

## Standard PRC-002-1 — Define Regional Disturbance Monitoring and Reporting Requirements

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### Standard Development Roadmap

*This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.*

This proposed standard is the Version 0 PRC-002 modified to include a translation of planning measure I.F.M3, which was not included in the approval Version 0 reliability standards because it required further work.

#### Development Steps Completed:

1. A SAR was posted from December 2, 2004 through January 7, 2005.
2. The SAC appointed a standard drafting team on January 13, 2005.
3. The drafting team posted its response to SAR comments and all other historical comments on April 19, 2005.
4. The drafting team posted Draft 1 of the standard on April 21, 2005.
5. The drafting team posted Draft 2 of the standard on September 1, 2005.
6. The drafting team posted Draft 3 of the standard on December 1, 2005.

#### Description of Current Draft:

This is the fourth draft of the standard to be posted for industry comment from April 3, 2006–May 2, 2006.

#### Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	May 3–15, 2006
2. Post standards and implementation plan for 30-day pre-ballot review.	May 15–June 14, 2006
3. Conduct first ballot.	June 19–29, 2006
4. Consider comments submitted with first ballot; post consideration of comments.	July 3–14, 2006
5. Conduct second ballot.	July 15–25, 2006
6. Post standards and implementation plan for 30-day review by board.	July 1–30, 2006
7. Board adoption date.	August 2, 2006
8. Proposed effective date.	Nine months after BOT adoption.

**Definitions of Terms Used in Standard**

*This section includes all newly defined or revised terms used in the proposed standard. Terms already defined in the Reliability Standards Glossary of Terms are not repeated here. New or revised definitions listed below become approved when the proposed standard is approved. When the standard becomes effective, these defined terms will be removed from the individual standard and added to the Glossary.*

**Disturbance Monitoring Equipment (DME):** Devices capable of monitoring and recording system data pertaining to a Disturbance. Such devices include the following categories of recorders<sup>1</sup>:

- Sequence of event recorders which record equipment response to the event
- Fault recorders, which record actual waveform data replicating the system primary voltages and currents. This may include protective relays.
- Dynamic Disturbance Recorders (DDRs), which record incidents that portray power system behavior during dynamic events such as low-frequency (0.1 Hz – 3 Hz) oscillations and abnormal frequency or voltage excursions

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<sup>1</sup> Phasor Measurement Units that meet the functional requirements of DMEs may qualify as DMEs.

## Standard PRC-002-1 — Define Regional Disturbance Monitoring and Reporting Requirements

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### A. Introduction

1. **Title:** Define Regional Disturbance Monitoring and Reporting Requirements
2. **Number:** PRC-002-1
3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Disturbance Monitoring Equipment (DME) and reporting of Disturbance data to facilitate analyses of events.
4. **Applicability**
  - 4.1. Regional Reliability Organization.
5. **Proposed Effective Date:** Nine months after BOT adoption.

### B. Requirements

- 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.
  - 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:

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- 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.
  - 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.
- 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:
- R4.1.** Criteria for events that require the collection of data from DMEs.
  - R4.2.** List of entities that must be provided with recorded Disturbance data.
  - R4.3.** Timetable for response to data request.
  - R4.4.** Provision for reporting Disturbance data in COMTRADE format in conformance with IEEE C37.111-1999 IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems, or its successor standard.
  - R4.5.** Naming of data files in conformance with the IEEE C37.232 Recommended Practice for Naming Time Sequence Data Files<sup>2</sup>.
  - R4.6.** Data content requirements and guidelines.
- 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.
- R6.** The Regional Reliability Organization shall periodically (at least every five years) review, update and approve its Regional requirements for Disturbance monitoring and reporting.

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<sup>2</sup> Compliance with this requirement is not effective until the IEEE Standard is approved.

**C. Measures**

- M1.** The Regional Reliability Organization’s requirements for the installation of Disturbance Monitoring Equipment shall address Requirements 1 through 3.
- M2.** The Regional Reliability Organization’s Disturbance monitoring data reporting requirements shall include all elements identified in Requirements 4.
- M3.** The Regional Reliability Organization shall have evidence it provided its Regional Disturbance monitoring and reporting requirements as required in Requirement 5.
- M4.** The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for Disturbance monitoring and reporting as required in Requirement 6.

**D. Compliance**

**1. Compliance Monitoring Process**

**1.1. Compliance Monitoring Responsibility**

NERC.

**1.2. Compliance Monitoring Period and Reset Time Frame**

One calendar year.

