Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Donald P. Milanicz**	
Organization:	**Baltimore Gas & Electric - System Protection & Control**	
Telephone:	**410-597-6728**	
Email:	**donald.p.milanicz@bge.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☒ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Including power circuit breakers in the definition of a protective system should be viewed with caution. Power circuit breakers are the means to accomplish the intended function of the protective system. If power circuit breakers are included in the definition, other types of high voltage equipment [circuit switchers & high speed ground switches for example] would have to be included as well.

   Definition of the Bulk Electric System [BES] above 200kV needs a limit of applicability.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

Comments:

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments: The time synchronization requirement for DDR's as written is quite possibly unattainable by certain classes of equipment

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **SERC EC Planning Standards Subcommittee (PSS)**

Lead Contact: Art Brown

Contact Organization: SCPSA (Santee Cooper)

Contact Segment: 1

Contact Telephone: (803) 761-8000 ext. 5195

Contact Email: aebrown@santeecooper.com

Additional Member Name	Additional Member Organization	Region*	Segment*
Darrell Pace	Alabama Ecectric Cooperative	SERC	1
Brian Moss	Duke Power Co.	SERC	1
Travis Sykes	TVA	SERC	1
David Weekley	MEAG Power	SERC	1
Clay Young	South Carolina Gas & Electric Co	SERC	3
Pat Huntley	SERC	SERC	2
Bob Jones	Southern Company Services	SERC	1
David Till	TVA	SERC	1

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: The SERC PSS objects to the following definitions:

   Misoperation: remove the 3rd bullet (Any operation when no fault or other abnormal condition has occurred). The bullet could be interpreted to include intentional operation (such as relay tests). Unintentional operations, which constitute true misoperations, are covered by the 5th bullet. Mitigation Plan: substitute compliance violation for problem. In SERC the phrase mitigation plan is used to denote required actions to alleviate a non-compliance. The phrase corrective action plan is used to denote correcting any problems identified through system or problem assessments. These phrases should not be used interchangeably. Use of these phrases needs to be made consistent throughout the NERC Reliability Standards. Protection System: delete the term power circuit breakers. This addition is a significant scope creep. The thrust of this standard should be on protective system controls and not isolation devices. Addition of power circuit breakers or any other piece of substation equipment should be handled through a separate SAR, if needed.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: In PRC-021-1 R1, delete the words (provide, and) in the 1st sentence. The requirement to provide the data is covered by R2. This change will make the standard requirements internally consistent with measurements M1 and M2, and other similar standards (e.g. PRC-020-1). In PRC-022-1 R1.5, delete the word mitigation and reinsert the terms corrective action.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: In MOD-024-1 and MOD-025-1, as stated in the Draft-1 comments, the SERC PSS again strongly recommends: The Levels of Non-Compliance as written are on a per generator basis, and will not work well for entities that have a large number of generators. In addition, because the details of the requirements are left up to the RRO, the levels of non-compliance should be rewritten as follows: 3.1. Level 1: Verified generator data were provided and were complete for less than 100% of a generator owner's units as required by the RRO procedures. 3.2. Level 2: Verified generator data were provided and were complete for less than 95% of a generator owner's units as required by the RRO procedures. 3.3. Level 3: Verified generator data

were provided and were complete for less than 90% of a generator owner's units as required by the RRO procedures. 3.4. Level 4: Verified generator data were provided and were complete for less than 85% of a generator owner's units as required by the RRO procedures.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: see earlier comments in Question 1 concerning mitigation versus corrective action.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: In PRC-019-1, the SERC PSS recommends that the Levels of Non-Compliance for the RRO and the generator owners be split into 2 sections, as was done in MOD-024-1, MOD-025-1, and PRC-004-1. In PRC-024-1, since R7 and D.3 place requirements on both generator owners and transmission owners, transmission owners should be added to the list of applicable entities in A.4. In PRC-024-1, R2 seems to require the same thing as R1, however the sub-items in R2 refer to coordination between generation protection and transmission protection. The PSS recommends that R2 be changed to read: The Regional Reliability Organization shall establish and maintain requirements for coordination between transmission system protection/performance and generator protection/performance.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Michael Gildea**	
Organization:	**Constellation Generation**	
Telephone:	**410.230.4901**	
Email:	**michael.gildea@constellation.com**	
NERC Region		**Registered Ballot Body Segment**
☒ ERCOT ☒ ECAR ☐ FRCC ☒ MAAC ☐ MAIN ☐ MAPP ☒ NPCC ☐ SERC ☐ SPP ☒ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☒	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Constellation Generation sees PRC-024 as incomplete.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: .

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: Constellation Generation sees PRC-024 as incomplete. PRC-024 must also explicitly convey that Generators have a primary obligation to protect their equipment (turbines) and then a secondary obligation to coordinate with LSE Load Shedding. (Generators may be required to set their underfrequency trips and/or time delay in the region that causes cumulative turbine damage.)

   Additionally, since PRC-024 requires Regions to establish criteria for generators to remain connected to the grid during frequency and voltage excursions, Generators need to have advanced input and acceptance to the durations and magnitudes of these excursion that their generaters are expected to ride through. This input and acceptance must also be explicitedly cited in the proposed standard or another NERC standard that is implemented concurrently.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

---

8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Jerry Nicely**	
Organization:	**Tennessee Valley Authority**	
Telephone:	**423-751-8236**	
Email:	**glnicely@tva.gov**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☒ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☒	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments:

   Misoperation - Remove the 3rd bullet, "Any operation when no fault or other abnormal condition has occurred". The bullet could be interpreted to include intentional operation (such as relay tests). Unintentional operations, which constitute true misoperations, are covered by the 5th bullet.

   Mitigation Plan - Replace "problem" with "compliance violation". In the SERC Region, the phrase "mitigation plan" is used to denote required actions to alleviate a non-compliance. The phrase "corrective action plan" is used to denote correcting any problems identified through system or problem assessments. These phrases should not be used interchangeably. Use of these phrases needs to be made consistent throughout the NERC Reliability Standards.

   Protection System - I am not sure what misoperations would be associated with power circuit breakers or station batteries, but agree that they are a part of the protection system. Maybe some clarification is needed.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

   PRC-021-1: B.R1 - Delete the term "provide, and" in the 1st sentence. The requirement to provide the data is covered by R2. This change will make the standard requirements internally consistent with measurements M1 and M2, and other similar standards (e.g. PRC-020-1).

   PRC-022-1: B.R1.5 - Replace "Mitigation" with "corrective action" (see definition comments under question 1).

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

   MOD-024-1: A.5 - A proposed effective date of July 1, 2006 for R3 may not be reasonable. While real power capability of generating units is currently being provided, it is unclear if the RRO procedures to be developed under R1, and provided to various entities under R2 by April 1, 2006, will require process changes in the data verification / reporting process. This is also a time period

when Generator Owners will be conducting reliability maintenance of their fleets in preparation for the upcoming summer peak season. We suggest the effective date for R3 be delayed to December 2006.

MOD-024-1 & MOD-025-1: B.R1.3 - Delete the word "and" between model and data in the first sentence. We believe the intent of these standards is for Generator Owners to verify generator related modeling data, and not the models themselves?

MOD-025-1: B.R1.5 - For consistency with MOD-024-1, move the word "verified" to the lead in sentence - "Information to be verified and reported:", and remove it from sub-bullets R1.5.1-R1.5.3. Additionally, it is expected that the data requested in R1.5.3 will always be engineering analyses because most plants do not have instrumentation installed to determine reactive power of auxiliary loads. Limitations requested in R.1.4.2 also will never be verified, but also based on engineering judgement…for example if we have shorted turns, we would never take the unit to the limit, but to a value determined to be safe by engineering. For those two items, I have a problem with the word "verified", but as long as engineering analyses or judgement would be allowed as the verification method, it would be acceptable.

MOD-024-1 & MOD-025-1: D.3 - The Levels of Non-Compliance, as written, are on a per generator basis, and will not work well for entities that have a large number of generators. In addition, because the details of the requirements are left up to the RRO, the levels of non-compliance should be rewritten as follows: 3.1. Level 1: Verified generator data were provided and were complete for less than 100% of a generator owner's units as required by the RRO procedures. 3.2. Level 2: Verified generator data were provided and were complete for less than 95% of a generator owner's units as required by the RRO procedures. 3.3. Level 3: Verified generator data were provided and were complete for less than 90% of a generator owner's units as required by the RRO procedures. 3.4. Level 4: Verified generator data were provided and were complete for less than 85% of a generator owner's units as required by the RRO procedures.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

   PRC-004-1; B.R2, After "Protection System Misoperations", insert "that result in loss of generation,"….

   PRC-000-1: R2, suggest a change from 30 days to 60 days. For utilities with a large number of generators, 30 days from request to providing the documentation is not enough time for submittal.,

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

   PRC-019-1: B.R2 - Add "R2.1.7 Generator backup distance relay characteristics (if applicable)."

PRC-019-1: D.2 - The levels of non-compliance should be split to reflect the differing requirements for the RRO and GO.

PRC-024-1: A.4 - Add a "4.3. Transmission Owners" since the requirements and levels of non-compliance (D.3) include the TO.

PRC-024-1: B. - Suggest re-numbering R1.1 to R1, and sub-bullets R1.1.1 to R1.1, etc.

PRC-024-1: B.R2.2, after "back-up protection", insert "and inadvertent energization".

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☒ No

   Comments: The cumulative workload impact of these standards, which in large part leave specific details still to be determined by the Regions, cannot be fully assessed. We suggest carefull review and consideration be given to new requirements that are proposed for implementation within a 12 month time period following issuance of the Regional requirements. This would appear to include MOD-024-1, PRC-018-1 (for already installed DME), PRC-004-1 (new applicability to GOs), PRC-005-1 (new applicability to GOs), and PRC-021-1.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR

installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**John Ferraro**	
Organization:	**Northeast Utilities**	
Telephone:	**860-665-6743**	
Email:	**ferrajr@nu.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☒ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Dynamic Disturbance Recorder Definition in PRC-002. Remove the word "continuously." Not all such devices store continuous data. In addition, the definition for Dynamic Disturbance Recording Equipment should mention that PMUs, although members of the DDR family, are not included. This function should be addressed in a separate NERC standard.

   Definition of Misoperation in PRC-003. In the third bullet, this should be limited to protection system operations only. In the fourth bullet, we do not consider failure to properly reclose to be a protection system misoperation. Autoreclosing is considered to be a control function rather than a protection function.

   The following is the definition of misoperations from NPCC Guideline B-21.

   A misoperation is considered to be one in which one or more specified protective functions:

   • did not occur as intended by the protection system design, or

   • did not occur within the time intended by the protection system design, or

   • occurred for an initiating event for which they were not intended by the protection system design to occur, or

   • occurred for no initiating event.

   Common examples of misoperations include:

   • failures to trip,

   • slow trips,

   • incorrect tripping during a fault, or

   • tripping for a non-fault condition.

   The following are not considered misoperations:

   • operations that are initiated by power plant, SVC, HVdc, circuit breaker, or other facility control systems (including autoreclosing),

   • operations that occur during commissioning or testing, or

   • operations that occur at a time when the affected or an associated element is out of service.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

Comments: We suggest that NERC define what they consider to be an Under-Voltage Load Shedding "Program". Many entities use UV as a means to identify loss-of-source conditions and initiate a transfer to an alternate source. In a wide-area UV situation, this could result in opening of breakers for both the normal and alternate supplies. This isn't done as part of a UVLS "Program". Does it become "programmatic" regardless of the voltage level at which load shedding occurs? Is recoverability a parameter for defining a UVLS "Program"?

In PRC-022, the levels of non-compliance (2.2 and 2.3) change the references from PRC-002 to PRC-022.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: We request clarification as to which generators these standards apply to (i.e. size, voltage, BPS classification, etc); or, is this determination at the Region's discretion?

   We recommend that some consideration be given to technically feasible physical testing as opposed to meeting requirements based solely upon commissioning data sheets or vendor supplied diagrams.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: No comments except for the definitions (see question 1 above).

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: No comments.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☒ No

   Comments: PRC-018: Certain companies are undergoing a substantial build-out of their transmission systems over the next several years. In so doing, financial and human resource limits are being challenged. While this work will include DME installation at the affected facilities, it may not be possible to upgrade all unaffected facilities to bring them into compliance with the new standards (channels may need to be added to existing recorders, etc.). We suggest the "entities" should be asked to provide a timeline for compliance once the RRO establishes the monitoring requirements covered by PRC-002.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR

installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: We recommend that, if PRC-002 is posted with the Phase III - IV package as proposed, PRC-002 should be modified to generalize the definitions of DDRs to include all DDRs, not just PMUs. In order to accomplish this, we suggest:

   R1. Add the word “establish” after shall.

   R1.2.2 We suggest that the word “synchronism” should be deleted.

   R2.2.3 We suggest that the word “synchronism” should be deleted.

   R3. Add "This section of the standard does not apply to Phasor Measurement Units (PMUs). This function should be addressed in a separate NERC standard."

   R3.1.2. The word “phrases” should be changed to “phases.”

   R3.1.3.1 and R.1.3.2. Change to a construction similar to R3.1.1. We suggest the criteria for electrical quantities recorded should be left to the RRO.

   R3.2.1. This matter should be in section 3.1.1. The RRO should assess the need for continuous recording.

R3.2.2. 100 us accuracy applies to PMUs, which normally have integral GPS clocks. It is not needed for DDR equipment, and this time synchronization accuracy is not required for event reconstruction. Although a modern GPS clock can itself be accurate to 100 microseconds or less, the IRIG-B distribution and the DDR device input circuit introduce errors. A more appropriate statement would be “time synchronized to UTC within 4 ms.,” as previously stated in R2.2.3.

R3.2.3. Recording rate of 6 Hz (samples per second) has been entirely adequate to observe the active oscillation modes, which are all under 1.0 Hz. We have in fact operated some installations at 30 Hz and higher, but it is not clear than this is always necessary or desirable for this purpose. There appears to be no justification for making "at least 30 Hz" a NERC standard. We have many stations operating well now at 6 Hz and 10 Hz. Going to 30 Hz at all locations would result in an unjustified large increase in record size, transfer time, and inconvenience. What we want is for engineers to read and understand these records, and adding unneeded data density at all locations is an impediment. This matter should be left to the RROs, perhaps with a minimum of 6 Hz.

R4.1 & R4.2 We would suggest “Data from continuous recording DDRs shall be retained for at least 10 days. All DME data used for analysis of identified events shall be retained for a period of 3 years.”

R5.4. It is not possible to provide SER files in Comtrade format so this section needs to be revised. We believe the correct year for C37.111 to be 1999, not 1997.

Conclusion:

Legacy DDRs should not be deemed "sub-standard" by NERC as would be implied by the present PRC-002-01 definitions and sections R3. and R4. These devices perform adequately for the purposes they were intended for. If NERC wants to proliferate the use of PMUs, a separate standard should be created. However, this should wait until it's thoroughly understood what benefit PMUs bring to the system, either in terms of real-time operation or in terms of post-event analysis.

9. Please provide any other comments on this set of standards that you haven’t already provided.

Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Peter Burke [on behalf of ATC's Planning and System Protetion areas]**	
Organization:	**American Transmission Company**	
Telephone:	**262-506-6863**	
Email:	**PBurke@atcllc.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☒ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☒ Yes

   ☐ No

   Comments: ATC strongly supports all the revised and/or new definitions. Very helpful to have Protection System, Misoperation and Mitigation Plan as defined terms. We recognize the importance of circuit breaker as an integral and vital protection system component to help achieve the ultimate objective of protective relaying --- to clear and isolate any faulted equipment. We also recognize that a circuit breaker failure or misoperation contributes to and results in protection system misoperations. Therefore, it is very encouraging to note that the SDT has included circuit breaker in the definition of Protection System and we lend our full support to the revised definition.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: ATC supports all modifications done to these standards since Draft 1 posting. The posted drafts are ready to ballot.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: ATC supports all modifications done to these standards since Draft 1 posting. The posted drafts are ready to ballot.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: ATC supports all modifications done to these standards since Draft 1 posting. The posted drafts are ready to ballot.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: ATC supports all modifications done to these standards since Draft 1 posting. The posted drafts will be ready to ballot provided the following comments are addressed:

   PRC-024-R1: Numbering within R1 is incorrect --- re-number all sub-requirements by moving them up one heirarchy level.

   PRC-024-R2: Should the word disturbances in "during frequency and voltage disturbances" be changed to "excursions" to be consistent with the rest of the standard?

   PRC-024-R7: Requires GOs and TOs to "comply with the regional requirements for coordination of generator protection defined in PRC-024-R1 and R2 and any approved variances". However, the coordination of generator protection (with transmission protection) is only covered in R2.2. Suggest following language to clarify the intent of R7 "….regional requirements for coordination of generator protection with transmission protection systems as defined in PRC-024-R2.2." Further, since the Applicability of this standard is to RROs and Generator Owners, the inclusion of Transmission Owners in R7 appears to be in error.

   PRC-024-M4: Modify as per the comments above on PRC-024-R7.

   PRC-024-M2: Applies to Generator Operators and Transmission Operators, whereas the corresponding requirement R5 applies to Generator Owners and Transmission Owners. Please correct whichever is in error.

   PRC-024-D1.3 and D1.4: Is the Transmission Owner included here by mistake? See previous comments regarding Applicability.

   PRC-024-D3: Is the Transmission Owner included here by mistake? See previous comments regarding Applicability.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments: Although PRC-024 and PRC-019 are much "crisper" standards compared to the Planning Measures they originate from, the industry may benefit by field testing them before approval and adoption.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for

reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: We disagree with the proposed splitting of PRC-002 and PRC-018 into two new SMR-001 and SMR-002 standards for DDRs only. There is some merit to the IDWG argument that some potential applications and functions of DDRs are not disturbance-related, and hence DDRs can be considered to be in a class different than the FRs or SOERs. However, the fact remains that DDRs are fundamentally recording and monitoring equipment, just like FRs and SOERs. Since the proposed separation of DDR standards is not based on any technical deficiencies identified in the requirements for DDRs in PRC-002, we fail to see the reliability benefit achieved by the proposed separation of standards. Doing the suggested separation under a new topical acronym (SMR) seems superfluous and unnecessary.

