning Coordinator to the Western Interconnection in Section 4.1.3 as a possible Responsible Entity.
Detailed Description (Describe the proposed deliverable(s) with sufficient detail for a drafting team to execute the project. If you propose a new or substantially revised Reliability Standard or definition, provide: (1) a technical justification[3] which includes a discussion of the reliability-related benefits of developing a new or revised Reliability Standard or definition, and (2) a technical foundation document (*e.g.,* research paper) to guide development of the Standard or definition):
The Transmission Owner (TO) applying the method in Attachment 1 who identifies a BES bus is in the ideal position to know which BES Elements (i.e., circuit breakers, transformer and transmission line) are

[3] The NERC Rules of Procedure require a technical justification for new or substantially revised Reliability Standards. Please attach pertinent information to this form before submittal to NERC.

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connected to a single BES bus that includes physical buses with breakers connected at the same voltage level within the same physical location sharing a common ground grid. Additionally, the identified BES bus owner should know who owns the particular BES Element (i.e., circuit breaker) that needs SER and FR data to capture disturbances on generators, transformers, and transmission lines as identified in Requirement R3. Owners of BES Elements beyond the physical buses with breakers connected at the same voltage level within the same physical location sharing a common ground grid should not be notified, unless their SER and FR data is needed to complete the identified BES bus SER and FR data.

Requirement R1, Part 1.1 uses a method and BES bus definition[4] outlined in Attachment 1 to identify BES buses that requires SER data and/or FR data. Part 1.2 requires the notification of other BES Element owners connected to the identified BES bus under Requirement R1, Part 1.1. As currently written, a notification is required regardless of whether the identified BES bus owner has FR data for the intended BES Element (i.e., transformer or transmission line) or owns the BES Elements directly connected to the identified BES bus. Requirement R1, Part 1.2 should be modified such that only the directly connected BES Element owner to the identified BES bus at the same voltage level within the same physical location sharing a common ground grid of the identified BES bus shall have FR data.

This will eliminate unnecessary notifications and obligations of the transformer and transmission line owners to compel other entities to have SER and FR data when there is no authority to do so. In these cases, the other BES Element owner(s) have to rely on SER and FR data from another entity that does not have the obligation under the standard.

Additionally, clarifying the BES Element for which SER and FR data is required will reduce auditing needs resulting from notifying BES element owners who should not be responsible to have SER and FR data as well as reducing the cost burden of meeting the reliability need for SER and FR data.

The standard should clearly define the terms “directly connected” versus “connected” as it relates to determining which elements are required to have the SER and FR data. PRC-002-2 uses “connected” in Requirements R1.2 and R3, however, “directly connected” is used in Requirement R2. One interpretation of “connected” versus “directly connected” is shown in Figure 1, where all breakers are considered “directly connected” and other BES elements such as transmission lines, transformers and generators are “connected” to the bus. Figure 2 shows an example of a ring bus arrangement with possible classification of “connected” and “directly connected” BES elements.

[4] Attachment 1, Step 1: Determine a complete list of BES buses that it owns. For the purposes of this standard, a single **BES bus** includes physical buses with breakers connected at the same voltage level within the same physical location sharing a common ground grid. These buses may be modeled or represented by a single node in fault studies. For example, ring bus or breaker-and-a-half bus configurations are considered to be a single bus.

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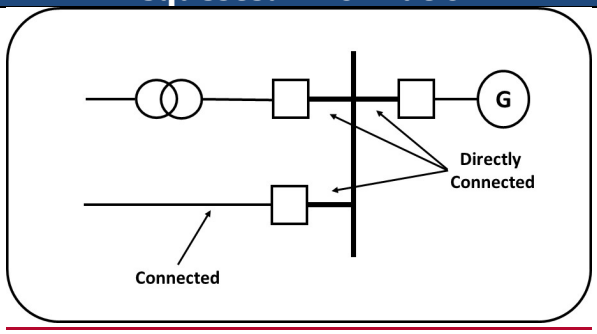


