NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Project 2007-11 – Disturbance Monitoring
PRC-002-2 – Disturbance Monitoring and Reporting Requirements

Mapping Document for PRC-018-1 to PRC-002-2 and PRC-002-1 to PRC-002-2

PRC-002-2 addresses the recording (data), not "how" the data is recorded, thus eliminating the complications that arise from the inherent differences between regional power systems. PRC-018-1 and PRC-002-1 deal with equipment, PRC-002-2 deals with recording. By specifying recording instead of equipment, PRC-002-2 governs the practical capturing of abnormal event data on the BES.

PRC-018-1 Requirements reference PRC-002-1 which requires PRC-018-1 Requirements to be either retired or covered in PRC-002-2.

As used herein, the acronym SOER is Sequence of Events Recording, the acronym FR is Fault Recording, and the acronym DDR is Dynamic Disturbance Recording.

Standard PRC-018-1 (To be Retired) FERC Approved	Proposed Standard PRC-002-2
R1. Each Transmission Owner and Generator Owner required to install DMEs by its Regional Reliability Organization (reliability standard **PRC-002 Requirements 1-3**) shall have DMEs installed that meet the following requirements:	**R12.** Each Transmission Owner and Generator Owner shall time synchronize all **Sequence of Events Recording** (SOER), **Fault Recording** (FR), and **Dynamic Disturbance Recording** (DDR) data for the bus locations as per Requirement R2 and Elements as per Requirement R7to **within ± 2 milliseconds** of Coordinated Universal Time (UTC), time stamped with or without a local offset. **R13.** Each Transmission Owner and Generator Owner shall provide **Sequence of Event**

Standard PRC-018-1 (To be Retired) FERC Approved	Proposed Standard PRC-002-2
R1.1. Internal Clocks in DME devices shall be synchronized to **within 2 milliseconds** or less of Universal Coordinated Time scale (UTC) R1.2. Recorded data from each Disturbance shall be **retrievable for ten calendar days**.	**Recording**, **Fault Recording**, and **Dynamic Disturbance Recording** data for the bus locations as per Requirement R2 and Elements as per Requirement R7 to the Reliability Coordinator, Regional Entity, or NERC upon request: 13.1. The recorded data will be provided within 30 calendar days of a request. 13.2. The recorded data will be **retrievable for the period of 10 calendar days** preceding a request. 13.3. Sequence of Events Recording data will be provided in Comma Separated Value (.CSV) format following Attachment 2. 13.4. Fault Recording and Dynamic Disturbance Recording data will be provided in electronic C37.111, IEEE Standard for Common Format for Transient Data Exchange (COMTRADE), formatted files. 13.5. Data files will be named in conformance with C37.232, IEEE Standard for Common Format for Naming Time Sequence Data Files (COMNAME).
Notes: PRC-018-1, Requirement R1 is covered in PRC-002-2, Requirements R12 and R13. PRC-018-1 addresses the equipment used for Disturbance monitoring data recording, PRC-002-2 addresses the recorded data. Technological advances made in the types of equipment used to record power system data have made it more effective to direct PRC-002-2 at the recording, not the equipment. Time synchronization and having the data retrievable for 10 days are general parameters that facilitate data analysis. PRC-002-1, Requirement R1 is covered in PRC-002-2, Requirement R13.	
R2. The Transmission Owner and Generator Owner shall each **install DMEs in accordance with** its Regional Reliability Organization's installation	**R1.** Each Transmission Owner shall identify BES bus locations for **Sequence of Events Recording** (SOER) and Fault Recording (FR). 1.1. Bus locations shall be identified using *PRC-002-2 Attachment 1 – Sequence of*