   If the SMR category of Reliability Standards is to be created at this time, the first logical step would be to rename the posted PRC-002 and PRC-018 drafts (including SOERs, FRs and DDRs) to SMR-001 and SMR-002 respectively. Perhaps in the future, after the DDRs are widely installed within the industry and their potential usage starts diverging significantly from those of conventional DME, it could be useful to extract new SMR standards for DDRs.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

PRC-002 and PRC-018: ATC supports all modifications done to these standards since Draft 1 posting. The posted drafts will be ready to ballot provided the following comments are addressed:

PRC-002-R1: Add missing word "establish" so that R1 reads “The Regional Reliability Organization shall establish the following …”.

PRC-002-R2: Why is the 4ms time-synchronization requirement for Fault Recorders less stringent than the corresponding 1ms requirement for Sequence-of-Event Recorders? Allowing a 4ms time synchronization tolerance can result in the time-stamp of recorded data or waveform from two FR's that are triggered by the same event to be out-of-sync by 1/4 cycle --- this is not acceptable. We recommend that the time-synchronization requirement for FRs be changed to 1ms. Note that our recommendation is consistent with the minimum time synchronization requirements for Fault Recorders in MAIN Guide 12 (Disturbance Monitoring Systems) approved in March, 2005.

PRC-002-R3.2.3: Why is the minimum sampling rate for DDRs specified as 1600 samples per second (or 26.67 samples/cycle)? Wouldn't specifying an integral number of samples per cycle be better? Say, 27 samples/cycle, or equivalently, 1620 samples/second. Further, we are not sure why the sampling rate requirement for DDRs is higher than that of FRs even though the FRs are intended to capture much faster events compared to DDRs. Please check against commercially available DDR specifications to ensure that the >16s/c sampling rate is not unreasonable.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

Standard Development Roadmap

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Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☒ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☒	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **CP9, Reliability Standards Working Group**

Lead Contact: Guy Zito

Contact Organization: Northeast Power Coordinating Council

Contact Segment: 2

Contact Telephone: 212-840-1070

Contact Email: gzito@npcc.org

Additional Member Name	Additional Member Organization	Region*	Segment*
Ralph Rufrano	New York Power Authority	NPCC	1
Kathleen Goodman	ISO-New England	NPCC	2
Greg Campoli	New York ISO	NPCC	2
Khaqan Khan	The IESO (Ontario)	NPCC	2
Peter Lebro	National Grid US	NPCC	1
David Little	Nova Scotia Power	NPCC	1
Roger Champagne	TransEnergie (Quebec)	NPCC	1
David Kiguel	Hydro One Networks (Ontario)	NPCC	1
Al Adamson	New York State Reliability Coun.	NPCC	2
Guy Zito	Northeast Power Cor. Council	NPCC	2

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Dynamic Disturbance Recorder Definition in PRC-002. Remove the word "continuously." Not all such devices store continuous data. In addition, the definition for Dynamic Disturbance Recording Equipment should mention that PMUs, although members of the DDR family, are not included. This function should be addressed in a separate NERC standard.

   Definition of Misoperation in PRC-003. In the third bullet, this should be limited to protection system operations only. In the fourth bullet, NPCC participating Members do not consider failure to properly reclose to be a protection system misoperation. Autoreclosing is considered to be a control function rather than a protection function.

   The following is the NPCC definition of misoperations from NPCC Guideline B-21.

   A misoperation is considered to be one in which one or more specified protective functions:

   • did not occur as intended by the protection system design, or

   • did not occur within the time intended by the protection system design, or

   • occurred for an initiating event for which they were not intended by the protection system design to occur, or

   • occurred for no initiating event.

   Common examples of misoperations include:

   • failures to trip,

   • slow trips,

   • incorrect tripping during a fault, or

   • tripping for a non-fault condition.

   The following are not considered misoperations:

   • operations that are initiated by power plant, SVC, HVdc, circuit breaker, or other facility control systems (including autoreclosing),

   • operations that occur during commissioning or testing, or

   • operations that occur at a time when the affected or an associated element is out of service.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

Comments: NPCC Participating Members recommend that the Requirements of PRC-021 (R1.1 - R1.8) replace PRC-020 (R1.1 - R1.3) and revise M1 and Levels of Non-Compliance 2.2, accordingly.

In PRC-022, the levels of non-compliance (2.2 and 2.3) change the references from PRC-002 to PRC-022.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: The NPCC participating Members request clarification as to which generators these standards apply to (i.e. size, voltage, BPS classification, etc). Or, is this determination at the Region's discretion?

   NPCC's participating Members recommend that some consideration be given to technically feasible physical testing as opposed to meeting requirements based solely upon commissioning data sheets or vendor supplied diagrams

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: NPCC participating Members are in agreement with these Standards as written with the exception of the definitions (see question 1 above)

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: NPCC participating Members are in agreement with these Standards as written

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: This does not follow the approved ANSI process. If SMR-001 and SMR-002 would be proposed through ANSI process, then associated PRC-002 and PRC-018 should be posted with SMR-001 and SMR-002, and not included in this Phase III - IV package.

   NPCC participating Members recommend that, if PRC-002 is posted with the Phase III - IV package as proposed, PRC-002 should be modified to generalize the definitions of DDRs to include all DDRs, not just PMUs. In order to accomplish this, we suggest:

   R1. Add the word “establish” after shall.

   R1.2.2 We suggest that the word “synchronism” should be deleted. (Also in other places.)

   R3. Add "This section of the standard does not apply to Phasor Measurement Units (PMUs). This function should be addressed in a separate NERC standard."

   R3.1.2. The word “phrases” should be changed to “phases.”

   R3.1.3.1 and R.1.3.2. Change to a construction similar to R3.1.1. We suggest the criteria for electrical quantities recorded should be left to the RRO. We would like to have the flexibility to install some special purpose devices in some locations which do not necessarily record all these quantities.

R3.2.1. This matter should be in section 3.1.1. The RRO should assess the need for continuous recording.

R3.2.2. 100 us accuracy applies to PMUs, which normally have integral GPS clocks. It is not needed for DDR equipment, and this time synchronization accuracy is not required for event reconstruction. Although a modern GPS clock can itself be accurate to 100 microseconds or less, the IRIG-B distribution and the DDR device input circuit introduce errors. A more appropriate statement would be “time synchronized to UTC within 4 ms.,” as previously stated in R2.2.3.

R3.2.3. Recording rate of 6 Hz (samples per second) has been entirely adequate to observe the active oscillation modes, which are all under 1.0 Hz. We have in fact operated some installations at 30 Hz and higher, but it is not clear than this is always necessary or desirable for this purpose. There appears to be no justification for making "at least 30 Hz" a NERC standard. We have many stations operating well now at 6 Hz and 10 Hz. Going to 30 Hz at all locations would result in an unjustified large increase in record size, transfer time, and inconvenience. What we want is for engineers to read and understand these records, and adding unneeded data density at all locations is an impediment. This matter should be left to the RROs, perhaps with a minimum of 6 Hz.

R4.1 & R4.2 We would suggest “Data from continuous recording DDRs shall be retained for at least 10 days. All DME data used for analysis of identified events shall be retained for a period of 3 years.”

R5.4. It is not possible to provide SER files in Comtrade format so this section needs to be revised. We believe the correct year for C37.111 to be 1999, not 1997.

Conclusion:

We would close by saying that dial-up devices which make triggered recordings of reasonable size which can be transferred and shared conveniently are very important in our area. We are not willing to have all these "workhorse" devices judged "sub-standard" by NERC as would be implied by the present PRC-002-01 definitions and sections R3. and R4.

9. Please provide any other comments on this set of standards that you haven’t already provided.

Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

Definitions of Terms Used in Standard

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Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

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7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
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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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☒ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☒	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **CP9, Reliability Standards Working Group**

Lead Contact: Guy Zito

Contact Organization: Northeast Power Coordinating Council

Contact Segment: 2

Contact Telephone: 212-840-1070

Contact Email: gzito@npcc.org

Additional Member Name	Additional Member Organization	Region*	Segment*
Ralph Rufrano	New York Power Authority	NPCC	1
Kathleen Goodman	ISO-New England	NPCC	2
Greg Campoli	New York ISO	NPCC	2
Khaqan Khan	The IESO (Ontario)	NPCC	2
Peter Lebro	National Grid US	NPCC	1
David Little	Nova Scotia Power	NPCC	1
Roger Champagne	TransEnergie (Quebec)	NPCC	1
David Kiguel	Hydro One Networks (Ontario)	NPCC	1
Al Adamson	New York State Reliability Coun.	NPCC	2
Guy Zito	Northeast Power Cor. Council	NPCC	2

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Dynamic Disturbance Recorder Definition in PRC-002. Remove the word "continuously." Not all such devices store continuous data. In addition, the definition for Dynamic Disturbance Recording Equipment should mention that PMUs, although members of the DDR family, are not included. This function should be addressed in a separate NERC standard.

   Definition of Misoperation in PRC-003. In the third bullet, this should be limited to protection system operations only. In the fourth bullet, NPCC participating Members do not consider failure to properly reclose to be a protection system misoperation. Autoreclosing is considered to be a control function rather than a protection function.

   The following is the NPCC definition of misoperations from NPCC Guideline B-21.

   A misoperation is considered to be one in which one or more specified protective functions:

   • did not occur as intended by the protection system design, or

   • did not occur within the time intended by the protection system design, or

   • occurred for an initiating event for which they were not intended by the protection system design to occur, or

   • occurred for no initiating event.

   Common examples of misoperations include:

   • failures to trip,

   • slow trips,

   • incorrect tripping during a fault, or

   • tripping for a non-fault condition.

   The following are not considered misoperations:

   • operations that are initiated by power plant, SVC, HVdc, circuit breaker, or other facility control systems (including autoreclosing),

   • operations that occur during commissioning or testing, or

   • operations that occur at a time when the affected or an associated element is out of service.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

Comments: NPCC Participating Members recommend that the Requirements of PRC-021 (R1.1 - R1.8) replace PRC-020 (R1.1 - R1.3) and revise M1 and Levels of Non-Compliance 2.2, accordingly.

In PRC-022, the levels of non-compliance (2.2 and 2.3) change the references from PRC-002 to PRC-022.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: The NPCC participating Members request clarification as to which generators these standards apply to (i.e. size, voltage, BPS classification, etc). Or, is this determination at the Region's discretion?

   NPCC's participating Members recommend that some consideration be given to technically feasible physical testing as opposed to meeting requirements based solely upon commissioning data sheets or vendor supplied diagrams

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: NPCC participating Members are in agreement with these Standards as written with the exception of the definitions (see question 1 above)

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: NPCC participating Members are in agreement with these Standards as written

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: This does not follow the approved ANSI process. If SMR-001 and SMR-002 would be proposed through ANSI process, then associated PRC-002 and PRC-018 should be posted with SMR-001 and SMR-002, and not included in this Phase III - IV package.

   NPCC participating Members recommend that, if PRC-002 is posted with the Phase III - IV package as proposed, PRC-002 should be modified to generalize the definitions of DDRs to include all DDRs, not just PMUs. In order to accomplish this, we suggest:

   R1. Add the word “establish” after shall.

   R1.2.2 We suggest that the word “synchronism” should be deleted. (Also in other places.)

   R3. Add "This section of the standard does not apply to Phasor Measurement Units (PMUs). This function should be addressed in a separate NERC standard."

   R3.1.2. The word “phrases” should be changed to “phases.”

   R3.1.3.1 and R.1.3.2. Change to a construction similar to R3.1.1. We suggest the criteria for electrical quantities recorded should be left to the RRO. We would like to have the flexibility to install some special purpose devices in some locations which do not necessarily record all these quantities.

R3.2.1. This matter should be in section 3.1.1. The RRO should assess the need for continuous recording.

R3.2.2. 100 us accuracy applies to PMUs, which normally have integral GPS clocks. It is not needed for DDR equipment, and this time synchronization accuracy is not required for event reconstruction. Although a modern GPS clock can itself be accurate to 100 microseconds or less, the IRIG-B distribution and the DDR device input circuit introduce errors. A more appropriate statement would be “time synchronized to UTC within 4 ms.,” as previously stated in R2.2.3.

R3.2.3. Recording rate of 6 Hz (samples per second) has been entirely adequate to observe the active oscillation modes, which are all under 1.0 Hz. We have in fact operated some installations at 30 Hz and higher, but it is not clear than this is always necessary or desirable for this purpose. There appears to be no justification for making "at least 30 Hz" a NERC standard. We have many stations operating well now at 6 Hz and 10 Hz. Going to 30 Hz at all locations would result in an unjustified large increase in record size, transfer time, and inconvenience. What we want is for engineers to read and understand these records, and adding unneeded data density at all locations is an impediment. This matter should be left to the RROs, perhaps with a minimum of 6 Hz.

R4.1 & R4.2 We would suggest “Data from continuous recording DDRs shall be retained for at least 10 days. All DME data used for analysis of identified events shall be retained for a period of 3 years.”

R5.4. It is not possible to provide SER files in Comtrade format so this section needs to be revised. We believe the correct year for C37.111 to be 1999, not 1997.

Conclusion:

We would close by saying that dial-up devices which make triggered recordings of reasonable size which can be transferred and shared conveniently are very important in our area. We are not willing to have all these "workhorse" devices judged "sub-standard" by NERC as would be implied by the present PRC-002-01 definitions and sections R3. and R4.

9. Please provide any other comments on this set of standards that you haven’t already provided.

Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Raymond M. Morella**	
Organization:	**FirstEnergy Corp**	
Telephone:	**330-384-5686**	
Email:	**morellar@firstenergycorp.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT	☒	1 - Transmission Owners
☒ ECAR	☐	2 - RTOs, ISOs, Regional Reliability Councils
☐ FRCC	☐	3 - Load-serving Entities
☒ MAAC	☐	4 - Transmission-dependent Utilities
☐ MAIN	☐	5 - Electric Generators
☐ MAPP	☐	6 - Electricity Brokers, Aggregators, and Marketers
☐ NPCC	☐	7 - Large Electricity End Users
☐ SERC	☐	8 - Small Electricity End Users
☐ SPP	☐	9 - Federal, State, Provincial Regulatory or other Government Entities
☐ WECC		
☐ NA - Not Applicable		

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☒ Yes

   ☐ No

   Comments:

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: PRC-021-1 Combine R1.3 and R1.4 into overall clearing time as in PRC-020-1 R1.2.2. PRC-021-1 is applicable to *owners* and PRC-022-1 is applicable to *operators*. This is inconsistent with the background documentation file that states both PRC-020-1 and PRC-021-1 [---- were modified so that the requirements are only applicable to the entities that'own' UVLS programs rather than to entities that either 'own or operate' UVLS programs.] This discrepancy between the PRC-022-1 and background documentation should be resolved. It appears the background document is misleading.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: MOD-024-1:Very General Comment in the area of "B. Requirements": Why are the Regions tasked with the responsibility of selecting these Requirements? Why doesn't NERC adopt a uniform set of Requirements for all of North America, then task each Region with enforcement? A more basic question would be: Why should/would there be any need for differing requirements under MOD-024-1 in different Regions? (This same comment applies to MOD-025-1.) Under the section D (Compliance), item 3.4.2: Why limit this to just R1.5.1 and not just all of R1.5? (This same comment applies to MOD-025-1.) MOD-025-1: R1.5.4.: I would suggest defining the term "conditions", so that enough data is collected and supplied by the Generating Company. In addition, it would be helpful to specify in this document that a sample test data sheet be included in each RRO's document (as was done in the past with Reactive and Real Power Testing in ECAR Letter #4) to ensure consistency and complete reporting.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations

- PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

  Comments: PRC-003-1 In R1.2 change format to content. It is more important to have the required content than having the same format. Many companies have existing databases that would need to be rewritten to get a common format.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: [PRC-019-1: It is suggested that NERC specify the settings of Generator Voltage Regulators and Protective Relays be provided to the Transmission Operator who can supply these to the RRO/NERC upon request. Draft Committee should consider requiring a detailed coordination study for each generating unit, to be submitted on a periodic basis, along with a report identifying shortcomings. Committee should consider requiring remediation of any shortcomings as a compliance issue.] [PRC-024-1 It seemed effective in this case to make the standard applicable for both the Regional Reliability Organizations and the Generation Owners. Perhaps there are other pairs of standards that could be combined in a similar manner. M.4 - change Requirements 1 and 2 to PRC-024 R1 and R2 to be consistent with previous wording.]

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☒ No

   Comments: PRC-005-1 Recommend an effective date of at least 1/2007 since the NERC definition of a protective system now includes power circuit breakers. This gives RROs, GOs, and TOs time to include circuit breakers in their protective system maintenance programs. Alternatively, should power circuit breakers be removed from the definition of the protection system and be viewed as a device controlled by the protection system?