Figure 1

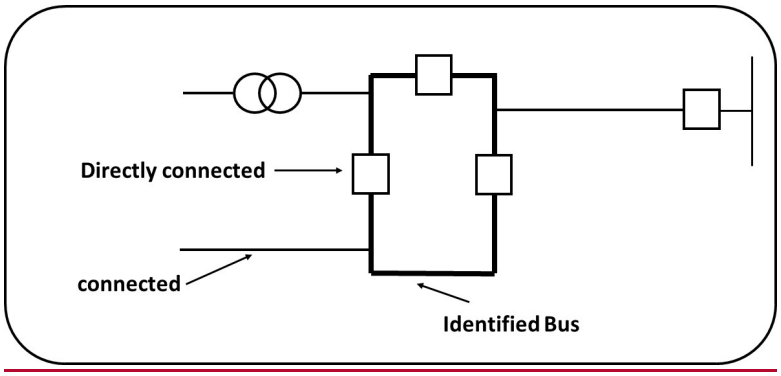
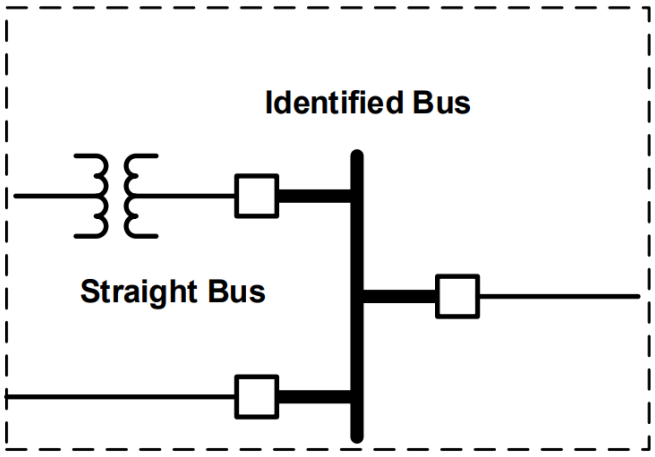


Figure 2



A straight bus configuration shown in Figure 3 ~~The above figure of a straight bus~~ is the simplest BES bus configuration sharing~~contained within~~ a common ground grid. Only the BES circuit breakers "1", "2" and "3" are "directly connected" to the identified BES bus.

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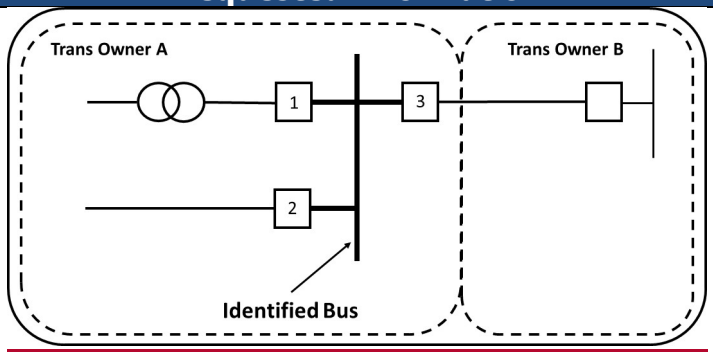

Figure 3

In this case, Transmission Owner A owns the BES bus as well as all breakers "directly connected" to it. In case where this BES bus is identified in Requirement R1, then Transmission Owner A is responsible for recording SER and FR data per Requirements R2 and R3 respectively. The Transmission Owner A should not be required to notify Transmission Owner B under Requirement R1.2 because Transmission Owner B does not own a BES element "directly connected" to the identified bus. However, per currently written Requirement R1.2, Transmission Owner A is required to notify Transmission Owner B. This has resulted in unnecessary notifications per Requirement R1.2 among various entities. The same is true for a ring bus configuration shown in Figure 4.

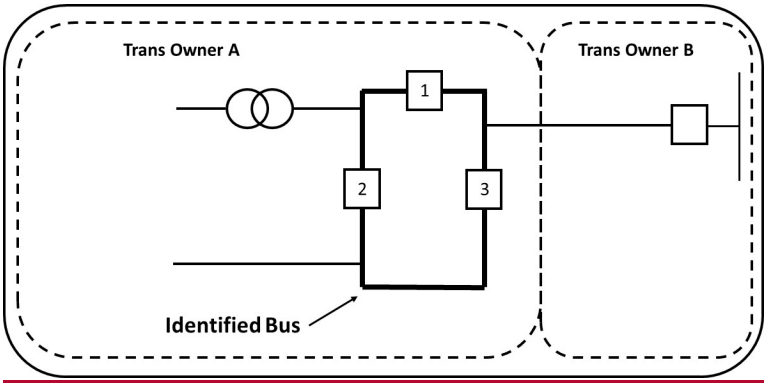

Figure 4

Figure 5 shows a variation of example in Figure 3, where BES breaker "3" is owned by Transmission Owner B. In this case, per Requirement R1.2, Transmission Owner A must notify Transmission Owner B that BES breaker "3" requires SER and FR data as breaker "3" is "directly connected" to the identified bus. In this case it is clear that ~~concerning~~ SER data in Requirement R2 is required because the BES circuit breaker "3" is "directly connected~~.~~" to the identified bus. Although Requirement R3 does not mention "directly connected", it is clear that Transmission Owner B is required to have FR data to determine specified electrical quantities for breaker "3". From there how the compliance requirement is met is up to the involved entities.