Standard PRC-018-1 (To be Retired) FERC Approved	Proposed Standard PRC-002-2
requirements (reliability standard **PRC-002 Requirements 1 through 3**). **PRC-002-1** R1. The Regional Reliability Organization shall establish the following installation requirements for **sequence of event recording**: R1.1. Location, monitoring and recording requirements, including the following: R1.1.1. Criteria for equipment location (e.g., by voltage, geographic area, station size, etc.). R1.1.2. Devices to be monitored R2. The Regional Reliability Organization shall establish the following installation requirements for **fault recording**: R2.1.Location, monitoring and recording requirements, including the following: R2.1.1. Criteria for equipment location (e.g., by voltage, geographic area, station size, etc.). R2.1.2. Elements to be monitored at each location. R2.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following: R2.1.3.1. Three phase to neutral voltages. R2.1.3.2. Three phase currents and neutral currents. R2.1.3.3. Polarizing currents and voltages, if used. R2.1.3.4. Frequency. R2.1.3.5. Megawatts and megavars.	*Events Recording (SOER) and Fault Recording (FR) Locations Selection Methodology.* 1.2. Bus locations shall be assessed at least every five calendar years. **R2**. Each Transmission Owner that identifies BES Elements at the locations established in Requirement R1 shall notify the owners of those Elements, within 90 calendar days of determination, that the Elements require **Sequence of Events Recording** (SOER) and Fault Recording (FR). **R3**. Each Transmission Owner and Generator Owner shall have **Sequence of Events Recording** (SOER) for circuit breaker position (open/close) for each of the circuit breakers they own connected to the bus locations as per Requirement R2. **R4.** Each Transmission Owner and Generator Owner shall have **Fault Recording** (FR) at the bus locations as per Requirement R2 to determine the following electrical quantities: 4.1. Phase-to-neutral voltages for each phase of either each line or bus they own. 4.2. Each phase current and the residual or neutral current for the following BES Elements they own: 4.2.1. Transformers that have a low-side operating voltage of 100kV or above. 4.2.2. Transmission Lines.

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R2.2.Technical requirements, including the following: R2.2.1.Recording duration requirements. R2.2.2. Minimum sampling rate of 16 samples per cycle. R2.2.3. Event triggering requirements. R3. The Regional Reliability Organization shall establish the following installation requirements for **dynamic Disturbance recording**: R3.1. Location, monitoring and recording requirements including the following: R3.1.1.Criteria for equipment location giving consideration to the following: -Site(s) in or near major load centers -Site(s) in or near major generation clusters -Site(s) in or near major voltage sensitive areas -Site(s) on both sides of major transmission interfaces -A major transmission junction -Elements associated with Interconnection Reliability Operating Limits -Major EHV interconnections between control areas -Coordination with neighboring regions within the interconnection R3.1.2. Elements and number of phases to be monitored at each location. R3.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following: R3.1.3.1. Voltage, current and frequency. R3.1.3.2. Megawatts and megavars. R3.2. Technical requirements, including the following: R3.2.1. Capability for continuous recording for devices installed after January 1, 2009.	**R5.** Each Transmission Owner and Generator Owner shall have **Fault Recording** as specified in Requirement R4 that meets the following: 5.1. A single record or multiple records that include: • A pre-trigger record length of at least two cycles and a post-trigger record length of at least 50 cycles for the same trigger point. • At least two cycles of the pre-trigger data, the first three cycles of the fault, and the final cycle of the fault. 5.2. A minimum recording rate of 16 samples per cycle. 5.3. Trigger settings for at least the following: 5.3.1. Neutral (residual) overcurrent. 5.3.2. Phase undervoltage. **R6.** Each Responsible Entity shall identify BES Elements for which **Dynamic Disturbance Recording** (DDR) is required. 6.1. The Elements shall include the following: 6.1.1. A minimum of one DDR location per 3,000 MW of the Responsible Entity's historical peak system Load, inclusive of Requirement R6, Part 1, Sub-parts 6.1.1 – 6.1.7. 6.1.2 At least one DDR location in each Responsible Entity’s footprint. 6.1.3. Generating resource(s) with:

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R3.2.2. Each device shall sample data at a rate of at least 960 samples per second and shall record the RMS value of electrical quantities at a rate of at least 6 records per second.	6.1.3.1. Gross individual nameplate rating greater than or equal to 500 MVA. 6.1.3.2 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 1000MVA. 6.1.4. Locations necessary to monitor all Elements of: • Eastern Interconnection - all permanent Flowgates. • ERCOT Interconnection - major transmission interfaces. • Hydro-Quebec Interconnection - major transmission interfaces. • Western Interconnection - all major transfer paths as defined by the Regional Entity. 6.1.5. Both ends of HVDC terminals (back-to-back or each terminal of a DC circuit) on the AC portion of the converter. 6.1.6. Locations necessary to monitor all Elements of Interconnection Reliability Operating Limits. 6.1.7. Any one Element within a major voltage sensitive area as defined by an in-service undervoltage load shedding (UVLS) program. 6.2. The Elements shall be assessed at least every five calendar years.

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	R7. Each Responsible Entity shall notify, within 90 calendar days of determination, each Transmission Owner and Generator Owner of the locations and Elements they own for which **Dynamic Disturbance Recording** is required as established in Requirement R6. **R8.** Each Transmission Owner shall have **Dynamic Disturbance Recording**, for each Element they own as per Requirement R7, to determine the following electrical quantities: 8.1. One phase-to-neutral or positive sequence voltage. 8.2. The phase current on the same phase at the same voltage corresponding to the voltage in Requirement R8, Part 8.1, or the positive sequence current. 8.3. Real Power and Reactive Power flows expressed on a three-phase basis corresponding to all circuits where current measurements are required. 8.4. Frequency of any one of the voltage(s) in Requirement R8, Part 8.1. **R9.** Each Generator Owner shall have **Dynamic Disturbance Recording**, for each Element they own as per Requirement R7, to determine the following electrical quantities: 9.1. Any one phase-to-neutral, phase-to-phase, or positive sequence voltage at either the Generator Step Up Units (GSUs) high-side or low-side voltage level. 9.2. The phase current on the same phase at the same voltage in Requirement R9, Part 9.1, two phase currents for phase-to-phase voltages, or positive sequence current.

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	9.3. Real Power and Reactive Power flows expressed on a three-phase basis corresponding to all circuits where current measurements are required. 9.4. Frequency of at least one of the voltages in Requirement R9, Part 9.1. **R10.** Each Transmission Owner and Generator Owner that is responsible for Dynamic Disturbance Recording as per Requirement R7 shall have continuous data recording and storage. If the equipment was installed prior to the effective date of this standard and is not capable of continuous recording, the following is required: 10.1. Triggered record lengths of at least three minutes. 10.2. At least one of the following triggers: • Off nominal frequency trigger set at: Low High o Eastern Interconnection <59.75 Hz >61.0 Hz o Western Interconnection <59.55 Hz >61.0 Hz o ERCOT Interconnection <59.35 Hz >61.0 Hz o Hydro-Quebec Interconnection <58.55 Hz >61.5 Hz • Rate of change of frequency trigger set at: o Eastern Interconnection < -0.03125 Hz/sec > 0.125 Hz/sec o Western Interconnection < -0.05625 Hz/sec > 0.125 Hz/sec o ERCOT Interconnection < -0.08125 Hz/sec > 0.125 Hz/sec o Hydro-Quebec Interconnection < -0.18125 Hz/sec > 0.1875 Hz/sec

Standard PRC-018-1 (To be Retired) FERC Approved	Proposed Standard PRC-002-2
	• Undervoltage trigger set at: o No lower than 85% of normal operating voltage for a duration of 5 seconds **R11.** Each Transmission Owner and Generator Owner shall have Dynamic Disturbance Recording, for the Elements as per Requirement R7, which conform to the following technical specifications: 11.1. Input sampling rate of at least 960 samples per second. 11.2. Output recording rate of electrical quantities of at least 30 times per second.
Notes: PRC-018-1, Requirement R2 and PRC-002-1 Requirements R1-R3 are covered in PRC-002-2, Requirements R1-R2, and R3-R11. PRC-018-1, Requirement R2 references PRC-002-1 Requirements R1-R3. PRC-002-1, Requirements R1-R3 reference equipment installation requirements for FR, SOER, and DDR. The technical parameters of PRC-002-2 pertain to the characteristics and content of the recordings that are needed to facilitate event analysis.	
R3. The Transmission Owner and Generator Owner shall each maintain, and report to its Regional Reliability Organization on request, the following data on the DMEs installed to meet that region's installation requirements (reliability standard PRC-002 Requirements1.1, 2.1 and 3.1):	None.