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: These comments apply to the content of PRC-002-1, PRC-018-1, SMR-001, and SMR-002. These standards include verify specific equipment characteristic requirements. NERC should be sure these characteristics are available in monitoring products that currently can be purchased. These standards should not use a draft IEEE standard (PC37.232) to establish requirements. The list of criteria for locating DDR equipment seems complete. How do the affected entities prove that all of the criteria listed were considered? Is a different choice of words appropriate to imply these are criteria to consider? Consider merging PRC-002-1 and PRC-018-1 and merging SMR-001 and SMR-002 in a similar format as PRC-024-1 which applies to both the RROs and GOs.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Ed Clark**	
Organization:	**Florida Power and Light**	
Telephone:	**561-694-4833**	
Email:	**ed_clark@fpl.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☒ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Recommend the definition of a Protective System as written in PRC-002-1 be changed. The term power circuit breakers should be deleted from the definition of a protective system. Isolation devices, such as a power circuit breaker or any other piece of substation equipment should be handled separately. Recommend the Misoperation definitions in PRC-003-1 be changed. 1) Any failure of a Protection System element to operate within the specified time when a fault or abnormal condition occurs within a zone of protection. The word element is not defined. System failure should be defined at bus, line, or transformer level and not at relay element level. 2) Any operation when no fault or other abnormal condition has occurred. The definition should exclude testing errors. The wording of any operation leaves much to interpretation and should be changed to automatic relay trip operation. 3) Any failure to properly reclose following a Protection System operation. The reporting of a reclosing misoperation should be removed or limited to specific critical lines in the region. Reclosing practices vary from utility to utility and no standards exist. Having no automatic reclosing installed should not be considered more desirable than an occasional failure to reclose.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: Recommend the Misoperation definitions in PCR-003 be changed. 1) Any failure of a Protection System element to operate within the specified time when a fault or abnormal condition

occurs within a zone of protection. The word element is not defined. System failure should be defined at bus, line, or transformer level and not at relay element level. 2) Any operation when no fault or other abnormal condition has occurred. The definition should exclude testing errors. The wording of any operation leaves much to interpretation and should be changed to automatic relay trip operation. 3) Any failure to properly reclose following a Protection System operation. The reporting of a reclosing misoperation should be removed or limited to specific critical lines in the region. Reclosing practices vary from utility to utility and no standards exist. Having no automatic reclosing installed should not be considered more desirable than an occasional failure to reclose.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

---

8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: The proposed compliance dates for the SMR-002 requirement 1 are too stringent. The 16 months from the SMR-001 implementation date to the first proposed compliance date for the SMR-002 requirement 1 does not allow appropriate time for new system designs. The DDR equipment will be new technogly for some transmission owners who will need time to develop the system requirements and get it into their budgeting process. It is difficult for a tranamission owner to commit to the proposed compliance dates without knowing how much monitoring the region will require.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: Recommend the proposed requirement R2.1.3 in Standard PRC-002-1 be changed to; Electrical quantities to be recorded for each monitored element shall consider the following. This would give the individual regions better flexibility in allocating the DME electrical quantities within their area. The DME may only have the capacity to cover a few lines with all phases, when it may be better to monitor scattered phases at a station and cover all lines. Single phase Megawatts and MegaVars values should be sufficient for disturbance analysis. The proposed compliance dates listed in PRC-018-1 (A5) are too stringent. It is difficult for a tranamission owner to commit to the proposed compliance dates without knowing the region's specific PRC-002-1 requirements 1 through 3.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **Pepco Holdings, Inc - Affiliates**

Lead Contact: Richard Kafka

Contact Organization: Pepco Holdings, Inc

Contact Segment: 1

Contact Telephone: (301) 469-5274

Contact Email: rjkafka@pepcoholdings.com

Additional Member Name	Additional Member Organization	Region*	Segment*
Evan Sage	Potomac Electric Power Co	MAAC	1
Carl Kinsley	Delmarva Power & Light	MAAC	1
Alvin Depew	Potomac Electric Power Co	MAAC	1

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☒ Yes

   ☐ No

   Comments: The definition for Misoperation in PRC-003-1 is acceptable, but is misstated in the Background document. Power circuit breakers should not be included in the definition of protection systems (PRC-002). Their inclusion in this definition makes them subject to the protection system maintenance requirements in PRC-005.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: The Background document (page 2 of 4), indicates the "owner" is responsible for both PRC-021 and PRC-022, but PRC-002 is applicable to those entities who "operate" a UVLS. This should be corrected in the Background document.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: PHI supports that the definition of the applicable circuits for PRC-003 apply to:

   - All transmission circuits 200 kV and above

   •All transmission circuits 100 kV to 200 kV operationally significant circuits, as defined by the RROs

   - Generator protection systems, whose misoperations impact the BES

1.PHI recommends that breakers be removed from the definition of Protection Systems in PRC-002, which is referenced PRC-005 on maintenance. Breakers were not in the original scope of the Phase III-IV Planning Standards, and this constitutes a major scope expansion of the original standard.

2.PHI recommends that PRC-005 apply to:

- All protection systems on the BES
- All generation protection systems whose misoperations impact the BES

Note: Titles in this question are misstated. For PRC-003-1, cross out *Procedure for* and *and Generator Control Systems*. For PRC-004-1, replace *Reporting* with *Mitigation*. Note: The definition for Misoperation in PRC-003-1 is acceptable, but is misstated in the Background document, page 3 of 4: The fourth bullet should state *properly* instead of *successfully*; the fifth bullet is redundant.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: Note: The title in this question is misstated for PRC-019-1. Add *and Protection* after *Capabilities*.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments: The definition of DDR should not address PMUs at this time…it may be premature. Some of the parameters are applicable only to PMUs and are not applicable to all DDRs. A separate SMR standard or later inclusion of PMUs in the standard should be created for PMUs, specifically addressing their performance requirements.

   R3.2.2 in PRC-002 (SMR-001 R1.2.2), as worded, precludes DDRs other than PMUs. Other measurement instruments can also act as DDRs. This wording should have the same synchronization parameters as PRC-002 R2.2.3 to generalize the standard to current DDRs.

   PRC-002 R3.3.3 (SMR-001 R1.2.3) should be revised to “Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 6 samples per second.” A recording rate of 30 samples per second would preclude use of existing DDR equipment that is not capable of faster rates. Alternately, the faster rate could be limited to new installations.

9. Please provide any other comments on this set of standards that you haven’t already provided.

   Comments: All proposed standards have the following statement in the Roadmap, should only be in PRC-002-1:

   "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."

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**John Horakh - 10-14-2005**	
Organization:	**MAAC**	
Telephone:	**609-625-6014**	
Email:	**john.horakh@pepcoholdings.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☒ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☒	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: The definition for *Protection System* should not include *power circuit breakers*; they are part of the *Switching/Interrupting System*, with input from the *Protection System*. They are operated, tested and maintained differently than the other equipment listed in the definition.

   Also note: The definition for Misoperation in PRC-003-1 is acceptable, but is misstated in the Background document, page 3 of 4.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: PRC-021-1 is applicable to *owners* and PRC-022-1 is applicable to *operators*. This is logical and avoids assigning the same responsibility to two different entitities, but it is inconsistent with the Background document (page 2 of 4), which indicates the *owner* is responsible for both 021 and 022. This should be resolved.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: OK as is

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: OK, but note: Titles in this question are misstated. For PRC-003-1, cross out *Procedure for* and *and Generator Control Systems*. For PRC-004-1, replace *Reporting* with *Mitigation*. Note: The definition for Misoperation in PRC-003-1 is acceptable, but is misstated in the Background document, page 3 of 4.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: OK, but note: The title in this question is misstated for PRC-019-1. Add *and Protection* after *Capabilities*.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments: Good reasons to delete.

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments: The delayed implementation will allow much higher compliance.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments: Note: In PRC-002-1, under M2 and M3, add *shall* before *include*. SMR-002-1 title is wrong in attached proposed standard. Need to decide what to call equipment left in PRC-002-1 and PRC-018-1 after Dynamic Data Recorders are removed. Sequence Of Events and Fault Recorders are left; calling them Disturbance Monitoring Equipment seems too broad a term that could also still apply to DDRs.Maybe *Event Recorders* or something like that?

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: No question was asked about PRC-002-1 and PRC-018-1. Although these may be changed by removing the DDR requirements, you should have agreement on the way they are now before continuing. I believe they are OK as is.

   A lot of positive changes, heading in the right direction. Note: All proposed standards have the following statement in the Roadmap, should only be in PRC-002-1:

   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.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☒ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☒	5 - Electric Generators
	☒	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **Southern Company Generation**

Lead Contact: Roman Carter

Contact Organization: Southern Company Generation

Contact Segment: 6

Contact Telephone: 205.257.6027

Contact Email: jrcarter@southernco.com

Additional Member Name	Additional Member Organization	Region*	Segment*
Roger Green	SoCo Generation	SERC	5
Tom Higgins	SoCo Generation	SERC	5
Terry Crawley	Southern Nuclear & SoCo Gen	SERC	5
Therron Wingard	SoCo Generation	SERC	5
Lucius Burris	SoCo Generation	SERC	6
Clifford Shepard	Southern Generation	SERC	6
Wayne Moore	Southern Generation	SERC	6
Joel Dison	Southern Generation	SERC	6

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Misoperation: Revise the 3rd bullet to state, "Any 'unintentional' operation when no fault or other abnormal condition has occurred.

   Mitigation Plan: Replacement of this term with the term "Corrective Action Plan" will avoid confusion with Mitigation Plans to address non-compliances.

   Protection System: Delete the term power circuit breakers which greatly increases the scope of the standard. This standard should be limited to protective system controls.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: MOD-024 & MOD-025 Levels of Non-Compliance: SoCo Generation again recommends: The Levels of Non-Compliance as written are on a per generator basis, and will not work well for entities that have a large number of generators. In addition, because the details of the requirements are left up to the RRO, the levels of non-compliance should be rewritten as follows: 3.1. Level 1: Verified generator data were provided and were complete for less than 100% of a generator owner's units as required by the RRO procedures. 3.2. Level 2: Verified generator data were provided and were complete for less than 95% of a generator owner's units as required by the RRO procedures. 3.3. Level 3: Verified generator data were provided and were complete for less than 90% of a generator owner's units as required by the RRO procedures. 3.4. Level 4: Verified generator data were provided and were complete for less than 85% of a generator owner's units as required by the RRO procedures.

   MOD-025: Due to the magnitude and complexity of implementing these requirements, a phased-in Implementation Plan is needed. A phase-in period equivalent to PRC-019 seems appropriate since there is an interrelationship between these two standards, especially in terms of the engineering/analyses and field alignment/testing evolutions.

   MOD-024 and 25 Reporting: We question the need for the Generator to report this information to the RRO under Requirement 3. It would be more appropriate for the Transmission Planner and Planning Authority to assimilate all the data for their Balancing Area and provide it to the RRO.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: PRC-003, 004, 005 Scope and Definition of Protection System: Delete power circuit breakers which greatly increases the scope of the standard. This standard should be limited to its original scope of protective system controls.

   PRC-003, 004, 005 Application to Generation Protection Systems: These standards represent new requirements for Generators and a significant increase in the amount of work and documentation required to fully comply. Therefore, a reasonable phase-in period (similar to PRC-019) should be allowed for full compliance.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: PRC-019 Purpose: The scope of this standard should focus on coordination of the devices with the generator's capabilities (which includes but is not limited to the generator D-curve). Therefore, the Purpose statement should be revised to only say, "Ensure generator voltage regulator controls and limit functions are coordinated with the generator's capabilities and protective relays." The first sentence in the current draft is not needed and may cause confusion.

   PRC-019 R2: Why do the RRO and TO need all this documentation? What will they do with it? Submittal of all documentation generated for PRC-019 to these two entities will impose a significant and unnecessary burden on generator owners. Southern Generation believes Generator Owners should only be required to submit this documentation/data to the TO and RRO "upon request." In addition, the TO should specify which data is needed and in what format. The TO should coordinate this with the RRO to ensure the data will satisfy the RRO needs as well.

   PRC-024: This standard should be addressed separately from Phase III/IV and included in a separate SAR. Southern Generation does not support this standard being in Set 1 of Phase III/IV because the industry has not developed the engineering basis for establishing the temporary voltage and frequency excursions for which turbine-generator and auxiliary equipment can safely continue to perform its intended functions. A generating plant is made up of many complex electrical devices and control systems that may have a variety of voltage and frequency transient responses. Therefore, at this point many questions still exist about what would be required to comply with this standard. Once this hurdle is overcome, a period of one year for the Generator Owner to comply with the RRO's requirements (which have not been defined, developed, and field tested) will probably be inadequate. A phased-in approach with a schedule similar to PRC-019 would be more appropriate.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☒ No

   Comments: We support the drafting team's approach for phased-in compliance. However, we recommend not holding the 2nd ballot during the holiday season and end-of-year work activities as currently projected.

   A phase-in period for MOD-025 equivalent to PRC-019 is recommended. See our comments under Question 3 above.

   PRC-024 should be removed from Phase III/IV and addressed under a separate SAR. See our comments under Question 5 above.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not

necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☒ No

   Comments: Southern Company Generation believes it is premature to include any of the SMR standards in Set 1 of the Phase III/IV standards. The SMR standards SHOULD NOT go to ballot with Set 1 of the phase III/IV standards because Industry should have an opportunity to comment and provide feedback.

   If they do go directly to ballot with no due process, then it would defeat the Reliability Standards development process. More time is needed for the industry to discuss these standards and determine the appropriate requirements and direction. If SMR-001 and SMR-002 are included in the Phase III/IV set 1 ballot, Southern Generation will cast a "NO" vote on the ballot.

   The scope and detail of the requirements in Draft 2 of PRC-002 and 018 have increased significantly from Draft 1.

   SMR-001 and SMR-002 introduce additional specific information that may be well understood by experts in this area, but need explanation for those who are not. These standards appear to be presenting a list that includes nice-to-have equipment specifications and event data for future installations/upgrades as opposed to identifying what should really

be a "requirement" for reliability. While these concepts may be based on good intentions, the reality could be major costs for implementation of equipment upgrades, since the existing equipment may not meet these requirements.

PRC-002 R2: Since fault recording equipment may include digital relays, the technical requirements should not be written based only on traditional fault recording equipment, but should make allowances for the relay's capabilities. For example, most digital relays in service now could not meet the R2 sampling rate of 16 samples per cycle.

PRC-018 Applicability: This standard should only apply to generators for which the Generator Owner also has ownership of interconnecting transmission facilities.

9. Please provide any other comments on this set of standards that you haven't already provided.

Comments: In all of these standards, there is an inappropriate emphasis on having "evidence" a requirement was met. We believe it is sufficient to have "documentation" that a requirement was met. The word "evidence" could have legal implications that go beyond the bounds of what is intended here, namely that sufficient documentation will be on hand to support compliance audits. Therefore, we recommend replacing the word "evidence" with the word "documentation" throughout these standards.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Barry Jackson**	
Organization:	**Duke Power**	
Telephone:	**704-382-6486**	
Email:	**bwjackso@duke-energy.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☒ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments:

   1. Most changes to DME definition add value, but the definition for DDR does not seem consistence with devices being used. Most DDRs do not continuous store data. Most use system changes to trigger the data capture. There is also a lot of confusion within the industry on what a DDR is and how it should be used. More education on use and deployment of disturbance recorders is needed as well as lessons learned from the Northeast blackout review before setting high level standard as being proposed.

   2. Adding power circuit breakers to the definition on protective system is a significant addition and should be carefully considered.

   3. Misoperations definition - Any failure of a Protective System element to operate within the specified time when a fault or abnormal condition occurs within a zone of protection. This is confusing and can lead to very detailed reviews that are unnecessary. This could be interpreted as having to investigate if a zone 1 relay could of operated instead of a zone 2 relay. More understanding and detail examples would help.

   4. Misoperations definition - Any failure to properly reclose following a Protective System Operation. This is an addition that greatly change the reporting process, where there would be little if any affect on the BES. Would suggest a change to only report failure to reclose where it is required to meet stability margins.

   5. Bulk Electric System (BES) This tern needs to be more clearly defined.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: No comments other than what is listed under definitions above.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments:

   1. SMR-001 and 002 should go through due process as is normal for new SARs.

   2. PRC-002 Definition for DDR applies to PMUs instead of the normal usage of equipment for this purpose.

   3. DDRs normally use triggers instead of continuous recording. Should allow existing DDRs to meet the standard instead of requiring them to be changed out for new devices that are just being developed.

   4. Time sync requirement of 100 microseconds would not be available in most installed equiopment, would suggest 1 millisecond.

   5. The area of use and deployment of DDRs is very misunderstood or unknown for most utility engineers. Would suggest NERC work with IEEE-PSRC to develop better documents and training to assist engineering in understanding equipment available and usage of the data to improve the performance of BES.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Greg Ludwicki**	
Organization:	**NIPSCO**	
Telephone:	**219-956-5332**	
Email:	**GLudwicki@NiSource.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☒ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☒	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: DC control circuitry is too broad.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: Are the real and reactive capabilities to be determined by simply achieving instantaneous outputs or sustained outputs over specific time period.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: PRC-024 should be applicable to Transmission Owner.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☒ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **WECC-Technical Studies Subcommittee**

Lead Contact: Dana Cabbell

Contact Organization: SCE

Contact Segment: 1

Contact Telephone: (626) 302-9604

Contact Email: dana.cabbell@sce.com

Additional Member Name	Additional Member Organization	Region*	Segment*
C. V. Chung	Seattle City Light	WECC	3
Chifong Thomas	Pacific Gas and Electric Co.	WECC	1
Dana Cabbell	Southern California Edison	WECC	1
Mariam Mirzadeh	WAPA-SNR	WECC	1

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Please change the fourth bullet in the definition of Misoperation to read: Any failure to properly reclose as intended following a Protection System operation. This would allow for the instances when the protection system is not designed to reclose.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: In PRC-022-1, R 1.3. A simulation of the event, if deemed appropriate by the Regional Reliability Organization. We agree that for most events, analysis of sequence of events (trips) may be sufficient and dynamic simulations may not be required. Further, we suggest that analysis of sequence of events (trip) should be initiated if the misoperation of the UVLS cannot be explained as incorrect UVLS relay settings.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: For steady state simulations, we generally think of net generator capability as the gross generator capability minus the auxiliary loads. The auxiliary loads are not necessarily an integral part of the generator itself. By specifying gross and net generator capability in MOD-024-1, R1.5.1 and R1.5.2 would seem to overlap, and begs the question as to whether compliance is to be measured at the generator terminal, or at the low side of the generator step up transformer. It may be clearer to require reporting of gross power capability in R1.5.1, rather than gross and net power generating capabilities. In MOD-025-1, for R.1.5.1 requires Verified maximum reactive power capability (both lagging and leading) at seasonal gross and net Real power generating capabilities as reported in accordance with Reliability Standard MOD-024 Requirement 1.5.1. Please delete the reference to gross and net because both gross and net refer to the same operating point of the generator, inlcuding both could lead to confusion. In addition, please delete the reference to Real power because MOD-024 is for Real power only, and this description is not necessary.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems

- PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
- PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: As written, Standard PRC-024-1 is applicable to Regional Reliability Organizations (RRO), and Generator Owners (GO). However, Requirement R7 and Measure M4 as well as the Compliance Section apply also to Transmission Owners. This seems inconsistent. How is the requirement for the Transmission Owner in this Standard relate to the Requirements in FAC-001-0? For example, in FAC-001-0, R2.1.5 requires that the Transmission Owner's Facility Connection Requirements address, among other things, System Proctection and Coordination. It would seem cleaner for this Standard to require the Generator performance to meet FAC-001-0. In addiiton, It may be easier to implement if we separate the Standard into two, one contains the requirements for the Regional Reliability Organizations, and, another one, the Generator Owners.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for

reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: In PRC-002-1, Section B, Requirements R1 states, The Regional Reliability Organization shall the following installation requirements etc. - This appears to be an incomplete sentence. The format of Requirement R3 seems to be different from Requirements R1 an R2. Is that intentional? The next comment applies whether the Standards is separated or not: In PRC-002-1, R3.1.1, please add the word, critical, to the first bullet to read, Site(s) in or near in or near critical and major load centers. The will provide guidance on priority when there is more than a few major load centers in an area. In addition, please delete the refernce to EHV in the seventh bullet point to read, Major interconnections between control areas. This will be less prescriptive and allow a wider net for installation of equipment where needed.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Greg Mason**	
Organization:	**Dynegy**	
Telephone:	**217 872-2301**	
Email:	**gregory.mason@dynegy.com**	
NERC Region		**Registered Ballot Body Segment**
☒ ERCOT ☒ ECAR ☐ FRCC ☐ MAAC ☒ MAIN ☐ MAPP ☒ NPCC ☒ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☒	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments:

   The definition for "Protection System" needs to be revised.As drafted it is too broad,too vague and would make misoperation analyses in PRC-003 and PRC-004 and maintenance and testing in PRC-005 impractical to complete.Under the proposed definition, it will be impractical to define understandable physical and reporting boundaries for such a broad range of equipment. Suggest revising wording to read:"Protective relays,associated communication systems,voltage and current sensing devices,power circuit breakers and DC battery status."