**1.3. Data Retention**

The Regional Reliability Organization shall retain documentation of its DME requirements and any changes to it for three years.

The Compliance Monitor will retain its audit data for three years.

**1.4. Additional Compliance Information**

The Regional Reliability Organization shall demonstrate compliance through providing its documentation of Disturbance Monitoring and Reporting requirements or self-certification as determined by the Compliance Monitor.

**2. Levels of Non-Compliance**

**2.1. Level 1:** There shall be a level one non-compliance if either of the following conditions exist:

**2.1.1** Disturbance data reporting requirements were not specified as required in R4.1 through R4.6.

**2.1.2** No evidence it conducted a review at least once every five years of its regional requirements for Disturbance monitoring and reporting as required in R7.

**2.2. Level 2:** There shall be a level two non-compliance if any of the following conditions exist:

**2.2.1** Technical requirements were not specified for one or more types of DMEs.

**2.2.2** Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required R1, R2 and R3.

**2.3. Level 3:** Not applicable.

**2.4. Level 4:** Disturbance monitoring and reporting requirements were not available or were not provided to Transmission Owners and Generator Owners.

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**E. Regional Differences**

None identified.

**Version History**

<b>Version</b>	<b>Date</b>	<b>Action</b>	<b>Change Tracking</b>

## Standard PRC-018-1 — Disturbance Monitoring Equipment Installation and Data Reporting

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### Standard Development Roadmap

*This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.*

This proposed standard is a translation of planning measure I.F.M2 and I.F.M4, which were not included in the approval Version 0 reliability standards because they required further work.

#### Development Steps Completed:

1. A SAR was posted from December 2, 2004 through January 7, 2005.
2. The SAC appointed a standard drafting team on January 13, 2005.
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6. Post standards and implementation plan for 30-day review by board.	July 1–30, 2006
7. Board adoption date.	August 2, 2006
8. Proposed Effective dates phased in over four years after BOT adoption: Requirements 1 and 2: <ul style="list-style-type: none"><li>– 50% compliant 2 years after initial issuance of regional requirements per Reliability Standard PRC-002 Requirement 6.</li><li>– 75% compliant 3 years after initial issuance of regional requirements per Reliability Standard PRC-002 R6</li></ul>	

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- 100% compliant 4 years after initial issuance of regional requirements per Reliability Standard PRC-002 R6

### Requirements 3 through 6

- 100% compliant six months after BOT adoption for already installed DME.
- 100% compliant 6 months after installation for DMEs installed to meet regional requirements per Reliability Standard PRC-002 R1, R2 and R3.



**Definitions of Terms Used in Standard**

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**No new definitions are proposed for this standard.**

## Standard PRC-018-1 — Disturbance Monitoring Equipment Installation and Data Reporting

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### A. Introduction

1. **Title:** **Disturbance Monitoring Equipment Installation and Data Reporting**
2. **Number:** PRC-018-1
3. **Purpose:** Ensure that Disturbance Monitoring Equipment (DME) is installed and that Disturbance data is reported in accordance with regional requirements to facilitate analyses of events.
4. **Applicability**
  - 4.1. Transmission Owner.
  - 4.2. Generator Owner.
5. **Proposed Effective Dates:** Phased in over four years after BOT adoption:  
Requirements 1 and 2:
  - 50% compliant 2 years after initial issuance of regional requirements per Reliability Standard PRC-002 Requirement 5.
  - 75% compliant 3 years after initial issuance of regional requirements per Reliability Standard PRC-002 R5.
  - 100% compliant 4 years after initial issuance of regional requirements per Reliability Standard PRC-002 R5.

Requirements 3 through 6:

- 100% compliant 6 months after BOT adoption for already installed DME.
- 100% compliant 6 months after installation for DMEs installed to meet Regional Reliability Organization requirements per Reliability Standard PRC-002 Requirements 1, 2 and 3.

### B. Requirements

- 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:
  - R1.1.** The time associated with each sample or condition recorded by a DME device shall be synchronized to within 2 milliseconds of Coordinated Universal Time (UTC) or better. The time stamp cannot be greater than one millisecond from the time the condition reached the input device, measured with the local station's clock.
  - R1.2.** Recorded data from each Disturbance shall be retrievable for ten days.
- R2.** The Transmission Owner and Generator Owner shall each install DMEs in accordance with its Regional Reliability Organization's installation requirements (Reliability Standard PRC-002 Requirements 1 through 3).
- 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 Requirements 1.1, 2.1 and 3.1):

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- 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.
- 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).
- 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.
- 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 and their basis.
  - R6.2.** Summary of maintenance and testing procedures.