Standard PRC-018-1 (To be Retired) FERC Approved	Proposed Standard PRC-002-2
R3.1. Type of DME (sequence of event recorder, fault recorder, or dynamic disturbance recorder). R3.2. Make and model of equipment. R3.3. Installation location. R3.4. Operational status. R3.5. Date last tested. R3.6. Monitored elements, such as transmission circuit, bus section, etc. R3.7. Monitored devices, such as circuit breaker, disconnect status, alarms, etc. R3.8.Monitored electrical quantities, such as voltage, current, etc.	
Notes: PRC-018-1, Requirement R3 is not covered in PRC-002-2. PRC-018-1 Requirement R3 refers to equipment and therefore is not mapped to PRC-002-2 which deals with recorded data and not equipment.	

Standard PRC-018-1 (To be Retired) FERC Approved	Proposed Standard PRC-002-2
R4. The Transmission Owner and Generator Owner shall each **provide Disturbance data** (recorded by DMEs) in accordance with its Regional Reliability Organization's requirements (reliability standard **PRC-002 Requirement 4**). **PRC-002-1** R4. The Regional Reliability Organization shall establish requirements for facility owners to report Disturbance data recorded by their DME installations. The Disturbance data reporting requirements shall include the following: 4.1. Criteria for events that require the collection of data from DMEs. 4.2. List of entities that must be provided with recorded Disturbance data. 4.3. Timetable for response to data request. 4.4. Provision for reporting Disturbance data in a format which is capable of being viewed, read and analyzed with a generic COMTRADE analysis tool. 4.5. Naming of data files in conformance with the IEEE C37.232 Recommended Practice for Naming Time Sequence Data Files. 4.6. Data content requirements and guidelines.	**R13.** Each Transmission Owner and Generator Owner **shall provide Sequence of Event Recording (SOER), Fault Recording (FR), and Dynamic Disturbance Recording (DDR) data** for the bus locations as per Requirement R2 and Elements as per Requirement R7 to the Reliability Coordinator, Regional Entity, or NERC upon request: 13.1. The recorded data will be provided within 30 calendar days of a request. 13.2. The recorded data will be retrievable for the period of 10 calendar days preceding a request. 13.3. Sequence of Events Recording data will be provided in Comma Separated Value (.CSV) format following Attachment 2. 13.4. Fault Recording and Dynamic Disturbance Recording data will be provided in electronic C37.111, IEEE Standard for Common Format for Transient Data Exchange (COMTRADE), formatted files. 13.5. Data files will be named in conformance with C37.232, IEEE Standard for Common Format for Naming Time Sequence Data Files (COMNAME).

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Notes: PRC-018-1, Requirement R4 references PRC-002-1 Requirement R4 which is covered is PRC-002-2, Requirement R13.	
R5. The Transmission Owner and Generator Owner shall each **archive all data** recorded by DMEs for Regional Reliability Organization-identified events for at least three years.	Covered in the Compliance section **1.2** Evidence Retention The following evidence retention periods identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full time period since the last audit. The Transmission Owner, Generator Owner, Planning Coordinator, and Reliability 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 shall retain evidence of Requirements R1 and R2, Measures M1 and M2 for five calendar years. The Transmission Owner shall retain evidence of Requirements R3, R4, R5, and R8 Measures M3, M4, M5, and M8 for three calendar years.