   In addition,the "Protection System" definition should only be used in PRC-003, PRC-004 and PRC-005 and not in PRC-002.This definition is too broad and would exceed the practical capability and capacity of the equipment referenced in PRC-002.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: None

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: MOD-024-1

   1.R1.3-Wording needs to be added to the end of R1.3 that explicitly states that "engineering analyses and calculations" is another acceptable method of data verification.

   2.M3-The Generation Owner is not going to know all the entities that are applicable TP's and PA's. M3 needs to be revised so that the Generation Owner is only required to routinely send its Real Power capabilities to one entity-the RRO.The TP or PA can receive the data from the RRO.This approach will also minimize the risk of creating mutiple sets of the same data.

   MOD-025-1

   1.R1.3-Wording needs to be added to the end of R1.3 that explicitly states that "engineering analyses and calculations" is another acceptable method of data verification.

2.R1.5.1-The word "seasonal" needs to be eliminated.Lagging and leading Reactive Power Capability is measured at different output levels,but not for different "seasonal" Real power capabilities.

3.M3-The Generation Owner is not going to know all the entities that are applicable TP's and PA's. M3 needs to be revised so that the Generation Owner is only required to routinely send its Real Power capabilities to one entity-the RRO.The TP or PA can receive the data from the RRO.This approach will also minimize the risk of creating mutiple sets of the same data.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: None except for earlier comment on defininition of "Protection System."

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

   PRC-019-1

   1.R3 and M2-The Generation Owner is not going to know all the entities that are applicable TO's. R3 and M2 need to be revised so that the Generation Owner is only required to routinely send it’s the data from R2.1-R2.1.6 to one entity-the RRO.The TO can receive the data from the RRO.This approach will also minimize the risk of creating mutiple sets of the same data.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☒ No

   Comments:

   MOD-024-1:The standard references a compliance date of 7/1/06 and the Implementation Plan states that Generation Owners must "begin" to provide verified data by 7/1/06.At a minimum, this apparent conflict needs to be clarified and a date for full compliance should be specified instead of a "begin" date.In addition,since the RRO has the capability of specifying how data can be verified, the RRO requirements could result in the installation of equipment to measure loads,etc.Therefore,the compliance deadline should be extended to 1/1/2007.

   MOD-025-1:The standard references a compliance date of 1/1/08 and the Implementation Plan states that Generation Owners must "begin" to provide verified data by 1/1/08.At a minimum, this apparent conflict needs to be clarified and a date for full compliance should be specified instead of a "begin" date.In addition,since the RRO has the capability of specifying how data can be verified, the RRO requirements could result in the installation of equipment to measure loads,etc.Also,reactive power testing requires more extensive coordination at the plants and with Transmission Owners.Therefore, based on these considerations,the compliance deadline should be extended to 1/1/2009.

   PRC-005-01:The scope of existing maintenance and testing programs may be increased by the RRO determination of applicable Protection Systems under PRC-003.This RRO work in PRC 003 is to be completed by 5/1/2006.Therefore,the compliance deadline for this standard should be extended from 5/1/2006 to 12/31/2006.

   PRC-024-01:The compliance deadline in R7 needs to be extended.RRO requirements are not proposed for completion until 1/1/2007.However,the RRO requirements may necessitate the installation of new equipment that has to be coordinated with unit outages.Therefore based on these considerations and the uncertainty of RRO requirements, the R7 compliance deadline should be extended from 1/1/2008 to 1/1/2010.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **Midwest Reliability Organization**

Lead Contact: Dennis Florom

Contact Organization: Midwest Reliability Organization

Contact Segment: 2

Contact Telephone: 402-473-3384

Contact Email: dflorom@les.com

Additional Member Name	Additional Member Organization	Region*	Segment*
Terry Bilke	MISO	MRO	2
Robert Coish	MHEB	MRO	2
Wayne Guttormson	SPC	MRO	2
Ken Goldsmith	ALT	MRO	2
Todd Gosnell	OPPD	MRO	2
Alan Boesch	NPPD	MRO	2
Jim Maenner	WPS	MRO	2
Darrick Moe	WAPA	MRO	2
Tom Mielnik	MEC	MRO	2
Joe Knight	MRO	MRO	2
The 31 Additional MRO Members	Companies not named above	MRO	2

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☒ Yes

   ☐ No

   Comments:

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

   PRC-020-1:

   Change D2.2 "provided did" to "provided, but did".

   In the Future Development Plan, the effective date given for step 8 does not match the body of the standard. This should be changed to "May 1, 2006" to be consistent.

   PRC-021-1:

   Change D2.2 "provided did" to "provided, but did", Change D2.3 "provided did" to "provided, but did".

   In the Future Development Plan, the effective date given for step 8 does not match the body of the standard. This should be changed to "August 1, 2006" to be consistent.

   PRC-022-1:

   In the Future Development Plan, the effective date given for step 8 does not match the body of the standard. This should be changed to "May 1, 2006" to be consistent.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

   MOD-024-1:

   In the Future Development Plan, the effective date given for step 8 does not match the body of the standard. This should be changed to "April 1, 2006" to be consistent.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

   PRC-003-1:

   R2. Remove “a”

   In the Future Development Plan, the effective date given for step 8 does not match the body of the standard. This should be changed to "May 1, 2006" to be consistent.

   PRC-004-1:

   D 1.3. Suggest removal of “or for 12 months, whichever is later”. It may take the entity longer than 12 months before they are able to take the effected equipment out of service in order to complete the mitigation plan.

   In the Future Development Plan, the effective date given for step 8 does not match the body of the standard. This should be changed to "August 1, 2006" to be consistent.

   PRC-005-1:

   In the Future Development Plan, the effective date given for step 8 does not match the body of the standard. This should be changed to "May 1, 2006" to be consistent.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

   PRC-019-1:

   R2 and R3: Change “and the Transmission Operator:” to “, Transmission Planner, Planning Authority, Reliability Coordinator, and the Transmission Operator:”

   PRC-024-1:

   4.3 Add “Transmission Owners” to Applicability to be consistent with R5 and R7

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☒ No

   Comments:

   Concern that Non-Compliance Levels of each Standard are not necessarily of equal nature. It will be necessary to rearrange Compliance Levels against their impact on reliability. This becomes especially important when at some point in the future when they may carry financial penalty. NERC should update industry on development of Standards Writing Handbook detailing consistency between standards.

   Concern that RROs may not be able to develop policies and procedures within the given timelines for the many standards that have been directed to the RROs. Also concern among some members whether or not these responsibilities even apply to RROs within NERC functional model.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: Since these would be the only two new standards in this category at this stage, there is no compelling reason to make this move at this point. There may be a better time at a later date for a more dramatic move for a larger equipment category move.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

   PRC-002-1:

   Wording on R1 needs to change. Suggest putting word "develop" after "shall".

R3.1.2. Change “phrases” to “phases”

M3. Delete “PRC-002” to be consistent with other measures.

PRC-018-1:

In the Future Development Plan, the effective date given for step 8 does not match the body of the standard. This should be changed to "Oct 1, 2007" to be consistent.

Throughout the standards, the reference to a Requirement is inconsistent. At times, the word “Requirement” is spelled out (as in “Requirement 1.1”), while in other places it is abbreviated to just “R” (as in “R1.1”). Recommend that NERC utilize just the abbreviations throughout the standards.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Dilip Mahendra**	
Organization:	**SMUD**	
Telephone:	**916-732-6180**	
Email:	**dmahend@smud.org**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT	☒	1 - Transmission Owners
☐ ECAR	☐	2 - RTOs, ISOs, Regional Reliability Councils
☐ FRCC	☐	3 - Load-serving Entities
☐ MAAC	☐	4 - Transmission-dependent Utilities
☐ MAIN	☐	5 - Electric Generators
☐ MAPP	☐	6 - Electricity Brokers, Aggregators, and Marketers
☐ NPCC	☐	7 - Large Electricity End Users
☐ SERC	☐	8 - Small Electricity End Users
☐ SPP	☐	9 - Federal, State, Provincial Regulatory or other Government Entities
☒ WECC		
☐ NA - Not Applicable		

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Please change the fourth bullet in the definition of Misoperation to read: Any failure to properly reclose as intended following a Protection System operation. This would allow for the instances when the protection system is not designed to reclose.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: In PRC-022-1, R 1.3. A simulation of the event, if deemed appropriate by the Regional Reliability Organization. We agree that for most events, analysis of sequence of events (trips) may be sufficient and dynamic simulations may not be required. Further, we suggest that analysis of sequence of events (trip) should be initiated if the misoperation of the UVLS cannot be explained as incorrect UVLS relay settings.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: For steady state simulations, we generally think of net generator capability as the gross generator capability minus the auxiliary loads. The auxiliary loads are not necessarily an integral part of the generator itself. By specifying gross and net generator capability in MOD-024-1, R1.5.1 and R1.5.2 would seem to overlap, and begs the question as to whether compliance is to be measured at the generator terminal, or at the low side of the generator step up transformer. It may be clearer to require reporting of gross power capability in R1.5.1, rather than gross and net power generating capabilities. In MOD-025-1, for R.1.5.1 requires Verified maximum reactive power capability (both lagging and leading) at seasonal gross and net Real power generating capabilities as reported in accordance with Reliability Standard MOD-024 Requirement 1.5.1. Please delete the reference to gross and net because both gross and net refer to the same operating point of the generator, inlcuding both could lead to confusion. In addition, please delete the reference to Real power because MOD-024 is for Real power only, and this description is not necessary.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems

- PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
- PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: As written, Standard PRC-024-1 is applicable to Regional Reliability Organizations (RRO), and Generator Owners (GO). However, Requirement R7 and Measure M4 as well as the Compliance Section apply also to Transmission Owners. This seems inconsistent. How is the requirement for the Transmission Owner in this Standard relate to the Requirements in FAC-001-0? For example, in FAC-001-0, R2.1.5 requires that the Transmission Owner's Facility Connection Requirements address, among other things, System Proctection and Coordination. It would seem cleaner for this Standard to require the Generator performance to meet FAC-001-0. In addiiton, It may be easier to implement if we separate the Standard into two, one contains the requirements for the Regional Reliability Organizations, and, another one, the Generator Owners.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for

reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: In PRC-002-1, Section B, Requirements R1 states, The Regional Reliability Organization shall the following installation requirements etc. - This appears to be an incomplete sentence. The format of Requirement R3 seems to be different from Requirements R1 an R2. Is that intentional? The next comment applies whether the Standards is separated or not: In PRC-002-1, R3.1.1, please add the word, critical, to the first bullet to read, Site(s) in or near in or near critical and major load centers. The will provide guidance on priority when there is more than a few major load centers in an area. In addition, please delete the refernce to EHV in the seventh bullet point to read, Major interconnections between control areas. This will be less prescriptive and allow a wider net for installation of equipment where needed.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Jim Useldinger**	
Organization:	**Kansas City Power & Light**	
Telephone:	**816-654-1212**	
Email:	**jim.useldinger@kcpl.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☒ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☒ Yes

   ☐ No

   Comments:

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

   Replace Generator Owner with Generator Operator to accomodate jointly owned units.

   Net real power capability is all that is needed. Numerous generators are modeled without step-up transformers (connected directly to high voltage buses). Requiring data for gross capability and unit auxiliary loads would be onerous, particularly for small generators.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

   Replace Generator Owner and Transmission Owner with Generator Operator and Transmission Operator to accomodate jointly owned facilities.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

   Replace Generator Owner with Generator Operator to accomodate jointly owned units.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☒ No

   Comments:

   Implementation of these standards should be delayed pending the outcome of the development of the ERO.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

   Development or implementation of standards at this time should be delayed pending the outcome of the development of the ERO.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Rebecca Berdahl**	
Organization:	**Bonneville Power Administration**	
Telephone:	**503-230-4502**	
Email:	**rmberdahl@bpa.gov**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☒ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☒	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☒	5 - Electric Generators
	☒	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **Bonneville Power Administration - Power Business Line**

Lead Contact: Rebecca Berdahl

Contact Organization: BPAP

Contact Segment: 3

Contact Telephone: 503-230-4502

Contact Email: rmberdahl@bpa.gov

Additional Member Name	Additional Member Organization	Region*	Segment*
Brenda Anderson	BPAP	WECC	6
Fran Halpin	BPAP	WECC	5

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: See Item 4 below.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: MOD-024-1 and MOD-025-1 Please add definitions for 'generator gross real power' and 'generatior net real power'. Auxillary loads should be associated with the generation plant and not the generation plant units.t

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: PRC-003-1 Add to 'Mitigation Plan' definition that further clarifies that the 'corrective action' be coordinated and controlled.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

Comments: PRC-024-1 Clarify in R.2.2 - Does the generation protection schemes being discussed go beyond voltage and frequency disturbance? Clarify what is meant by 'backup protection'. '

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☒ No

   Comments: Retain and modify MOD-022 because justification as stated for removal may not be valid. Disturbance monitoring data is used to monitro system response and validate system models.

   Recommend that PRC-023 be modified/remanded without deleting - there are elements in this standard that need to remain in place (such as redundancy of communications) while modification occurs. Recommend that this standard be posted following modification by the Planning Subcommittee.

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☒ No

   Comments: Move item numbers 4, 5, 6 and 7 out 1 month in the implementation plan. Too many ballot issues being decided during the holiday season and representation may be very thin.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not

necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.

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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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Harish Mehta
Mehta Tech, Inc.
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Comments on NERC Standards

Standard PRC-002-1
Standard PRC-003-1
SMR-001-1
SMR-002-1

Many multifunction devices may be used for sequence of event, fault and disturbance data. Therefore the specific reference to protective device in the definition of fault recorder is misleading and inappropriate. A general statement recognizing multifunction nature of monitoring, control and protection devices will be more appropriate with a reference to relays and other devices such as PMU.

It should be obvious that not all dedicated recording devices or relays are equal in their ability to record time synchronized fault data and the accuracy of the data being recorded. If the standard does not address these two issue then consideration should be given to adding these requirements to assure compatibility of recorded fault information.

If DDR - Dynamic Disturbance Recorder or Dynamic Data Recorder is deleted from DME scope, the use of the words Disturbance Monitoring Equipment to group the sequence of event and fault recording applications becomes misleading. The new name Dynamic Data Recorder will be a new term coined by NERC without any relevant prior industry recognition or use. This would cause further confusion.

The following time stamp accuracy requirements are vastly different and need consistency review to allow adequate root cause and event reconstruction. This wide range will make NERC responsible for setting accuracy standards and therefore obligate it to accept data that may not allow acceptable root-cause analysis.

Sequence of event recorders or recording)	1 millisecond
Fault recorders (or recording)	4 milliseconds
DDR	100 microseconds

UTC Time Synchronization generally means synchronization device's time keeping to UTC broadcast using GPS satellites. A device's assignment of time to each record and to the measurements in the record involve more than the time keeping by the device. Different considerations apply to different designs and implementation. Some devices store only the reconstituted values and not the actual measurements themselves. The requirement can be interpreted in many different ways and without a clear statement, the lack of precise time will likely persist.

When common format is used for data from different recording application, there will be a need for making time accuracy differentiation that reflect the minimum accuracy stated in this

standard. COMTRADE makes no provision to classify time attribute by the measure on the basis of its accuracy.

Time sync to UTC is a good first step toward treatment of time in high-speed measurement devices. Many members active in regional reliability councils have stated that the accuracy requirement for DDR several order of magnitude greater than those that they have experienced with their installed systems. A report prepared by John Hauer and others on experiences with PMU equipment in WECC provide further indication of difficulties in measurement of time and time stamping of records and data.

Difficulties experienced in analyzing August 14, 2003 Blackout indicate a need for better time keeping. Synchronization to UTC time will improve the situation significantly and measurably. However, mere time sync will not resolve data coherency issues if the essential data for sequence of events, high-speed fault and relatively slower speed continuous records if the time sync for them have order of magnitude differences.