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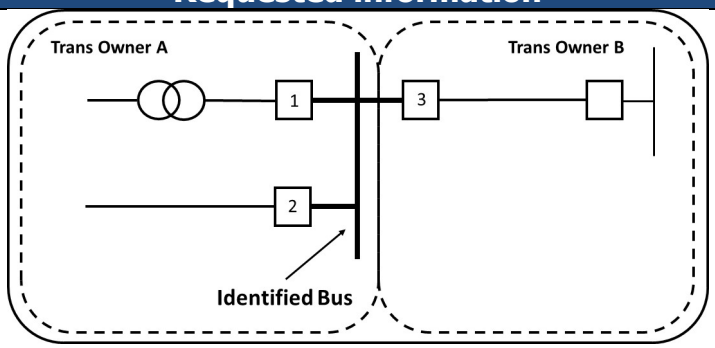

Figure 5

~~However, to achieve the need for FR data in Requirement R3, the identified BES bus owner notifies the transformer and transmission line owners under~~ Under the current Requirement R1, Part 1.2, the identified BES bus owner is required to notify all owners of ~~thus obligating them to have FR data where the circuit breaker is~~ "directly connected" breakers ~~and the logical BES Element to record~~ that SER and/or FR data is required.

Under the current Requirement R3, the notified Transmission Owner B is required to have FR data, either by obtaining FR data from Transmission Owner A~~GO and TO transformer or line owner will need to contact the circuit breaker owner in hope of obtaining FR data~~ or by installing their own equipment. The Transmission Owner B~~GO and TO~~ cannot compel the Transmission Owner A ~~circuit breaker owner~~ to provide~~have~~ FR data. Additionally, relying on another entity ~~that has no reliability responsibility~~ for complying with PRC-002-2 places Transmission Owner B~~the transformer or transmission line owner~~ at risk if the other entity fails to have the necessary and adequate FR data.

The intent of the standard in Requirement R3 is to have FR data associated with all applicable BES Elements at a single BES bus. This~~but that~~ includes physical buses with breakers "directly connected" at the same voltage level within the same physical location sharing a common ground grid of the identified BES bus. Requirement R1, Part 1.2 should only require notification to the BES Element (i.e., circuit breaker) owner "directly connected" with the identified BES bus.

Under a ring bus configuration shown in Figure 6, elements (such as transmission lines, transformers etc.) that connect to the ring bus share BES circuit breakers for their protection system. The notifications per Requirement R1.2 by the identified bus owner are the same as with example in Figure 4. From there how the compliance requirement is met is up to the involved entities.

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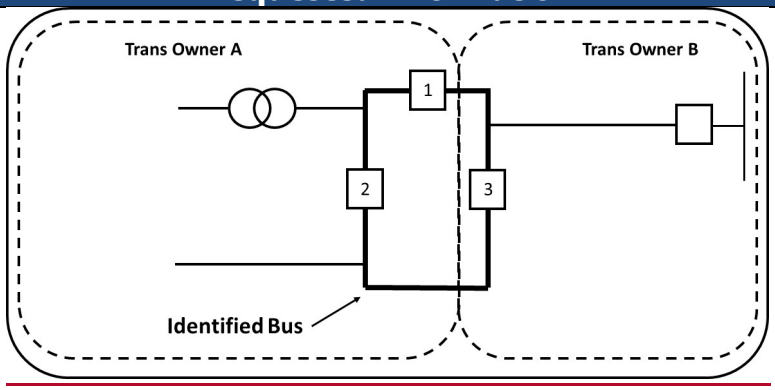

Figure 6

If one of the connecting elements is a generator as shown in Figure 7, Requirement R2 is clear about SER data obligation for the Generator Owner and notification from Transmission Owner to Generator Owner per Requirement R1.2 should be required. However, obligation for FR data per requirement R3 needs clarification as to if the Generator Owner is required or not to have FR data for breaker "3". Requirement R3.2.1 exempts generator step-up transformers, implying that FR data would be available from equipment on the transmission system but this assumption may not be valid in all scenarios. The same clarification is also necessary for a configuration shown in Figure 8 where a generator is connected to the identified BES bus via a tie-line and the ownership of breaker "3" and the interconnecting tie-line belongs to the Generator Owner. From PRC-002-2 perspective, expectations for having FR data for breaker "3" is not different for scenarios presented in Figures 7 and 8.