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	The Planning Coordinator and Reliability Coordinator shall retain evidence of Requirements R6 and R7, Measures M6 and M7 for five calendar years. The Generator Owner shall retain evidence of Requirement R9, Measure M9 for three calendar years. The Transmission Owner and Generator Owner shall retain evidence of Requirements R10, R11, R13, and R14, Measures M10, M11, M13, and M14 for three calendar years. If a Responsible Entity is found non-compliant, it shall keep information related to the non-compliance until mitigation is complete and approved or for the time specified above, whichever is longer. The Compliance Enforcement Authority shall keep the last audit records and all requested and submitted subsequent audit records.
Notes: PRC-018-1, Requirement R5 is covered in the PRC-002-2 Compliance section under Evidence Retention.	
R6. Each Transmission Owner and Generator Owner that is required by its Regional Reliability Organization to have DMEs shall have a maintenance and testing program for those DMEs that includes: R6.1. Maintenance and testing intervals	**R14.** Each Transmission Owner and Generator Owner, within 90 calendar days of the discovery of a failure of the **Sequence of Events Recording** (SOER), **Fault Recording** (FR), or **Dynamic Disturbance Recording** (DDR) at the bus locations as per Requirement R2 and Elements as per Requirement R7, shall: • Restore the recording ability. • Report the inability to record data to the Regional Entity along with a Corrective Action Plan (CAP) to restore the recording ability.

Standard PRC-018-1 (To be Retired) FERC Approved	Proposed Standard PRC-002-2
and their basis. R6.2. Summary of maintenance and testing procedures.	
Notes: PRC-018-1, Requirement R6 is covered in PRC-002-2, Requirement R14. PRC-018-1, Requirement R6 deals with routine maintenance and testing of equipment. PRC-002-2, Requirement R14 deals with the long term availability of recording capability. Both Requirements are meant to ensure the availability of the recording of data. By requiring the TOs and GOs to notify their Regional Entity reinforces the importance of the available recording capability.	

Standard PRC-002-1	Proposed Standard PRC-002-2
R1. The Regional Reliability Organization shall establish the following installation requirements for **sequence of event recording**: R1.1. Location, monitoring and recording requirements, including the following: R1.1.1. Criteria for equipment location (e.g., by voltage, geographic area, station size, etc.). R1.1.2. Devices to be monitored	**R1.** Each Transmission Owner shall identify BES bus locations for **Sequence of Events Recording** (SOER) and Fault Recording (FR). 1.1. Bus locations shall be identified using *PRC-002-2 Attachment 1 – Sequence of Events Recording (SOER) and Fault Recording (FR) Locations Selection Methodology.* 1.2. Bus locations shall be assessed at least every five calendar years.

Standard PRC-002-1	Proposed Standard PRC-002-2
	R2. Each Transmission Owner that identifies BES Elements at the locations established in Requirement R1 shall notify the owners of those Elements, within 90 calendar days of determination, that the Elements require **Sequence of Events Recording** (SOER) and Fault Recording (FR). **R3**. Each Transmission Owner and Generator Owner shall have **Sequence of Events Recording** for circuit breaker position (open/close) for each of the circuit breakers they own connected to the bus locations as per Requirement R2.
Notes: PRC-002-1, Requirement R1 is covered in PRC-002-2, Requirements R1-R3. (See PRC-018-1, Requirement R3 above for additional information.)	
R2. The Regional Reliability Organization shall establish the following installation requirements for **fault recording**: R2.1. Location , monitoring and recording requirements, including the following: R2.1.1. Criteria for equipment location (e.g., by voltage, geographic area, station size, etc.). R2.1.2. Elements to be monitored at each location. R2.1.3. Electrical quantities to be recorded for each monitored	**R1.** Each Transmission Owner shall identify BES bus locations for Sequence of Events Recording (SOER) and **Fault Recording** (FR). 1.1. Bus locations shall be identified using *PRC-002-2 Attachment 1 – Sequence of Events Recording (SOER) and Fault Recording (FR) Locations Selection Methodology*. 1.2. Bus locations shall be assessed at least every five calendar years. **R2.** Each Transmission Owner that identifies BES Elements at the locations established in Requirement R1 shall notify the owners of those Elements, within 90 calendar days of determination, that the Elements require Sequence of Events Recording (SOER) and **Fault Recording** (FR).