Industry practices for determination of time of event also include visual inspection of data and human interpretation by experienced engineers. For this reason, we urge NERC to encourage the industry and respective regional councils to develop a consensus prior to selecting the numbers specified for time sync accuracy for each application.

NERC PRC-002-1 and SMR-001-1 allow time representation in UTC or in local time. As a result of the use of daylight saving time, the same hour after midnight cover two different hourly periods. For this reason, the requirement for unambiguous time keeping will be served more dependably if a requirement to be able to trace time to UTC even when local time is used should be added to the standard.

The collection of parameters included in the standards is a subset of many parameters that define the characteristic of recordings. By their selection and by placing specific (minimum) requirements for them, NERC standard making bodies undertake considerable responsibility for their sufficiency. As in case of Time Sync, for the other parameters, we urge NERC to encourage the industry and the respective regional councils to develop to develop a consensus prior to selection of the numbers specified for each.

These technologies are evolving fast and a defined approach to their gradual and orderly introduction may be a wiser course of action than a limited set of fixed targets.

COMTRADE defines a data format for high-speed measurement with a defined configuration file to make the interpretation of measurement possible for any application. While it is used for other purposes, it is not defined to serve all the needs of records derived from real-time measurements. Similarly the file naming convention being developed by IEEE Power System Relaying Committee (PSRC) is also a narrowly defined convention to prevent loss of initial time stamp for a record as a result of deficiency in Windows OS. It is not a standard for all files with sequential data. While the use of these conventions may simplify handling of a number of issues, dependability and portability for real-time measurement and for files of results calculated from will require a lot more research and standardization of formalized

procedures. NERC may wish to encourage regional councils to undertake the review to allow the members to progressively upgrade their equipment and practices over a period of time after a careful review..

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **WECC Disturbance Monitoring Work Group**

Lead Contact: R. Peter Mackin

Contact Organization: Transmission Agency of Northern California

Contact Segment: 1

Contact Telephone: 916-631-3212

Contact Email: pmackin@navigantconsulting.com

Additional Member Name	Additional Member Organization	Region*	Segment*
Abraham Ellis	Public Service of New Mexico	WECC	1
Bharat Bhargava	Southern California Edison	WECC	1
Jim Burns	Bonneville Power Administration	WECC	1
Donald Davies	WECC Staff	WECC	2
Dan Hamai	Western Area Power Admin.	WECC	1
John Hauer	Pacific Northwest Nat. Lab.	WECC	9
Henry Huang	Pacific Northwest Nat. Lab.	WECC	9
John Hernadez	Salt River Project	WECC	1
John Kehler	Alberta Electric System Operator	WECC	2
Mike Kwok	BC Transmission Corporation	WECC	1
Harry Lee	BC Hydro	WECC	3
Ken Martin	Bonneville Power Administration	WECC	1
Darren McCrank	Alberta Electric System Operator	WECC	2
Bill Miller	Pacific Gas and Electric Co.	WECC	1
Bill Mittelstadt	Bonneville Power Administration	WECC	1
Fabio Rodriguez	PacifiCorp	WECC	1
Doug Selin	Arizona Public Service	WECC	1
Fred Henderson	Pacific Gas and Electric Co.	WECC	1

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☒ Yes

   ☐ No

   Comments: The WECC DMWG only reviewed the definition for Disturbance Monitoring Equipment.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments: The WECC DMWG supports the deletion of MOD-022 at this time. (The WECC will continue to use disturbance data to develop and maintain models using its own Regional processes.) The DMWG has no opinion either way on MOD-028 or PRC-023.

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for

reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: The WECC DMWG believes that technology is moving towards a convergence where the same device will be able to perform multiple functions (e.g., DDR and SER or DDR and DFR). Given this trend, it does not make sense to separate the standards as proposed.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Charles E. Matthews**	
Organization:	**Bonneville Power Admin. - Transmission Business Line**	
Telephone:	**(360) 619-6668**	
Email:	**cematthews@bpa.gov**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☒ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: The definition for misoperation includes both misoperation and failure to operate. One implies security whereas the other implies reliability of a protection system. Since these have different implications, they should be referred to separately.

   If these terms are used, gross and net output need further definition.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: Regarding lsanding Schemes refered to in Requirement R1.6, an islanding scheme is not necessarily included as part of a load shedding scheme, but a load shedding scheme can react to an islanding scheme. In the BPA system this is more applicable to under frequency load shedding rather than under voltage load shedding. Therefore, it may be difficult to associate a specific islanding scheme to a specific UVLS scheme.

   Transmission Operator is included in Requirement R3 and Measure M2 and therefore should be included in the Introduction under Applicability

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: I assume Generator Gross Capability refers to the generator capability at the generator bus and Net Generator Capability refers to the capability of the generator netted with the auxiliary load. This standard needs more definition or clarification. In general, generator output is unit specific and auxiliary load would be plant specific. This is especially true for projects with more than one unit sharing a common step-up transformer. These standards should require verification of the Generator Capability, and auxiliary loads should be verifed explicitly rather than netted with the generation. Also, in Standard MOD-025-1 requirement R1.5.1, the reactive capability curve should be verified rather than just the reactive power capability at a single real power output. To more accurately simulate the power system in steady-state models, the reactive capability curve is required.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:

- PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
- PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
- PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

  Comments: The standards should explicitly include both misoperation and failure to operate. Since these have different implications for the impacted systems, they should be referred to separately.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

     Comments: Standard PRC-024-1 Reqirement R2.2 states "Coordination of generator protection, including back-up protection, with transmission protection systems." Since this standard applies to generator performance during frequency and voltage excursions, clarification is needed on what transmission protection schemes this requirement is referring to. It would have been expected that since R2.1 refers to coordination between generator underfrequency protection and regional under frequency load shedding, that R2.2 would then refer to voltage protection such as regional requirements for voltage ride-through.

     Transmission Owner is included in Requirement R7 and therefore should be included in the Introduction under Applicability .

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Jay Seitz**	
Organization:	**U.S. Bureau of Reclamation**	
Telephone:	**303-445-2844**	
Email:	**jseitz@do.usbr.gov**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☒ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☒	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: The definition provided in PRC-003-1 of misoperation includes failure of a protection system element. This seems to be a different category of event than a misoperations and will require a different mitiagation approach.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: The terms gross real power, net real power, gross reactive power, and net reactive power used throughout the standards are not defined in the standards or the NERC glossary. It is assumed that net power (real or reactive) is the gross power with the auxiliary load power netted out. Auxiliary loads should be associated with the plant rather than a generating unit and should be modeled explicitly rather than netted with generation. Would recommend doing away with the gross and net power terms and instead require maximum power output capability and concentrate on accurate modeling of the auxiliary loads at genration facilities.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities

- PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

  Comments: PRC-024-1; the numbering for this standard is not consistent. There is no requirement R1 (Suggest renumbering R1.1 and R1.1.1; R1.1.2;R1.1.3).

  Requirement R2 is concerned with requirements for generators to remain connected during frequency and voltage disturbances. R2.1 requires generator underfrequency protection to align with the RRO UFLS program. Suggest this requirement be modified to also address overfrequency.

  It is unclear how R2.2 is related to frequency or voltage excursions. Suggest this requirement be clarified.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☒ No

   Comments: It is unclear how the deletion of MOD-022 may impact the intent of an RRO to allow the use data obtianed from disturbance monitoring equipment to validate dynamic models. Data obtained from real events is valuble and its use for validation should be allowed.

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☒ No

   Comments: The implementation plan includes an aggressive schedule of activity during the busy holiday season. The schedule should be adjusted to reflect this reality by moving actions 4 through 7 out one month.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Robert Kondziolka**	
Organization:	**Salt River Project**	
Telephone:	**(602) 236-0971**	
Email:	**rekondzi@srpnet.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT	☒	1 - Transmission Owners
☐ ECAR	☐	2 - RTOs, ISOs, Regional Reliability Councils
☐ FRCC	☐	3 - Load-serving Entities
☐ MAAC	☐	4 - Transmission-dependent Utilities
☐ MAIN	☐	5 - Electric Generators
☐ MAPP	☐	6 - Electricity Brokers, Aggregators, and Marketers
☐ NPCC	☐	7 - Large Electricity End Users
☐ SERC	☐	8 - Small Electricity End Users
☐ SPP	☐	9 - Federal, State, Provincial Regulatory or other Government Entities
☒ WECC		
☐ NA - Not Applicable		

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact: l

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*
l			

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Please change the fourth bullet in the definition of Misoperation to read: Any failure to properly reclose as intended following a Protection System operation. This would allow for the instances when the protection system is not designed to reclose.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: In PRC-022-1, R 1.3. A simulation of the event, if deemed appropriate by the Regional Reliability Organization. For most events, analysis of sequence of events (trips) may be sufficient and dynamic simulations may not be required. Further, it is suggested that analysis of sequence of events (trip) should be initiated if the misoperation of the UVLS cannot be explained as incorrect UVLS relay settings.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: For steady state simulations, the net generator capability can be thought of as the gross generator capability minus the auxiliary loads. The auxiliary loads are not necessarily an integral part of the generator itself. By specifying gross and net generator capability in MOD-024-1, R1.5.1 and R1.5.2 would seem to overlap, and begs the question as to whether compliance is to be measured at the generator terminal, or at the low side of the generator step up transformer. It may be clearer to require reporting of gross power capability in R1.5.1, rather than gross and net power generating capabilities. In MOD-025-1, for R.1.5.1 requires Verified maximum reactive power capability (both lagging and leading) at seasonal gross and net Real power generating capabilities as reported in accordance with Reliability Standard MOD-024 Requirement 1.5.1. Please delete the reference to gross and net because both gross and net refer to the same operating point of the generator, inlcuding both could lead to confusion. In addition, please delete the reference to Real power because MOD-024 is for Real power only, and this description is not necessary.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems

- PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
- PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: As written, Standard PRC-024-1 is applicable to Regional Reliability Organizations (RRO), and Generator Owners (GO). However, Requirement R7 and Measure M4 as well as the Compliance Section apply also to Transmission Owners. This seems inconsistent. How is the requirement for the Transmission Owner in this Standard relate to the Requirements in FAC-001-0? For example, in FAC-001-0, R2.1.5 requires that the Transmission Owner's Facility Connection Requirements address, among other things, System Proctection and Coordination. It would seem cleaner for this Standard to require the Generator performance to meet FAC-001-0. In addiiton, It may be easier to implement if we separate the Standard into two, one contains the requirements for the Regional Reliability Organizations, and, another one, the Generator Owners.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for

reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: In PRC-002-1, Section B, Requirements R1 states, The Regional Reliability Organization shall the following installation requirements etc. - This appears to be an incomplete sentence. The format of Requirement R3 seems to be different from Requirements R1 an R2. Is that intentional? The next comment applies whether the Standards is separated or not: In PRC-002-1, R3.1.1, please add the word, critical, to the first bullet to read, Site(s) in or near in or near critical and major load centers. This will provide guidance on priority when there is more than a few major load centers in an area. In addition, please delete the refernce to EHV in the seventh bullet point to read, Major interconnections between control areas. This will be less prescriptive and allow a wider net for installation of equipment where needed.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Jeff Baker**	
Organization:	**Cinergy**	
Telephone:	**513-287-3368**	
Email:	**jeff.baker@cinergy.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☒ Yes

   ☐ No

   Comments:

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

---

8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: PRC-002-1 R1. insert word "establish" after "shall". Section 2.4 - Change "Level 3" to "Level 4".

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:	**Xcel Energy - Northern States Power Company**	
Telephone:	**(612) - 337 - 2152**	
Email:	**martin.s.trence@xcelenergy.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☒ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☒ Yes

   ☐ No

   Comments:

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: None

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: None

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: None

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: PRC-024-1 , Add Transmission Owner to the List of Applicable Entities as Requirement 7 has the Transmission Owner performing a function in this standard.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments: Implementation dates should be adjusted to coordinate with BOT date of approval.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault

recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: The requirements of the proposed new set of DDR standards mirror the existing V0 set of standards to the extent that there is no definitive difference between them, therefore it is more prudent to maintain the requirements for both DDR's and DME"s in one set of standards until such time definitive differences are established.

9. Please provide any other comments on this set of standards that you haven’t already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**John E. Sullivan**	
Organization:	**Ameren**	
Telephone:	**(314) 554-3833**	
Email:	**JSullivan@ameren.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☒ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Definitions for Gross and Net Real and Reactive Power should be uniform across NERC, rather than subject to individual Regional variations.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: Whereas PRC-020-1 covers UVLS systems which would mitigate risk of voltage collapse in the Bulk Electric System, PRC-022-1 as worded covers all UVLS systems. This wording in PRC-022-1 should be modified to cover the same UVLS systems as in PRC-020-1.

   The data collected for the UVLS systems should be sufficient to permit modeling the operation of the UVLS systems in powerflow and dynamics simulations.

   Some additional information which should be considered for inclusion in the reporting requirements are:

   A. Is the UVLS system triggered by metering in a local substation or by a central computer? If a central computer is used, what inputs are used to trigger the UVLS system?

   B. Is the UVLS always available or only armed as needed? How is the arming of the UVLS system determined?

   C. For which critical contingencies or operating conditions is the UVLS system designed to protect?

   In PRC-022-1 R1, the effects of any automatic load restoration should be included.

   The Applicability section of PRC-022-1 refers to Load-Serving Entities, while PRC-021-1 does not. Should Load-Serving Entities be included in PRC-021-1?

   In the 'Levels of Non-Compliance' section of PRC-022-1, reference is made to PRC-002-1. It appears these references should be to PRC-022-1.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

Comments: Because personnel employed by the Transmission Owner are frequently involved in the development of system models, both MOD-024-1 and MOD-025-1 should be modified to show the Transmission Owner as one of the parties to which generator capability data is reported in Requirement R3 and Measurements M2 and M3.

R1.4 of MOD-024-1 and MOD-025-1 should specify a maximum time period for testing (five years), rather than leaving the periodicity completely open.

MOD-025-1 should state that generating unit reactive capability will be verified at or near the unit's maximum rating.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: Because personnel employed by the Transmission Owner are frequently involved in the development of system models, PRC-019-1 should be modified to add the Transmission Owner as one of the parties to which generator data is reported in Requirements R2 and R3, and Measure M2.

   Under the Proposed Effective Dates section of PRC-019-1, the readability would be enhanced by using quantities of 20%, 40%, 60%, 80%, and 100% in the table, rather than incremental 20% quantities with each time period.

   In PRC-024-1, Transmission Owners should be added to the list of applicable parties. The standard specifically mentions Transmission Owners in Requirement R7.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments: The deletion of PRC-023 is acceptable for now, provided that a revised standard is published after adequate review.

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault

recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments: Regarding SMR-001-1 R1.1.1: Criteria for equipment location will be very difficult to develop and could be inconsistent from region to region. The MAIN Relay Task Force has already examined this issue. The result was a general statement that strategic locations should be selected to provide sufficient data to enable verification of powerflow and dynamic simulations of disturbances to the EHV system, with specific locations determined by the Planning Authority.

   Further clarification is needed in SMR-001-1 R1.1.4: Does 'capability' indicate a present or future requirement? Continuous recording is defined differently from manufacturer to manufacturer. Some claim continuous recording with data saved only when triggered, while others save data continuously. Where does this data need to be stored? If centralized data collection is required, then high-speed communications (LAN) is required.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: Regarding PRC-002-1 R2.2.5: Existing MAIN requirements do not include requirements for sequence of event recording equipment (SOER). The method of data retrieval is not specified. Does SOER data need to be collected at a centralized point, or is dial-up remote access acceptable?

Regarding PRC-002-1 R5.4 and R5.5 - Many older DFR's may not support the COMTRADE format or the renaming of files. Current MAIN requirements allow hard-copy, Facsimile, e-mail, and COMTRADE submittals.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **Transmission Issues Subcommittee**

Lead Contact: Kirit S. Shah

Contact Organization: NERC

Contact Segment:

Contact Telephone: 314-554-3542

Contact Email: kshah@ameren.com

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: TIS does not agree with the drafting team that each Region should develop its own definitions for Gross and Net Real and Reactive Power. Even if the verification procedures defined in MOD-024 and MOD-025 are different from region-to-region, TIS believes that the definitions of these quantities should be uniform across NERC.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

   1. PRC-020-1 R1 refers to UVLS implemented to mitigate voltage collapse or voltage instability in the BES. TIS agrees with this philosophy, so as not to get burdened with "localized" schemes. However, PRO-022-1 R1, refers to "all UVLS". TIS understands that this discrepency with PRC-020 and PRC-021 is intentional. TIS disagrees with this approach, and recommends that PRO-022-1 should refer to the same UVLS systems that are described in PRC-020-1, which are those UVLS systems for the protection of the BES.

   2. PRC-020-1 TIS recommends that R1.2.3, R1.2.4, and R1.2.5 be dropped from the standard, and R1.3 be reworded to state: Any other schemes that are part of or impact the UVLS programs such as, related generation protection, islanding schemes, and automatic load restoration schemes.