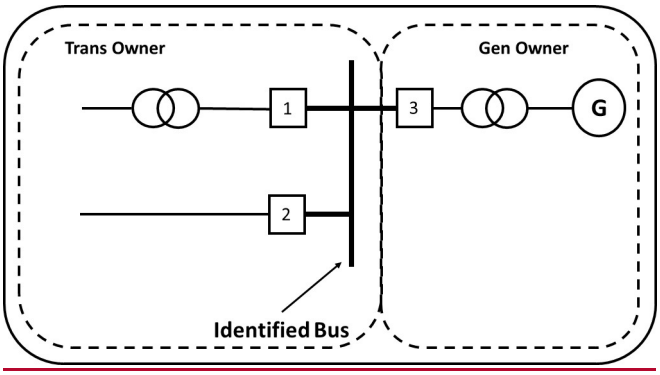

Figure 7

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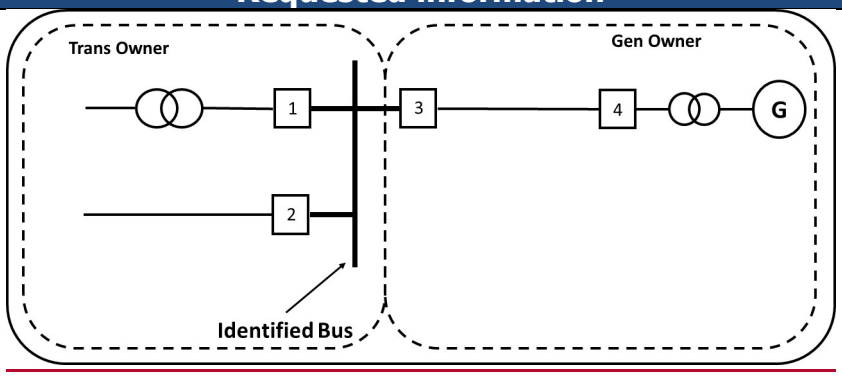

Figure 8

Identifying ~~Having~~ the appropriate BES Elements ~~identified~~ at the same voltage level within the same physical location sharing a common ground grid that requires SER and/or FR data will help facilitate obtaining data by only having to seek the data from those entities directly connected to the identified BES bus. However, the current standard could be interpreted that generation, transformer, and transmission line owners could have FR data that is recorded at a location remote to the identified BES bus. As such, any modifications should consider alternative approaches that will achieve the intent of the standard while reducing associated cost and compliance burdens.

The PRC-002-2, R1.3 and R5.4 requires Responsible Entities to re-evaluate BES buses/BES Elements at least once every five calendar years and notify other owners…and implement the re-evaluated list of BES buses/BES Elements as per the Implementation Plan. The current PRC-002-2 implementation plan in turn requires that "Entities shall be 100 percent compliant with a re-evaluated list from Requirement R1 or R5 within three (3) years following the notification by the TO or the Responsible Entity that re-evaluated that list." This requires PRC-002-2 Registered Entities to continue to reference the current PRC-002-2 implementation plan in order to understand the requirement to implement the re-evaluated list of BES buses/BES Elements on a three-year cycle. Moving the three-year requirement from the PRC-002-2 implementation plan to the standard as requirement language itself, as it is essentially a periodic requirement, will provide additional clarity to Responsible Entities as well as reduce the number of extraneous documents needed to comply with the standard.

Requirement R1.3 requires re-evaluation of BES buses at least once every five calendar years in accordance with R1.1, which refers to methodology presented in Attachment 1. Attachment 1, Step 7 specifies that if the list has one (1) or more but less than or equal to 11 buses the FR/SER data is required at the BES bus with the highest maximum available calculated three phase ~~SC~~short circuit MVA as determined in step 3. This is applicable to small Transmission Owners. During a re-evaluation, depending on minor system changes, it is likely that a bus with a highest maximum available three phase ~~SC~~short circuit MVA changes and would require installation of equipment to capture SER/FR data at this newly identified bus. This is justified if change in fault currents is large, however, if the change is minor then results in unnecessary burden on the Responsible Entity. Adding a criterion that constitutes