Standard PRC-002-1	Proposed Standard PRC-002-2
element shall be sufficient to determine the following: R2.1.3.1. Three phase to neutral voltages. R2.1.3.2. Three phase currents and neutral currents. R2.1.3.3. Polarizing currents and voltages, if used. R2.1.3.4. Frequency. R2.1.3.5. Megawatts and megavars. R2.2. Technical requirements, including the following: R2.2.1.Recording duration requirements. R2.2.2. Minimum sampling rate of 16 samples per cycle. R2.2.3. Event triggering requirements.	**R4.** Each Transmission Owner and Generator Owner shall have **Fault Recording** (FR) to determine the following electrical quantities at the bus locations as per Requirement R2: 4.1. Phase-to-neutral voltages for each phase of either each line or bus. 4.2. Each phase current and the residual or neutral current for the following BES Elements: 4.2.1. Transformers that have a low-side operating voltage of 100kV or above. 4.2.2. Transmission Lines. **R5.** Each Transmission Owner and Generator Owner shall have **Fault Recording** as specified in Requirement R4 that meets the following: 5.1. A single record or multiple records that include: • A pre-trigger record length of at least two cycles and a post-trigger record length of at least 50 cycles for the same trigger point. • At least two cycles of the pre-trigger data, the first three cycles of the fault, and the final cycle of the fault. 5.2. A minimum recording rate of 16 samples per cycle. 5.3. Trigger settings for at least the following: 5.3.1. Neutral (residual) overcurrent. 5.3.2. Phase undervoltage.
Notes: PRC-002-1, Requirement R2 is covered in PRC-002-2, Requirements R1, R2, R4, and R5.	

Standard PRC-002-1	Proposed Standard PRC-002-2
R3. The Regional Reliability Organization shall establish the following installation requirements for **dynamic Disturbance recording**: R3.1. Location , monitoring and recording requirements including the following: R3.1.1.Criteria for equipment location giving consideration to the following: -Site(s) in or near major load centers -Site(s) in or near major generation clusters -Site(s) in or near major voltage sensitive areas -Site(s) on both sides of major transmission interfaces -A major transmission junction -Elements associated with Interconnection Reliability Operating Limits -Major EHV interconnections between control areas -Coordination with neighboring regions within the interconnection R3.1.2. Elements and	**R6.** Each Responsible Entity shall identify BES Elements for which **Dynamic Disturbance Recording** (DDR) is required. 6.1. The Elements shall include the following: 6.1.1. A minimum of one DDR location per 3,000 MW of the Responsible Entity's historical peak system Load, inclusive of Requirement R6, Part 1, Sub-parts 6.1.1 – 6.1.7. 6.1.2 At least one DDR location in each Responsible Entity's footprint. 6.1.3. Generating resource(s) with: 6.1.3.1. Gross individual nameplate rating greater than or equal to 500 MVA. 6.1.3.2 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 1000MVA. 6.1.4. Locations necessary to monitor all Elements of: • Eastern Interconnection - all permanent Flowgates. • ERCOT Interconnection - major transmission interfaces. • Hydro-Quebec Interconnection - major transmission interfaces. • Western Interconnection - all major transfer paths as defined by the Regional Entity. 6.1.5. Both ends of HVDC terminals (back-to-back or each terminal of a DC circuit)

Standard PRC-002-1	Proposed Standard PRC-002-2
number of phases to be monitored at each location. R3.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following: R3.1.3.1. Voltage, current and frequency. R3.1.3.2. Megawatts and megavars. R3.2. Technical requirements, including the following: R3.2.1. Capability for continuous recording for devices installed after January 1, 2009. R3.2.2. Each device shall sample data at a rate of at least 960 samples per second and shall record the RMS value of electrical quantities at a rate of at least 6 records per second.	on the AC portion of the converter. 6.1.6. Locations necessary to monitor all Elements of Interconnection Reliability Operating Limits. 6.1.7. Any one Element within a major voltage sensitive area as defined by an in-service undervoltage load shedding UVLS program. 6.2. The Elements shall be assessed at least every five calendar years. **R7.** Each Responsible Entity shall notify, within 90 calendar days of determination, each Transmission Owner and Generator Owner of the locations and Elements they own for which **Dynamic Disturbance Recording** (DDR) is required as per Requirement R7. **R8**. Each Transmission Owner shall have Dynamic Disturbance Recording, for each Element they own as per Requirement R7, to determine the following electrical quantities: 8.1. One phase-to-neutral or positive sequence voltage. 8.2. The phase current on the same phase at the same voltage corresponding to the voltage in Requirement R8, Part 8.1, or the positive sequence current. 8.3. Real Power and Reactive Power flows expressed on a three-phase basis corresponding to all circuits where current measurements are required. 8.4. Frequency of any one of the voltage(s) in Requirement R8, Part 8.1.