   3. PRC-021-1 TIS recommends that R1.5, R1.6, and R1.7 be dropped and R1.8 be renumbered and revised to state: Any other schemes that are part of or impact the UVLS programs, such as related generation protection, islanding schemes, and automatic load restoration schemes.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: There is a potential for wide variance in verification procedures among RROs. The standard should establish certain criteria for the RRO, such as testing at the time of commissioning of new equipment and not permitting reliance on manufacurer's design data, name plate data, or engineering calculations. Similarly, the periodicity in R1.4 for verification should not be left entirely to the RRO in order to avoid wide variations in this requirement. R1.4 of the standards should establish a maximum five year period for verification unless there is a change in equipment which may affect these capabilities. However, TIS would not disagree should a RRO establish a more frequent verification period than five years.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments: TIS agreement with the implementation plan is for standards MOD-025, PRC-020, PRC-021, and PRC-022.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault

recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: TIS greatly appreciates the response to and acceptance by the drafting team of many of TIS's comments on the earlier posting of these standards. TIS believes the drafting team made numerous improvements to the standards that are reflected in this posting.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **Resource Issues Subcommittee**

Lead Contact: Mary H. Johannis

Contact Organization: NERC

Contact Segment:

Contact Telephone: 503-230-3047

Contact Email: mhjohannis@bpa.gov

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☐ No

   Comments:

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: These standards as written do not appear to be enforceable on a consistent basis due to the lack of any performance requirement on the RRO's procedures. At a minimum, these standards must provide guidance to the RRO on how the RRO procedure is to relate to the objective of the standard, which is to ensure accurate information on unit capability is provided to steady-state models. Does the drafting team mean this to be limited to verification of Pmax, Pmin, Qmax, and Qmin that is submitted for use in NERC load flow models? Or does the drafting team intend the objective to verify generator performance parameters throughout the entire range of operation? MOD-025, in particular, should require the verification of a generating unit's reactive capability at or near the unit's maximum rating. Without additional guidance to the RRO, unacceptably wide variation in regional procedures may occur.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: RIS does not believe that standard PRC-024 as written, provides the RRO with adequate guidance from which to develop acceptable criteria. Based upon the current language in the standard, RIS questions how NERC would determine whether a RRO's criteria is adequate and meets the intent of the standard.

   RIS suggests that R1 of PRC-024 require, at a minimum, that a RRO's criteria for generators remaining online be consistent with TPL-003, Table 1 events.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

---

8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Navin Bhatt**	
Organization:	**American Electric Power**	
Telephone:	**614-552-1660**	
Email:	**nbbhatt@AEP.com**	
NERC Region		**Registered Ballot Body Segment**
☒ ERCOT ☒ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☒ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☒	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☒ Yes

   ☐ No

   Comments:

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: This set does not need any modifications; it is perfect.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: No modifications are suggested for this set.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: No modifications are suggested for this set.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: PRC-019-1: Comments #1: The purpose is "Ensure the generator capability curve is consistent with the actual generator capability and ensure - - - and protective relays." Availability of data of R2.1.1 through R2.1.6 is not adequate to meet the stated Purpose. A knowledgeable engineer would probably have to review the R2.1.1-R2.1.6 data to make sure that the generator capability curve is consistent and that the generator voltage regulator controls and limit functions

are coordinated with the generator's capabilities and protective relays. This standard is inadequate in addressing this critical process step of reviewing the data and perhaps certifiying the consistency mentioned in the Purpose. Comment #2: Modify R2.1.2 as follows: "Steady state over-excitation limiter and underexcitation limiter control characteristics, including field current inverse time characteristics, as appropriate."

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments: Agree with the deletion of MOD-022. No comment on the deletion of MOD-028 and PRC-023.

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault

recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments: The DDR-related requirements must be placed in the 2 new standards SMR-001 and SMR-002. There are several significant differences between the DDRs and the DFRs/SOERs. These differences include data recording requirements, data analyses tools/techniques and use/application of data. Also, the equipment installation needs/ requirements are quite different.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Ron Falsetti**	
Organization:	**Independent Electricity System Operator (IESO), Ontario**	
Telephone:	**905 855-6187**	
Email:	**ron.falsetti@ieso.ca**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☒ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☒	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments:

   Dynamic Disturbance Recorder Definition in PRC-002. Remove the word "continuously." Not all such devices store continuous data. In addition, the definition for Dynamic Disturbance Recording Equipment should mention that PMUs, although members of the DDR family, are not included. This function should be addressed in a separate NERC standard.

   Definition of Misoperation in PRC-003. In the third bullet, this should be limited to protection system operations only. In the fourth bullet, the IESO does not consider failure to properly reclose to be a protection system misoperation. Autoreclosing is considered to be a control function rather than a protection function.

   Following is the NPCC definition of misoperations from NPCC Guideline B-21. The IESO recommends replacing the NERC definition with the NPCC definition.

   A misoperation is considered to be one in which one or more specified protective functions:

   • did not occur as intended by the protection system design, or

   • did not occur within the time intended by the protection system design, or

   • occurred for an initiating event for which they were not intended by the protection system design to occur, or

   • occurred for no initiating event.

   Common examples of misoperations include:

   • failures to trip,

   • slow trips,

   • incorrect tripping during a fault, or

   • tripping for a non-fault condition.

   The following are not considered misoperations:

   • operations that are initiated by power plant, SVC, HVdc, circuit breaker, or other facility control systems (including autoreclosing),

   • operations that occur during commissioning or testing, or

   • operations that occur at a time when the affected or an associated element is out of service.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:

- PRC-020-1 — Under-Voltage Load Shedding Program Database
- PRC-021-1 — Under-Voltage Load Shedding Program Data
- PRC-022-1 — Undervoltage Load Shedding Program Performance

Comments:

PRC-020-1

Section B, R1 - The IESO recommends that the Requirement R1.3 of PRC-021 be added to PRC-020 (R1.2) to have consistency between these two standards.

PRC-021-1

Section B, R1 - The IESO would suggest that Requirement R1 should read "Each Transmission Owner and Distribution Provider that owns a UVLS program shall provide, and annually update, its UVLS implementation data as defined in PRC-020-1_R1 to support the Regional UVLS program database."

PRC-022-1

Section D, Levels of Non-Compliance (2.2 and 2.3) - Change the references from PRC-002 Requirement R1 to PRC-022 Requirement R1.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

   The IESO requests clarification as to which generators these standards apply to (i.e. MW size, voltage, BPS classification, etc). Or, is this determination at the Region's discretion?

   MOD-024-1

   Section B, R3 - There is a typo, "requuirement 1" should be "Requirement 1"

   Section D, 3.1 Level 1 - There is a typo, "but but" should be "but"

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

   The IESO is in agreement with these Standards as written with the exception of the definitions (see question 1 above)

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

Comments:

The IESO is in agreement with these Standards as written.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☒ No

   Comments:

   MOD-022-1

   The IESO believes that there are merits to using disturbance data to develop and varify models, therefore suggest delaying the implementation of this standard, to allow further development. We are opposed to deleting it.

   MOD-028-1

   The IESO disagrees with the draft teams position that all the information within this standard is redundant and contained within MOD-012 & MOD-013, As an example, Requirement R2 (data has to be validated every five years) is not in the above noted standards. This requirement should be moved to MOD-013. With the above recommendation, MOD-028 could then be retired.

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which

were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments:

   It is the IESO view, this proposal falls outside the approved ANSI process. The IESO strongly urges that the ANSI approved process be followed for the new SMR-001 and SMR-002 standards and that the associated PRC-002 and PRC-018 be re-posted with SMR-001 and SMR-002; And excluded from this Phase III - IV package.

   The IESO recommends that, if PRC-002 is posted with the Phase III - IV package as proposed, PRC-002 should be modified to generalize the definitions of DDRs to include all DDRs, not just PMUs. In order to accomplish this, we suggest:

   R1. Add the word “establish” after shall.

R1.2.2 We suggest that the word “synchronism” should be deleted. We suggest that its use is inappropriate in this contex and that the term be deleted throughout the standard.

R3. Add "This section of the standard does not apply to Phasor Measurement Units (PMUs). This function should be addressed in a separate NERC standard."

R3.1.2. The word “phrases” should be changed to “phases.”

R3.1.3.1 and R.1.3.2. Change to a construction similar to R3.1.1. We suggest the criteria for electrical quantities recorded be left to the RRO. We would like to have the flexibility to install some special purpose devices in some locations which do not necessarily record all these quantities.

R3.2.1. This matter should be included in section 3.1.1. The RRO should assess the need for continuous recording.

R3.2.2. 100 us accuracy applies to PMUs, which normally have integral GPS clocks. It is not needed for DDR equipment, and this time synchronization accuracy is not required for event reconstruction. Although a modern GPS clock can itself be accurate to 100 microseconds or less, the IRIG-B distribution and the DDR device input circuit introduce errors. A more appropriate statement would be “time synchronized to UTC within 4 ms.,” as previously stated in R2.2.3.

R4.1 & R4.2 We would suggest “Data from continuous recording DDRs shall be retained for at least 10 days. All DME data used for analysis of identified events shall be retained for a period of 3 years.”

R5.4. It is not possible to provide SER files in Comtrade format so this section needs to be revised. We believe the correct year for C37.111 to be 1999, not 1997.

Conclusion:

We conclude by saying that dial-up devices which make triggered recordings of reasonable size which can be transferred and shared conveniently are very important in our area. We are not willing to have all these "workhorse" devices judged "sub-standard" by NERC as would be implied by the present PRC-002-01 definitions and sections R3 and R4.

9. Please provide any other comments on this set of standards that you haven’t already provided.

Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **MMWG**

Lead Contact: Mark Kuras

Contact Organization: MAAC

Contact Segment: 2

Contact Telephone: 610-666-8924

Contact Email: kuras@pjm.com

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☒ Yes

   ☐ No

   Comments:

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: MVAR capability should be evaluated at the interconnection point specifically. The models need to reflect the MVAR's that actually make it to the grid. Limitations internal to the plant may limit MVAR capability that may not be reflected if only GSU losses considered. These may be parasitic loads or generator bus voltage limitations (frequently occurs at nuclear plants). Bottom line is that we need accurate data for what actually reaches the grid. The Regional Reliability Organization needs time to develop accepted standards and methods for determining consistent requirements for the associated standards for Generator Owners so field testing and/or some external evaluation and additional costs may be necessary. In MOD-024, please more clearly explain seasonal gross and Net Real Power. Extra s in Compliance Section 3.2. In Compliance Section 3.4.1 is redundant with other compliance requirements, especially 3.4.2. Delete 1.5.2 in MOD-025, there is no need to collect this information since the effects are already included in 1.5.1 and the same data is requested in PRC-019 R2.1.4. In Compliance Section 3.4.1 is redundant with other compliance requirements, especially 3.4.2.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: PRC-019-1: R2 and R3: Change …and the Transmission Operator:.. to …, Transmission Planner, Planning Authority, Reliability Coordinator, and the Transmission Operator: PRC-024-1: 4.3 Add …Transmission Owners… to Applicability to be consistent with R7. There seems to be an error in that PRC-024 R1 is missing, but I'm assuming R1.1 to be that. In PRC-019 R2.1.4 change …limit… to …condition… In R2.1.3, do prime movers have MW limits? I thought generators have MW limits. In R3 and R3.2, drop …through 2.1.6… assumed when 2.1 is stated. In R3.2, replace ...that any… with …any known change…. This perserve the requirement to report if you know something changed but prevent non-compliance for unknown changes like drift in settings.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: Concern that Non-Compliance Levels of each Standard are not necessarily of equal nature among all standards in this group. It will be necessary to rearrange Compliance Levels against their impact on reliability. This becomes especially important when at some point in the future when they may carry financial penalty. NERC should update industry on development of Standards Writing Handbook detailing consistency between standards.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **NERC Interconnection Dynamics Working Group**

Lead Contact: Bob Cummings

Contact Organization: NERC

Contact Segment:

Contact Telephone: 609-452-8060

Contact Email: idwg@nerc.com

Additional Member Name	Additional Member Organization	Region*	Segment*
Navin B. Bhatt	American Electric Power	ECAR	
Jose Conto	ERCOT	ERCOT	
John W. Shaffer	Florida Power & Light Co.	FRCC	
Mahendra C. Patel	PJM Interconnection, L.L.C.	MAAC	
Franklin D. Bristol	American Transmission Co., LLC	MAIN	
Jason J. Weiers	Otter Tail Power Company	MRO	
Philip Tatro	National Grid USA	NPCC	
Lee Taylor	Southern Company	SERC	
Donald D. Taylor	Westar Energy	SPP	
Les Pereira	Northern California Power Agency	WECC	
Joseph M. Burdis	PJM Interconnection, L.L.C.	MAAC	
Carson W. Taylor	Bonneville Power Administration	WECC	
Robert W. Cummings	NERC	NERC	

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☐ No

   Comments: Definition of DME – The word continuously should be removed from the definition of disturbance data recorders (in PRC-002 or SMR-001). This inappropriately excludes devices that are triggered. Continuous recording versus triggering is more appropriately addressed within the Standard (requirements for DDRs), rather than in the definition.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: No modifications are suggested for this set.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: No modifications are suggested for this set.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: No modifications are suggested for this set.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: PRC-019-1: Comments #1: The purpose is "Ensure the generator capability curve is consistent with the actual generator capability and ensure - - - and protective relays." Availability

of data of R2.1.1 through R2.1.6 is not adequate to meet the stated Purpose. A knowledgeable engineer would probably have to review the R2.1.1- R2.1.6 data to make sure that the generator capability curve is consistent and that the generator voltage regulator controls and limit functions are coordinated with the generator's capabilities and protective relays. This standard is inadequate in addressing this critical process step of reviewing the data and perhaps certifiying the consistency mentioned in the Purpose. Comment #2: Modify R2.1.2 as follows: Steady state over-excitation limiter and underexcitation limiter control characteristics, including field current inverse time characteristics, as appropriate.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments: Agree with the deletion of MOD-022. No comment on the deletion of MOD-028 and PRC-023.

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault

recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments: The DDR-related requirements must be placed in the 2 new standards SMR-001 and SMR-002. There are several significant differences between the DDRs and the DFRs/SOERs. These differences include data recording requirements, data analyses tools/techniques and use/application of data. Also, the equipment installation needs/ requirements are quite different. R3.2.1 in PRC-002-1 or R1.1.4 in SMR-001-1: Should be modified to read: Capability for continuous recording (all new installations). This is in keeping with recommendation 6 of the DME report prepared by the IDWG , which states: 6.IDWG recommends use of continuous recording DRDs for future installations. That recommendation was approved by the NERC Board of Trustees in May 2005

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: None

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

Definitions of Terms Used in Standard

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Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

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1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**David Angell**	
Organization:	**Idaho Power**	
Telephone:	**(208) 388-2701**	
Email:	**daveangell@idahopower.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☒ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☐ No

   Comments:

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: The sections specifying the data requirements in PRC-020-1 and PRC-021-1 should have similar data requirements to PRC-006-0 UFLS. The data requirements should be listed as:

   PRC-020-1 & PRC-021-1

   R1.2. Data Requirements:

   R1.2.1. Voltage set points.

   R1.2.2. Size of corresponding load shedding blocks (% of connected loads).

   R1.2.3. Intentional and total tripping time delays.

   R1.2.4. Generation protection.

   R1.2.5. Tie tripping schemes.

   R1.2.6. Islanding schemes.

   R1.2.7. Automatic load restoration schemes.

   R1.2.8. Any other schemes that are part of or impact the UVLS programs.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

4. Please identify anything you believe needs to be modified before this set of standards is balloted:

- PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
- PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
- PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

.

M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **FRCC**

Lead Contact: John Odom

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Eric Senkowicz	FRCC	FRCC	2
Tom Washburn	OUC	FRCC	3

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments:

   PRC-002-1 Definition of Protection System should not include power circuit breakers. Isolation devices, such as a power circuit breaker or any other piece of substation equipment should be handled separately.

   PRC-003-1 Definition of Misoperation should not refer to a Protection System "element" since this is not defined and system failures should be defined at bus, line or transformer level and not the relay element level.

   Third bullet - Definition should make it clear that a testing error is not a misoperation. The words "Any operation" should be changed to "Automatic relay trip operation", since the words "Any operation" is vague and open to interpretation.

   Fourth bullet - The reporting of a reclosing misoperation should be removed or limited to specific critical lines in the Region. Reclosing practices vary from utility to utility. Having no automatic reclosing on a line should not be considered more desirable than an occasional failure to reclose.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: PRC-020-1 Requirements R1.2.3, R1.2.4 and R1.2.5 are generally not part of UVLS schemes. The standard as written requires the Region to provide data for items that may not exist or are not related to a particular UVLS scheme. If some aspect of R1.2.3, R1.2.4 and R1.2.5 is particularly salient to a specific UVLS scheme, the data for that aspect shall be provided as called for in requirement R1.3. Remove requirements R1.2.3, R1.2.4 and R1.2.5.

   PRC-021-1 Requirements R1.5, R1.6 and R1.7 are generally not part of UVLS schemes. The standard as written requires the Region to provide data for items that may not exist or are not related to a particular UVLS scheme. If some aspect of R1.5, R1.6 and R1.7 is particularly salient to a specific UVLS scheme, the data for that aspect shall be provided as called for in requirement R1.8. Remove requirements R1.5, R1.6 and R1.7.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: Definition of Misoperation - See comments for question 1.

   PRC-003-1 R3 - Add the word "and" after "Transmission Owner" and remove the comma.

   PRC-003-1 M3 - Replace the word "any" with "each" before "Distribution Provider" to be consistent with the rest of the Measures.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: PRC-019-1 R2.1.2 - Change the words "control characteristics" to "settings". The words "control characteristics" can be interpreted to mean damping and time constants of the limiting control scheme. An evaluation of set points is sufficient to determine proper coordination. Provision of additional data implied by "control characteristics" could be very burdensome and of little value since the control schemes used by many limiters cannot be modeled with currently available commercial simulation software.

   Re-write Requirements R2.1.2 and R2.1.5 as follows:

   R2.1.2 Overexcitation limiter settings and overexcitation protection settings

   R2.1.5 Underexcitation limiter settings and loss of field protection settings.

   This change is necessary to ensure that overexcitation limiters coordinate with overexcitation protection and that under excitation limiters coordinate with loss of field protection.

   PRC-024-1 Requirement R1.1 should be changed to R1 with subsequent bullets becoming R1.1, R1.2, and R1.3.

   The word "criteria" in R1.1 should be changed to "requirements".

   R2 should be deleted as a requirement within the standard. In developing its "criteria" or "requirements" in R1, the RRO will consider the performance of its transmission protection systems, the generator protection and the RRO's Under Frequency Load Shedding (UFLS) program, as well as other Region specific information. Since R2.1 and R2.2 are not the only factors to consider and since determining coordination is not readily measurable, these requirements should be deleted.