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a substantial change in fault current levels which would require changing SER and FR data recording locations would help with associated cost and compliance burden.
Cost Impact Assessment, if known (Provide a paragraph describing the potential cost impacts associated with the proposed project):
For most part, the proposed modifications would eliminate unnecessary and administrative compliance burden for the Responsible Entities. If the revised standard requires disturbance monitoring equipment, approximate cost would be $50,000 to $100,000 per installation unless the existing equipment is set up for monitoring and storage. ~~None, the proposed modification above eliminates the unnecessary cost of being required to have FR data due to expanded notifications and the administrative burden to transformer and transmission line owners when these entities generally do not own the BES Elements that actually record the FR data.~~
Please describe any unique characteristics of the BES facilities that may be impacted by this proposed standard development project (*e.g.*, Dispersed Generation Resources):
The standard already applies to TOs and GOs but depending on revision, additional generator interconnecting facilities might be required to provide FR data~~None~~.
To assist the NERC Standards Committee in appointing a drafting team with the appropriate members, please indicate to which Functional Entities the proposed standard(s) should apply (*e.g.*, Transmission Operator, Reliability Coordinator, etc. See the most recent version of the NERC Functional Model for definitions):
Transmission Owner and Generation Owner
Do you know of any consensus building activities[5] in connection with this SAR? If so, please provide any recommendations or findings resulting from the consensus building activity.
None.
Are there any related standards or SARs that should be assessed for impact as a result of this proposed project? If so, which standard(s) or project number(s)?
A SAR was submitted by the NERC Inverter-Baser Resource Performance Task Force (IRPTF) to address potential gaps and improvements based on the work and findings of the IRPTF was authorized for posting by the NERC Standards Committee on January 20, 2021.
Are there alternatives (e.g., guidelines, white paper, alerts, etc.) that have been considered or could meet the objectives? If so, please list the alternatives.
Standard Implementation Guide or Practice Guide could provide the necessary clarity; however, these documents cannot change the strict language of the PRC-002-2 Reliability Standard. Nothing is being considered at the present time.

[5] Consensus building activities are occasionally conducted by NERC and/or project review teams. They typically are conducted to obtain industry inputs prior to proposing any standard development project to revise, or develop a standard or definition.

Reliability Principles	
Does this proposed standard development project support at least one of the following Reliability Principles (Reliability Interface Principles)? Please check all those that apply.	
☐	1. Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
☐	2. The frequency and voltage of interconnected bulk power systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
☒	3. Information necessary for the planning and operation of interconnected bulk power systems shall be made available to those entities responsible for planning and operating the systems reliably.
☐	4. Plans for emergency operation and system restoration of interconnected bulk power systems shall be developed, coordinated, maintained and implemented.
☒	5. Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk power systems.
☐	6. Personnel responsible for planning and operating interconnected bulk power systems shall be trained, qualified, and have the responsibility and authority to implement actions.
☐	7. The security of the interconnected bulk power systems shall be assessed, monitored and maintained on a wide area basis.
☐	8. Bulk power systems shall be protected from malicious physical or cyber attacks.

Market Interface Principles	
Does the proposed standard development project comply with all of the following Market Interface Principles?	Enter (yes/no)
1. A reliability standard shall not give any market participant an unfair competitive advantage.	Yes
2. A reliability standard shall neither mandate nor prohibit any specific market structure.	Yes
3. A reliability standard shall not preclude market solutions to achieving compliance with that standard.	Yes
4. A reliability standard shall not require the public disclosure of commercially sensitive information. All market participants shall have equal opportunity to access commercially non-sensitive information that is required for compliance with reliability standards.	Yes

Identified Existing or Potential Regional or Interconnection Variances	
Region(s)/ Interconnection	Explanation
None	

For Use by NERC Only

SAR Status Tracking (Check off as appropriate).	
☐ Draft SAR reviewed by NERC Staff ☐ Draft SAR presented to SC for acceptance ☐ DRAFT SAR approved for posting by the SC	☐ Final SAR endorsed by the SC ☐ SAR assigned a Standards Project by NERC ☐ SAR denied or proposed as Guidance document

Version History

Version	Date	Owner	Change Tracking
1	June 3, 2013		Revised
1	August 29, 2014	Standards Information Staff	Updated template
2	January 18, 2017	Standards Information Staff	Revised
2	June 28, 2017	Standards Information Staff	Updated template
3	February 22, 2019	Standards Information Staff	Added instructions to submit via Help Desk
4	February 25, 2020	Standards Information Staff	Updated template footer