Standard PRC-002-1	Proposed Standard PRC-002-2
	R10. Each Transmission Owner and Generator Owner that is responsible for **Dynamic Disturbance Recording** as per Requirement R7 shall have continuous data recording and storage. If the equipment was installed prior to the effective date of this standard and is not capable of continuous recording, the following is required: 10.1. Triggered record lengths of at least three minutes. 10.2. At least one of the following triggers: • Off nominal frequency trigger set at: Low High o Eastern Interconnection <59.75 Hz >61.0 Hz o Western Interconnection <59.55 Hz >61.0 Hz o ERCOT Interconnection <59.35 Hz >61.0 Hz o Hydro-Quebec Interconnection <58.55 Hz >61.5 Hz • Rate of change of frequency trigger set at: o Eastern Interconnection < -0.03125 Hz/sec > 0.125 Hz/sec o Western Interconnection < -0.05625 Hz/sec > 0.125 Hz/sec o ERCOT Interconnection < -0.08125 Hz/sec > 0.125 Hz/sec o Hydro-Quebec Interconnection < -0.18125 Hz/sec > 0.1875 Hz/sec • Undervoltage trigger set at: o No lower than 85% of normal operating voltage for a duration of 5 seconds

Standard PRC-002-1	Proposed Standard PRC-002-2
	R11. Each Transmission Owner and Generator Owner shall have **Dynamic Disturbance Recording**, for the Elements as per Requirement R7, which conform to the following technical specifications: 11.1. Input sampling rate of at least 960 samples per second. 11.2. Output recording rate of electrical quantities of at least 30 times per second.
Notes: PRC-002-1, Requirement R3 is covered in PRC-002-2, Requirements R6-R8 and R10-R11.	
R4. The Regional Reliability Organization shall establish requirements for facility owners to **report Disturbance data recorded** by their DME installations. The Disturbance data reporting requirements shall include the following: 4.1. Criteria for events that require the collection of data from DMEs. 4.2. List of entities that must be provided with recorded Disturbance data. 4.3. Timetable for response to data request.	**R13.** Each Transmission Owner and Generator Owner **shall provide Sequence of Event Recording, Fault Recording, and Dynamic Disturbance Recording data** for the bus locations as per Requirement R2 and Elements as per Requirement R7 to the Reliability Coordinator, Regional Entity, or NERC upon request: 13.1. The recorded data will be provided within 30 calendar days of a request. 13.2. The recorded data will be retrievable for the period of 10 calendar days preceding a request. 13.3. Sequence of Events Recording data will be provided in Comma Separated Value (.CSV) format following Attachment 2. 13.4. Fault Recording and Dynamic Disturbance Recording data will be provided in electronic C37.111, IEEE Standard for Common Format for Transient Data Exchange (COMTRADE), formatted files. 13.5. Data files will be named in conformance with C37.232, IEEE Standard for Common Format for Naming Time Sequence Data Files (COMNAME).