   PRC-024-01 should be field tested to ensure that the requirements are measurable.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☒ No

   Comments: Comments about implementaton dates have been made within the standards.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: If there is sufficient justification for creating two new standards, the SMR standards should be posted for comments after the decision is made to separate them from the PRC-002 & PRC-018. One issue that needs to be addressed if the SMR standards are created is that the proposed compliance dates for the SMR-002 R1 is too short. The 15 months from SMR-001 implementation date to the first proposed compliance date does not allow enough time for new system designs. The DDR technology will be new for some transmission owners and they will need time to develop the system requirements and get the new technology into their budgets after the Region specifies the requirements.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: PRC-002-1 R1 - Insert the word "establish" between the words "shall" and "the".

   PRC-002-1 R2.1.3 Replace the words "be sufficient to determine" with "consider". Since this standard is for the RRO to establish requirements the existing words are very restrictive. As an example, the RRO should be able to determine if measurement of all three phases are required at specific locations.

   PRC-002-1 R3.1.2 "number of phrases" should be replaced with "phases".

   PRC-018-1 The proposed compliance dates are too stringent. The 15 months between the Region developing specific requirements in PRC-002-1 and the installation requirement of

25% of the Region's requirement does not give the Transmission Owners enough time to specify, budget, procure and install the equipment.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

SPCTF Specific Comments on PRC-003, PRC-004, and PRC-005

PRC-003 — Regional Requirements for Analysis of Misoperations of Transmission and Generation Protection System

Applicability

Because the SPCTF feels that the definition of the applicable circuits recommends for PRC-003 that these standards apply to:

- All transmission circuits 200 kV and above
- All transmission circuits 100 kV to 200 kV operationally significant circuits, as defined by the RROs
- Generator protection systems, whose misoperations impact the bulk electric system

Definition of Misoperation

Part of the definition of Misoperation should be modified to read:

- Any protection system operation when no fault or other abnormal condition has occurred.

The words "protection system" should be added. This change should be reflected throughout the standards, wherever the definition is restated.

PRC-004 — Analysis and Mitigation of Transmission and Generation

Protection System Misoperations:

Definition of Misoperation

Part of the definition of Misoperation should be modified to read:

- Any protection system operation when no fault or other abnormal condition has occurred.

The words "protection system" should be added. This change should be reflected throughout the standards, wherever the definition is restated.

PRC-005 — Transmission and Generation Protection System Maintenance and Testing:

Definition of Protection Systems

The SPCTF recommends that breakers be removed from the definition of Protection Systems in PRC-002, which is referenced PRC-005 on maintenance. Breakers were not in the original scope of the Phase III-IV Planning Standards, and this constitutes a major scope expansion of the original standard. This change should be reflected throughout the standards, wherever the definition is restated in standards PRC-

Applicability

SPCTF recommends that PRC-005 apply to:

- All protection systems on the bulk electric system.
- All generation protection systems whose misoperations impact the bulk electric system

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

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Do not use quotation marks in any data field.
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Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **NERC System Protection and Controls Task Force**

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Contact Organization: NERC

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W. Mark Carpenter	TXU Electric Delivery	ERCOT	
David Angell	Idaho Power Company	WECC	
Deven Bhan	Western Area Power Administratio	MRO	
Joseph M. Burdis	PJM Interconnection, L.L.C.	MACC	
John L. Ciufo	Hydro One, Inc.	NPCC	
Jim Ingleson	New York Independent System Oper	NPCC	
Fred Ipock	City Utilities of Springfield	SPP	
Bill Kennedy	b7kennedy & Associates	N/A	
Gary L. Kobet	Tennessee Valley Authority	SERC	
William J. Miller	Exelon Corporation	MAIN	
John Mulhausen	Florida Power & Light Co.	FRCC	
Evan T. Sage	Potomac Electric Power Co.	MACC	
Bob Stuart	NERC Consultant	N/A	
Philip Tatro, P.E.	National Grid USA	NPCC	
Philip B. Winston	Georgia Power Company	SERC	
Henry Miller	AEP Service Corp.	ECAR	
Baj Agrawal	Arizona Public Service Co.	WECC	
Tom Wiedman	Wiedman Power System Consulting	N/A	
Jon F. Daume	Bonneville Power Administration	WECC	
Jerome B. Williams	AEP Service Corp.	ECAR	
Robert W. Cummings	NERC Staff	N/A	

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: PRC-002 -- SPCTF objects to the inclusion of power circuit breakers in the definition of protection systems in PRC-002. Although breakers are controlled by the protection system, their inclusion in this definition makes them subject to the protection system maintenance requirements in PRC-005. That change is a significant expansion of the original Phase III-IV planning standards on equipment maintenance. This change also applies to SMR-001. PRC-003 -- Part of the definition of MISOPERATION should be modified to: Any protection system operation when no fault or other abnormal condition has occurred. The words protection system were added. This change should be repeated in the definition section of PRC-004. This change also applies to SMR-001.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: Standard PRC-020-1 -- Change section R1.2 to match the data requirements of Standard PRC-006-0 UFLS -- R1.2. Data Requirement: R1.2.1. Voltage set points. R1.2.2. Size of corresponding load shedding blocks (% of connected loads.) R1.2.3. Intentional and total tripping time delays. R1.2.4. Generation protection. R1.2.5. Tie tripping schemes. R1.2.6. Islanding schemes. R1.2.7. Automatic load restoration schemes. R1.2.8. Any other schemes that are part of or impact the UVLS programs. ------ Standard PRC-021-1 -- Change section R1. to match the data requirements of Standard PRC-006-0 UFLS: R1. 1. Voltage set points. R1.2. Size of corresponding load shedding blocks (% of connected loads.) R1.3. Intentional and total tripping time delays. R1. 4. Generation protection. R1.5. Tie tripping schemes. R1. 6. Islanding schemes. R1. 7. Automatic load restoration schemes. R1. 8. Any other schemes that are part of or impact the UVLS programs.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems

- PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
- PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

  Comments: See attached Microsoft Word document: SPCTF Specific Comments on PRC-003 through PRC-005.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

     Comments:

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments: PRC-023 -- IT is inappropriate to completely drop a standard on protection system redundancy…this clearly was a causal factor in the West Wing outage in June 2004 that caused all three Palo Verde Units to trip. Instead of droppping it, SAC should postposne work on this until SPCTF completes its review protection system redundancy (already planned) and will submit a SAR, with a revised draft standard.

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments: See attached Microsoft Word document: SPCTF Specific Comments on PRC-002 (and SMR-001)

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

SPCTF Specific Comments on PRC-002 (and SMR-001)

Definition of Protection Systems

SPCTF objects to the inclusion of power circuit breakers in the definition of protection systems in PRC-002. Although breakers are controlled by the protection system, their inclusion in this definition makes them subject to the protection system maintenance requirements in PRC-005. That change is a significant expansion of the original Phase III-IV planning standards on equipment maintenance.

The definition of Protection Systems should be modified to read:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, station batteries, and DC control circuitry.

This change should be reflected where the definition is restated in PRC-003, PRC-004, PRC-005, and PRC-018.

Definition of Disturbance Measurement Equipment (DME)

If the Dynamic Disturbance Recorders (DDRs) are kept in this standard, the definition of DDR should not address PMUs at this time…it may be premature. Some of the parameters are applicable only to PMUs and are not applicable to all DDRs. A separate SMR standard or later inclusion of PMUs in the standard should be created for PMUs, specifically addressing their performance requirements.

Other Comments

1. R1.2.2. Change synchronization time from one to four milliseconds to be consistence with the Fault Recording Equipment requirement R2.2.3. (PRC-002) – While internal time precision is capable of one millisecond accuracy, the input for external time synchronization equipment is typically only of four millisecond accuracy.
2. Separate the R2.1.3.1 electrical quantities to be recorded by Fault Recording Equipment into two sections. One section should cover bus monitoring and the other section to cover power system element monitoring.

    R2.1.3.1. Electrical quantities to be recorded for each bus element shall be sufficient to determine the following:

        R2.1.3.1.1. Three phase to neutral voltages

        R2.1.3.1.2. Polarizing currents and voltages, if used

        R2.1.3.1.3. Frequency

    R2.1.3.2. Electrical quantities to be recorded for each monitored element shall be sufficient to estimate the following:

        R2.1.3.2.1 Positive and zero sequence currents (this would allow monitoring two phases or one phase and ground of each power system element)

        R2.1.3.2.2. Megawatts and megavars

3. R3.2.2 in PRC-002 (SMR-001 R1.2.2), as worded, precludes DDRs other than PMUs. Other measurement instruments can also act as DDRs. This wording should have the

same synchronization parameters as PRC-002 R2.2.3 to generalize the standard to current DDRs.

4. PRC-002 R3.3.3 (SMR-001 R1.2.3) should be revised to “Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 6 samples per second.” A recording rate of 30 samples per second would preclude use of existing DDR equipment that is not capable of faster rates. Alternately, the faster rate could be limited to new installations.

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**James W. Ingleson**	
Organization:	**New York ISO**	
Telephone:	**518-356-6131**	
Email:	**ingleson@nyiso.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☒ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☒	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Protection System Definition in PRC-002 and other standards. Romove "Power Circuit Breaker" from definition." The overall maintenance of power circuit breakers in considered by us to be a different discipline area. Our protection system maintenace program includes verification of the ability of each trip coil to trip the circuit breaker, however the overall maintenance of the ciruit breaker in not addressed as a part of the protection system maintenance program.

   Dynamic Disturbance Recorder Definition in PRC-002. Remove the word "continuously." Not all such devices have the ability to store or forward continuous data. In addition, the definition for Dynamic Disturbance Recording Equipment should mention that PMUs, although members of the DDR family, are not included. The PMU function should be addressed in a separate NERC standard. As we are engaged in a PMU demonstration progam at the present, the "EIPP," it is premature to introduce a stadard on a PMU system at this time. Such standards are under consideration by the EIPP.

   Definition of Misoperation in PRC-003. In the third bullet, this should be limited to protection system operations only. In the fourth bullet, NYISO does not consider failure to properly reclose to be a protection system misoperation. Autoreclosing is considered to be a control function rather than a protection function.

   The following is the NPCC definition of misoperations from NPCC Guideline B-21.

   A misoperation is considered to be one in which one or more specified protective functions:

   • did not occur as intended by the protection system design, or

   • did not occur within the time intended by the protection system design, or

   • occurred for an initiating event for which they were not intended by the protection system design to occur, or

   • occurred for no initiating event.

   Common examples of misoperations include:

   • failures to trip,

   • slow trips,

   • incorrect tripping during a fault, or

   • tripping for a non-fault condition.

   The following are not considered misoperations:

   • operations that are initiated by power plant, SVC, HVdc, circuit breaker, or other facility control systems (including autoreclosing),

• operations that occur during commissioning or testing, or

• operations that occur at a time when the affected or an associated element is out of service.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: NYISO recommends that the Requirements of PRC-021 (R1.1 - R1.8) replace PRC-020 (R1.1 - R1.3) and revise M1 and Levels of Non-Compliance 2.2, accordingly.

   In PRC-022, the levels of non-compliance (2.2 and 2.3) change the references from PRC-002 to PRC-022.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: The NYISO requests clarification as to which generators these standards apply to (i.e. size, voltage, BPS classification, etc). Or, is this determination at the Region's discretion?

   NYISO recommends that some consideration be given to technically feasible physical testing as opposed to meeting requirements based solely upon commissioning data sheets or vendor supplied diagrams

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: NYISO is in agreement with these Standards as written with the exception of the definitions (see question 1 above)

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: NYISO is agreement with these Standards as written

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: This does not follow the approved ANSI process. If SMR-001 and SMR-002 would be proposed through ANSI process, then associated PRC-002 and PRC-018 should be posted with SMR-001 and SMR-002, and not included in this Phase III - IV package.

   NYISO recommends that, if PRC-002 is posted with the Phase III - IV package as proposed, PRC-002 should be modified to generalize the definitions of DDRs to include all DDRs, not just PMUs. If these changes were made we would not object to including DDRs in the current package. In order to accomplish this, we suggest the following

   :

   R1. Add the word “establish” after shall.

   R1.2.2 We suggest that the word “synchronism” should be deleted. (Also in other places.)

   R3. Add "This section of the standard does not apply to Phasor Measurement Units (PMUs). This function should be addressed in a separate NERC standard at some time in the future."

   R3.1.2. The word “phrases” should be changed to “phases.”

   R3.1.3.1 and R.1.3.2. Change to a construction similar to R3.1.1. We suggest the criteria for electrical quantities recorded should be left to the RRO. We would like to have the flexibility

to install some special purpose devices in some locations which do not necessarily record all these quantities.

R3.2.1. This matter should be in section 3.1.1. The RRO should assess the need for continuous recording.

R3.2.2. 100 us accuracy applies to PMUs, which normally have integral GPS clocks. It is not needed, and not generally possible, for DDR equipment, and this degree of time synchronization accuracy is not required for event reconstruction. Although a modern GPS clock can itself be accurate to 100 microseconds or less, the IRIG-B distribution and the DDR device input circuit introduce uncertainties and delays. A more appropriate statement would be “time synchronized to UTC within 4 ms.,” as previously stated in R2.2.3.

R3.2.3. Recording rate of 6 Hz (samples per second) has been entirely adequate to observe the active oscillation modes, which are all under 1.0 Hz. We have in fact operated some installations at 30 Hz and higher, but it is not clear than this is always necessary or desirable for this purpose. There appears to be no justification for making "at least 30 Hz" a NERC standard. We have many stations operating well now at 6 Hz and 10 Hz. Going to 30 Hz at all locations would result in an unjustified large increase in record size, transfer time, and inconvenience. What we want is for engineers to read and understand these records, and adding unneeded data density at all locations is an impediment. This matter should be left to the RROs, perhaps with a minimum of 6 Hz.

R4.1 & R4.2 We would suggest “Data from continuous recording DDRs shall be retained for at least 10 days. All DME data used for analysis of identified events shall be retained for a period of 3 years.”

R5.4. It is not possible to provide SER files in Comtrade format so this section needs to be revised. We believe the correct year for C37.111 to be 1999, not 1997.

Conclusion:

We would close by saying that dial-up devices which make triggered recordings of reasonable size which can be transferred and shared conveniently are very important in our area. We are not willing to have all these "workhorse" devices judged "sub-standard" by NERC as would be implied by the present PRC-002-01 definitions and sections R3. and R4.

9. Please provide any other comments on this set of standards that you haven’t already provided.

Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Kathleen Goodman**	
Organization:	**ISO New England**	
Telephone:	**(413) 535-4111**	
Email:	**kgoodman@iso-ne.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☒ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☒	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Protection System Definition in PRC-002 and other standards. Remove "Power Circuit Breaker" from definition. The overall maintenance of power circuit breakers in considered by us to be a different discipline area. Our protection system maintenace program includes verification of the ability of each trip coil to trip the circuit breaker, however the overall maintenance of the ciruit breaker in not addressed as a part of the protection system maintenance program.

   Dynamic Disturbance Recorder Definition in PRC-002. Remove the word "continuously." Not all such devices have the ability to store or forward continuous data. In addition, the definition for Dynamic Disturbance Recording Equipment should mention that PMUs, although members of the DDR family, are not included. The PMU function should be addressed in a separate NERC standard. As we are engaged in a PMU demonstration progam at the present, the "EIPP," it is premature to introduce a stadard on a PMU system at this time. Such standards are under consideration by the EIPP.

   Definition of Misoperation in PRC-003. In the third bullet, this should be limited to protection system operations only. In the fourth bullet, ISO NE does not consider failure to properly reclose to be a protection system misoperation. Autoreclosing is considered to be a control function rather than a protection function.

   The following is the NPCC definition of misoperations from NPCC Guideline B-21.

   A misoperation is considered to be one in which one or more specified protective functions:

   • did not occur as intended by the protection system design, or

   • did not occur within the time intended by the protection system design, or

   • occurred for an initiating event for which they were not intended by the protection system design to occur, or

   • occurred for no initiating event.

   Common examples of misoperations include:

   • failures to trip,

   • slow trips,

   • incorrect tripping during a fault, or

   • tripping for a non-fault condition.

   The following are not considered misoperations:

   • operations that are initiated by power plant, SVC, HVdc, circuit breaker, or other facility control systems (including autoreclosing),

• operations that occur during commissioning or testing, or

• operations that occur at a time when the affected or an associated element is out of service.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: ISO NE recommends that the Requirements of PRC-021 (R1.1 - R1.8) replace PRC-020 (R1.1 - R1.3) and revise M1 and Levels of Non-Compliance 2.2, accordingly. For PRC-020, the "Proposed Effective Date" does not match the "Anticipated Actions Date".

   In PRC-021-1, the "Proposed Effective Date" does not match the "Anticipated Actions Date". In the "Applicability","Requirements" and "Measures" sections, the responsible entities should match those contained in the respective sections of PRC-022-1.

   In PRC-022, the levels of non-compliance (2.2 and 2.3) change the references from PRC-002 to PRC-022. The "Proposed Effective Date" does not match the "Anticipated Actions Date." For example, PRC-021 has applicability to the TO and DP; and PRC-022 has applicability to the TOP, DP and LSE. Recommend that these both indicate "TOP, TO, DP, and LSE who own and/or operate such equipment" in the applicability section.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: ISO NE requests clarification as to which generators these standards apply to (i.e. size, voltage, BPS classification, etc). Or, is this determination at the Region's discretion?

   ISO NE recommends that some consideration be given to technically feasible physical testing as opposed to meeting requirements based solely upon commissioning data sheets or vendor supplied diagrams.

   ISO NE recommends that each of these standards should be broken down into separate standards covering RRO requirements and GO requirements similar to PRC-002 & PRC-018. For MOD-024, the "Proposed Effective Date" does not match the "Anticipated Actions Date". Requirements R1.3 & R1.4 of both standards do not appear to be related to the titles of these standards. These requirements should be put into a separate model data verification standard.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: ISO NE is in agreement with these Standards as written with the exception of the definitions (see question 1 above) and the following comment: the "Proposed Effective Dates" for these standards do not match the "Anticipated Actions Dates."