### C. Measures

- M1.** The Transmission Owner and Generator Owner shall each have evidence that DMEs it is required to have meet the functional requirements specified in Requirement 1 and are installed in accordance with its associated Regional Reliability Organization's requirements.
- M2.** The Transmission Owner and Generator Owner shall each maintain the data listed in Requirements 3.1 through 3.8 for the DMEs installed to meet its Regional Reliability Organization's DME installation requirements.
  - M2.1** The Transmission Owner and Generator Owner shall each have evidence it provided this DME data to its Regional Reliability Organization within 30 calendar days of a request.
- M3.** The Transmission Owner and Generator Owner shall each have evidence it retained and provided recorded Disturbance data to entities in accordance with its associated Regional Reliability Organization's Disturbance data reporting requirements.
- M4.** Each Transmission Owner and Generator Owner that is required to install DMEs to meet its Regional Reliability Organization's DME installation requirements, shall have an associated DME maintenance and testing program as defined in Requirement 6.

### D. Compliance

- 1. Compliance Monitoring Process**
  - 1.1. Compliance Monitoring Responsibility**
    - Regional Reliability Organization.

**1.2. Compliance Monitoring Period and Reset Timeframe**

One calendar year.

**1.3. Data Retention**

The Transmission Owner and Generator Owner shall each retain any changes to the data on DME installations and any Disturbance data provided to the Regional Reliability Organization for three years.

The Compliance Monitor shall retain any audit data for three years.

**1.4. Additional Compliance Information**

The Transmission Owner and Generator Owner shall demonstrate compliance through self-certification or audit (periodic, as part of targeted monitoring or initiated by complaint or event), as determined by the Compliance Monitor.

**2. Levels of Non-Compliance**

**2.1. Level 1:** There shall be a level one non-compliance if any of the following conditions is present:

**2.1.1** DMEs that meet all its Regional Reliability Organization's installation requirements (in accordance with Requirement 2) were installed at 90% or more but not all of the required locations.

**2.1.2** Recorded Disturbance data that meets all Regional Reliability Organization's Disturbance data requirements (in accordance with Requirement 4) was provided for 90% or more but not all of the required locations.

**2.1.3** Data on required DMEs was incomplete (in accordance with R3)

**2.1.4** Documentation of the DME maintenance and testing program provided was incomplete as required in R6, but records indicate maintenance and testing did occur within the identified intervals for the portions of the program that were documented.

**2.2. Level 2:** There shall be a level two non-compliance if any of the following conditions is present:

**2.2.1** DMEs that meet all Regional Reliability Organization's installation requirements (in accordance with R2) were installed at 80% or more but less than 90% of the required locations.

**2.2.2** Recorded Disturbance data that meets all Regional Reliability Organization's Disturbance data requirements (in accordance with R4) was provided for 80% or more but less than 90% of the required locations.

**2.2.3** Recorded Disturbance data was not provided to all required entities (in accordance with R4)

**2.2.4** Archived data was not retained for three years (in accordance with Requirement 5).

**2.2.5** Documentation of the DME maintenance and testing program provided was complete as required in R6, but records indicate that maintenance and testing did not occur within the defined intervals.

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- 2.3. Level 3:** There shall be a level three non-compliance if any of the following conditions is present:
- 2.3.1** DMEs that meet all Regional Reliability Organization's installation requirements (in accordance with R2) were installed at 70% or more but less than 80% of the required locations.
  - 2.3.2** Recorded Disturbance data that meets all Regional Reliability Organization's Disturbance data requirements (in accordance with R4) was provided for 70% or more but less than 80% of the required locations.
  - 2.3.3** Documentation of the DME maintenance and testing program provided was incomplete as required in R6, and records indicate implementation of the documented portions of the maintenance and testing program did not occur within the identified intervals.
- 2.4. Level 4:** There shall be a level four non-compliance if any one of the following conditions is present:
- 2.4.1** DMEs that meet all Regional Reliability Organization's installation requirements (in accordance with R2) were installed at less than 70% of the required locations.
  - 2.4.2** Recorded Disturbance data that meets all Regional Reliability Organization's Disturbance data requirements (in accordance with R4) was provided for less than 70% of the required locations.
  - 2.4.3** DMEs that meet all functional requirements (in accordance with R1) were not installed at all required locations.
  - 2.4.4** Documentation of the DME maintenance and testing program, or its implementation, was not provided.

### E. Regional Differences

None identified.

### Version History

Version	Date	Action	Change Tracking
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