Standard PRC-002-1	Proposed Standard PRC-002-2
4.4. Provision for reporting Disturbance data in a format which is capable of being viewed, read and analyzed with a generic COMTRADE analysis tool, 4.5. Naming of data files in conformance with the IEEE C37.232 Recommended Practice for Naming Time Sequence Data Files. 4.6. Data content requirements and guidelines.	
Notes: PRC-002-1, Requirement R4 is covered in PRC-002-2, Requirement R13.	
R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DME installation and Disturbance data reporting to the affected Transmission Owners and Generator Owners within 30 calendar days of approval of those requirements.	**R2.** Each Transmission Owner that identifies BES Elements at the locations established Requirement R1 shall **notify the owners** of those Elements, within 90 calendar days of determination, that the Elements require Sequence of Events Recording and Fault Recording. **R6.** Each Responsible Entity shall identify BES Elements for which **Dynamic Disturbance Recording** (DDR) is required. 6.1. The Elements shall include the following: 6.1.1. A minimum of one DDR location per 3,000 MW of the Responsible

Standard PRC-002-1	Proposed Standard PRC-002-2
	Entity's historical peak system Load, inclusive of Requirement R6, Part 1, Sub-parts 6.1.1 – 6.1.7. 6.1.2 At least one DDR location in each Responsible Entity's footprint. 6.1.3. Generating resource(s) with: 6.1.3.1. Gross individual nameplate rating greater than or equal to 500 MVA. 6.1.3.2 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 1000MVA. 6.1.4. Locations necessary to monitor all Elements of: • Eastern Interconnection - all permanent Flowgates. • ERCOT Interconnection - major transmission interfaces. • Hydro-Quebec Interconnection - major transmission interfaces. • Western Interconnection - all major transfer paths as defined by the Regional Entity. 6.1.5. Both ends of HVDC terminals (back-to-back or each terminal of a DC circuit) on the AC portion of the converter. 6.1.6. Locations necessary to monitor all Elements of Interconnection Reliability Operating Limits. 6.1.7. Any one Element within a major voltage sensitive area as defined by an in-service undervoltage load shedding (UVLS) program.

Standard PRC-002-1	Proposed Standard PRC-002-2
	6.2. The Elements shall be assessed at least every five calendar years. **R7.** Each Responsible Entity **shall notify**, within 90 calendar days of determination, each Transmission Owner and Generator Owner of the locations and Elements they own for which **Dynamic Disturbance Recording** (DDR) is required as established in Requirement R6.
Notes: PRC-002-1, Requirement R5 is covered in PRC-002-2, Requirements R2, R6-R7.	
R6. The Regional Reliability Organization shall periodically (**at least every five years**) review, update and approve its Regional requirements for Disturbance monitoring and reporting.	**R1.** Each Transmission Owner shall identify BES bus locations for Sequence of Events Recording (SOER) and Fault Recording (FR). 1.1. Bus locations shall be identified using *PRC-002-2 Attachment 1 – Sequence of Events Recording (SOER) and Fault Recording (FR) Locations Selection Methodology.* 1.2. Bus locations shall be **assessed at least every five calendar** years. **R6.** Each Responsible Entity shall identify BES Elements for which Dynamic Disturbance Recording (DDR) is required. 6.1. The Elements shall include the following: 6.1.1. A minimum of one DDR location per 3,000 MW of the Responsible Entity's historical peak system Load, inclusive of Requirement R6, Part 1, Sub-parts 6.1.1 – 6.1.7. 6.1.2 At least one DDR location in each Responsible Entity’s footprint.

Standard PRC-002-1	Proposed Standard PRC-002-2
	6.1.3. Generating resource(s) with: 6.1.3.1. Gross individual nameplate rating greater than or equal to 500 MVA. 6.1.3.2 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 1000MVA. 6.1.4. Locations necessary to monitor all Elements of: • Eastern Interconnection - all permanent Flowgates. • ERCOT Interconnection - major transmission interfaces. • Hydro-Quebec Interconnection - major transmission interfaces. • Western Interconnection - all major transfer paths as defined by the Regional Entity. 6.1.5. Both ends of HVDC terminals (back-to-back or each terminal of a DC circuit) on the AC portion of the converter. 6.1.6. Locations necessary to monitor all Elements of Interconnection Reliability Operating Limits. 6.1.7. Any one Element within a major voltage sensitive area as defined by an in-service undervoltage load shedding (UVLS) program. 6.2. The Elements shall be **assessed at least every five** calendar years.

Standard PRC-002-1	Proposed Standard PRC-002-2
Notes: PRC-002-1, Requirement R6 is covered in PRC-002-2, Requirements R1 and R6.	