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: ISO is agreement with these Standards as written except as follows: ISO NE recommends that each of these standards should be broken down into separate standards covering RRO requirements and GO requirements similar to PRC-002 & PRC-018. For PRC-024, TO's and other entities that have UFLS should be added to the "Applicability" section. Recommend that this be changed to indicate "TOP, TO, DP, and LSE who own and/or operate such equipment" in the applicability section.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: This does not follow the approved ANSI process. If SMR-001 and SMR-002 would be proposed through ANSI process, then associated PRC-002 and PRC-018 should be posted with SMR-001 and SMR-002, and not included in this Phase III - IV package.

   ISO NE recommends that, if PRC-002 is posted with the Phase III - IV package as proposed, PRC-002 should be modified to generalize the definitions of DDRs to include all DDRs, not just PMUs. If these changes were made we would not object to including DDRs in the current package. In order to accomplish this, we suggest the following:

   R1. Add the word “establish” after shall.

   R1.2.2. We suggest that the word “synchronism” should be deleted. (Also in other places.)

   R3. Add "This section of the standard does not apply to Phasor Measurement Units (PMUs). This function should be addressed in a separate NERC standard at some time in the future."

   R3.1.2. The word “phrases” should be changed to “phases.”

   R3.1.3.1 and R.1.3.2. Change to a construction similar to R3.1.1. We suggest the criteria for electrical quantities recorded should be left to the RRO. We would like to have the flexibility

to install some special purpose devices in some locations which do not necessarily record all these quantities.

R3.2.1. This matter should be in section 3.1.1. The RRO should assess the need for continuous recording.

R3.2.2. 100 us accuracy applies to PMUs, which normally have integral GPS clocks. It is not needed, and not generally possible, for DDR equipment, and this degree of time synchronization accuracy is not required for event reconstruction. Although a modern GPS clock can itself be accurate to 100 microseconds or less, the IRIG-B distribution and the DDR device input circuit introduce uncertainties and delays. A more appropriate statement would be “time synchronized to UTC within 4 ms.,” as previously stated in R2.2.3.

R3.2.3. Recording rate of 6 Hz (samples per second) has been entirely adequate to observe the active oscillation modes, which are all under 1.0 Hz. We have in fact operated some installations at 30 Hz and higher, but it is not clear than this is always necessary or desirable for this purpose. There appears to be no justification for making "at least 30 Hz" a NERC standard. We have many stations operating well now at 6 Hz and 10 Hz. Going to 30 Hz at all locations would result in an unjustified large increase in record size, transfer time, and inconvenience. What we want is for engineers to read and understand these records, and adding unneeded data density at all locations is an impediment. This matter should be left to the RROs, perhaps with a minimum of 6 Hz.

R4.1 & R4.2. We would suggest “Data from continuous recording DDRs shall be retained for at least 10 days. All DME data used for analysis of identified events shall be retained for a period of 3 years.”

R5.4. It is not possible to provide SER files in Comtrade format so this section needs to be revised. We believe the correct year for C37.111 to be 1999, not 1997.

Conclusion:

We would close by saying that dial-up devices which make triggered recordings of reasonable size which can be transferred and shared conveniently are very important in our area. We are not willing to have all these "workhorse" devices judged "sub-standard" by NERC as would be implied by the present PRC-002-01 definitions and sections R3. and R4.

9. Please provide any other comments on this set of standards that you haven’t already provided.

Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Roger Champagne**	
Organization:	**Hydro-Québec TransÉnergie**	
Telephone:	**514-289-2211; ext. 2766**	
Email:	**champagne.roger.2@hydro.qc.ca**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☒ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Dynamic Disturbance Recorder Definition in PRC-002. Remove the word "continuously." Not all such devices store continuous data. In addition, the definition for Dynamic Disturbance Recording Equipment should mention that PMUs, although members of the DDR family, are not included. This function should be addressed in a separate NERC standard.

   Definition of Misoperation in PRC-003. In the third bullet, this should be limited to protection system operations only. In the fourth bullet, we do not consider "failure to properly reclose" to be a protection system misoperation. Autoreclosing is considered to be a control function rather than a protection function.

   The following is the NPCC definition of misoperations from NPCC Guideline B-21.

   A misoperation is considered to be one in which one or more specified protective functions:

   • did not occur as intended by the protection system design, or

   • did not occur within the time intended by the protection system design, or

   • occurred for an initiating event for which they were not intended by the protection system design to occur, or

   • occurred for no initiating event.

   Common examples of misoperations include:

   • failures to trip,

   • slow trips,

   • incorrect tripping during a fault, or

   • tripping for a non-fault condition.

   The following are not considered misoperations:

   • operations that are initiated by power plant, SVC, HVdc, circuit breaker, or other facility control systems (including autoreclosing),

   • operations that occur during commissioning or testing, or

   • operations that occur at a time when the affected or an associated element is out of service.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

Comments: We recommend that the Requirements of PRC-021 (R1.1 - R1.8) replace PRC-020 (R1.1 - R1.3) and revise M1 and Levels of Non-Compliance 2.2, accordingly.

In PRC-022, the levels of non-compliance (2.2 and 2.3) change the references from PRC-002 to PRC-022.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: Please clarify to which generators these standards apply to (i.e. size, voltage, BPS classification, etc). Or, is this determination at the Region's discretion?

   We recommend that some consideration be given to technically feasible physical testing as opposed to meeting requirements based solely upon commissioning data sheets or vendor supplied diagrams.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: We are in agreement with these Standards as written with the exception of the definitions (see question 1 above)

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: We are in agreement with these Standards as written

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: This does not follow the approved ANSI process. If SMR-001 and SMR-002 would be proposed through ANSI process, then associated PRC-002 and PRC-018 should be posted with SMR-001 and SMR-002, and not included in this Phase III - IV package.

   We recommend that, if PRC-002 is posted with the Phase III - IV package as proposed, PRC-002 should be modified to generalize the definitions of DDRs to include all DDRs, not just PMUs. In order to accomplish this, we suggest:

   R1. Add the word “establish” after shall.

   R1.2.2 We suggest that the word “synchronism” should be deleted. (Also in other places.)

   R3. Add "This section of the standard does not apply to Phasor Measurement Units (PMUs). This function should be addressed in a separate NERC standard."

   R3.1.2. The word “phrases” should be changed to “phases.”

   R3.1.3.1 and R.1.3.2. Change to a construction similar to R3.1.1. We suggest the criteria for electrical quantities recorded should be left to the RRO. We would like to have the flexibility to install some special purpose devices in some locations which do not necessarily record all these quantities.

R3.2.1. This matter should be in section 3.1.1. The RRO should assess the need for continuous recording.

R3.2.2. 100 us accuracy applies to PMUs, which normally have integral GPS clocks. It is not needed for DDR equipment, and this time synchronization accuracy is not required for event reconstruction. Although a modern GPS clock can itself be accurate to 100 microseconds or less, the IRIG-B distribution and the DDR device input circuit introduce errors. A more appropriate statement would be “time synchronized to UTC within 4 ms.,” as previously stated in R2.2.3.

R3.2.3. Recording rate of 6 Hz (samples per second) has been entirely adequate to observe the active oscillation modes, which are all under 1.0 Hz. We have in fact operated some installations at 30 Hz and higher, but it is not clear than this is always necessary or desirable for this purpose. There appears to be no justification for making "at least 30 Hz" a NERC standard. We have many stations operating well now at 6 Hz and 10 Hz. Going to 30 Hz at all locations would result in an unjustified large increase in record size, transfer time, and inconvenience. What we want is for engineers to read and understand these records, and adding unneeded data density at all locations is an impediment. This matter should be left to the RROs, perhaps with a minimum of 6 Hz.

R4.1 & R4.2 We would suggest “Data from continuous recording DDRs shall be retained for at least 10 days. All DME data used for analysis of identified events shall be retained for a period of 3 years.”

R5.4. It is not possible to provide SER files in Comtrade format so this section needs to be revised. We believe the correct year for C37.111 to be 1999, not 1997.

Conclusion:

We would close by saying that dial-up devices which make triggered recordings of reasonable size which can be transferred and shared conveniently are very important in our area. We are not willing to have all these "workhorse" devices judged "sub-standard" by NERC as would be implied by the present PRC-002-01 definitions and sections R3. and R4.

9. Please provide any other comments on this set of standards that you haven’t already provided.

Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:	**Mark Kuras**	
Organization:	**MAAC**	
Telephone:	**610-666-8924**	
Email:	**kuras@pjm.com**	
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☒ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☒	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name:

Lead Contact:

Contact Organization:

Contact Segment:

Contact Telephone:

Contact Email:

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Triggered Dynamic Disturbance Recorders should also be considered as Dynamic Disturbance Recorders. Power circuit breakers should not be considered part of a Protection System. Misoperation - Instead of …within the specified time… use the following…at the desired time… to cover the misoperation where a relay trips faster than desired. After the word …reclose… insert, …, if reclosing is installed,…

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: All of the UVLS standards should include the following words after the Applicability listings. …installed to mitigate the risk of voltage collapse or voltage instability in the Bulk Electric System (BES). to exclude UVLS systems installed for local conditions only.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: In MOD-024 - No Requirement for GO to provide info to TP or PA but it's in M3. Recommend that RRO be clearing house for GO data so that they only have to send data to one place. Extra s in Compliance Section 3.2. In Compliance Section 3.4.1 is redundant with other compliance requirements, especially 3.4.2. Delete 1.5.2 in MOD-025, there is no need to collect this information since the effects are already included in 1.5.1 and the same data is requested in PRC-019 R2.1.4. In Compliance Section 3.4.1 is redundant with other compliance requirements, especially 3.4.2.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: In PRC-003 - R2 has two requirements in it. A requirement to review and update and a requirement to forward to TOs, DPs and GOs. Please separate. In Levels of Non-Compliance

the use of the term …requirements… is confusing because of the use of requirements in NERC standards in general. Suggest changing to …Procedure… as used in the Title.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: PRC-019-1: R2 and R3: Change …and the Transmission Operator:.. to …, Transmission Planner, Planning Authority, Reliability Coordinator, and the Transmission Operator: PRC-024-1: 4.3 Add …Transmission Owners… to Applicability to be consistent with R7. There seems to be an error in that PRC-024 R1 is missing, but I'm assuming R1.1 to be that. In PRC-019 R2.1.4 change …limit… to …condition… In R2.1.3, do prime movers have MW limits? I thought generators have MW limits. In R3 and R3.2, drop …through 2.1.6… assumed when 2.1 is stated. In R3.2, replace ...that any… with …any known change…. This perserve the requirement to report if you know something changed but prevent non-compliance for unknown changes like drift in settings.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☒ No

   Comments: No problem with separation of DDRs into its own standard. New standards should be clearly posted on website, not burried in a comment form. Strongly disagree with requirement that a DDR be recording continously. Triggered recorders should be allowed.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **NERC Standards Evaluation Subcommittee**

Lead Contact: Bill Bojorquez

Contact Organization: ERCOT

Contact Segment:

Contact Telephone: 512-248-3036

Contact Email: bbojorquez@ercot.com

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: The SES does not agree with the proposed definitions; specifically: Protection System and Misoperation.

   The SES does not believe the proposed definition for Protection System goes far enough, and believes it is not proper to define a protection system as just a list of components as stated in the proposed definition. SES offers the following: Protection System--A protection system contains a number of individual components coordinated together such that any element of a power system is promptly removed from service when it suffers a fault, or when it starts to operate in any abnormal manner that might cause damage or other interfere with the effective operation of the remainder of the system.

   As to the proposed definition for Misoperation, the SES recommends the SDT remove the last reference to: Any failure to properly reclose following a Protection System operation.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

   PRC-020-1:

   R1: The SES believes this requirement to be somewhat vague and recommends the SDT clarify what constitutes "sufficient information". As written it appears something more is required beyond the requirements in R1.2.

   R1.3: Appears to be a "catch-all" phrase, the SES is unsure how one can measure compliance of this requirement since it is not clearly stated.

   Measures and Levels of Non-Compliance are not consistent. The measures require the RRO to have evidence that it performed a function, but the compliance appears to be related to whether the function was carried out. The SES believes what is important to measure is if the requirement action was done (i.e. a database established/updated and made available).

   PRC-021-1:

R1: The SES believes this standard should require the owner to document its UVLS program in terms of the program's guiding principles and overall philosophy including the a detailed descripton of the program's scope and breadth, not just data only.

M1: Please clarify what is intended by "documentation of its UVLS program that shows an annual update ...". Does the documentation have to include a requirement that the data be updated annually?

Data Retention: Is it the data supplied to the RRO that is to be retained for two years?

Non-Compliance: Level 2.4 is the non-compliance that the owner did not provide the data or did not meet the measurement to have evidence that it provided the data?

PRC-022-1:

Measure M1: Should M1 read : "shall have documentation of its analysis of.."?

Measures and Levels of Non-Compliance: M1 requires documentation but the compliance does not. M2 requires evidence of documentation to be provided within 90 days. Should Level 4 also include that such evidence was not provided within 90 days?

With regards to the Levels of Non-Compliance, Level 2 and Leve3: The reference to Reliability Standard PRC-002 should be PRC-022.

General Comments for PRC-020-1, PRC-021-1, and PRC-022-1:

This family of three standards requires that the RRO maintain a database of UVLS systems, requires the TO and the DP to provide data on their systems to the RRO, and requires the TO and DP to report operations and misoperations to the RRO. There does not appear to be any requirement that, like UFLS systems (PRC-006-0), any entity study whether UVLS would be effective, and to implement UVLS if found to be effective. Recognizing that UVLS is more local in nature than UFLS, it may be more appropriate to require the TO to study UVLS, rather than a RRO. The SDT should consider incorporating into this family of standards a requirement that each TO should study, and implement if found effective, a UVLS program to mitigate the risk of voltage collapse or voltage instability in the BES. The TO should also be required to demonstrate that its UVLS program is coordinated with adjacent TOs.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

   MOD-024-1:

   R1.5 Should be labeled R1.1 as it is the core requirement of the standard.

   Levels of Non-compliance: Levels for the RRO do not include compliance for M2.

   The SES believes the stated purpose of MOD-024-1 is to produce "accurate" information of gross and net real power capability of generators for steady state models. However, there is no requirement in the standard that the RRO demonstrate that its procedures produce such a result. In theory, a RRO could require all generators in its region to supply the nameplate rating of its generators, an estimate of station service, and exempt all generators above 600 MW from the requirements of the region's procedures, and be in compliance with the standard. As a minimum,

the SES believes the RRO should be required to demonstrate that its procedures produce the required result and suggests the following:

R1. After the first sentence, add "The RRO shall demonstrate that its procedures produce accurate steady state models of generator gross and net real power capability."

M1 should become "The RRO shall submit its procedures for the verification and reporting of generator gross and net real power capability in accordance with Requirement 1 to NERC for review. Updates to these procedures shall be provided to NERC for review when they occur".

Compliance should be modified to be consistent with the revised R1 and M1.

MOD-025-1:

R1.5 should be labeled R1.1 as it is the core requirement of the standard.

Levels of Non-compliance: Levels for the RRO do not include compliance for M2

As with MOD-024-1, the SES believes the stated purpose of MOD-025-1 is to produce "accurate" information of gross and net reactive power capability of generators for steady state models. However, there no requirement in the standard that the RRO demonstrate that its procedures produce such a result. In theory, a RRO could require all generators in its region to supply the nameplate rating of its generators, an estimate of station service, and exempt all generators above 600 MW from the requirements of the region's procedures, and be in compliance with the standard. As a minimum, the SES believes the RRO should be required to demonstrate that its procedures produce the required result and suggests the following:

R1. After the first sentence, add "The RRO shall demonstrate that its procedures produce accurate steady state models of generator gross and net reactive power capability."

M1 should become "The RRO shall submit its procedures for the verification and reporting of generator gross and net reactive power capability in accordance with Requirement 1 to NERC for review. Updates to these procedures shall be provided to NERC for review when they occur."

Compliance should be modified to be consistent with the revised R1 and M1.

General Comments for MOD-024-1 and MOD-025-1:

The SES believes the SDT should attempt to require a stronger linkage between the models developed and testing to ensure the reasonableness of the models under varying scenarios. Also, the SES believes the SDT should include language which addresses the procedures to be used for correcting models based on verifiable test results.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

   PRC-003-1

   R1.1: The SES believes this requirement as written is too vague and provides little guideance as a standard. Specifically, the SES asks can the SDT clearify what is is intended to be reviewed by

…misoperations (due to their potential impact on BES reliability). The SES believes a requirement such as this will result in a wide variety of differing interpertations as to what types of misoperations are routinely reviewed and analyzed such that the effectiveness of this standard will be diminished. The SES recommends the SDT use language similar to that found in other standards such as "…all protection systems on lines and devices 100 kV and above (or at a lower voltage if designated by the RRO) that misoperate".

Data Retension: The wording is confusing. Is the current RRO version of the procedures to be retained for three years?

The SES believes the stated purpose of PRC-003-1 is to ensure protection system misoperations are analyzed and mitigated. No where in the standard is there a requirement that the procedures developed to meet this purpose be effective, and the standard does not provide for the review of the RRO's procedures. The RRO should be required to demonstrate that the requirements developed in accordance with R1 produce the desired result. Also suggest adding to M1 "The RRO shall submit its procedures for the review and mitigation of protection system misoperations prepared in accordance with R1 to NERC for review. Updates to these procedures shall be provided to NERC for review when they occur."

PRC-005-1:

R1: Similar to our comments for PRC-003-1, the proposed requirement does not adequately define …Protection Systems that affect the reliability of the BES. This leaves the decision to the TO, GO, or DP as to what systems are covered under this requirment. As with our previous comment, the SES believes this will result in a wide diverse interpertation of the standard which will in effect reduce the standards effectiveness. The SES recommends the SDT state at what minimum level should this standard apply to.

The SES believes the stated purpose of the standard is to ensure that protections systems are maintained and tested. However, there is no performance requirement or measure of effectiveness of a maintenance program required by the standard. In theory, a TO, GO or DP could maintain and test its protection systems once every ten years, and as long as this was documented, the standard was met. The standard should require the TO, GO, or DP to demonstrate that its maintenance and testing program facilitates reliable protection systems. The standard should also provide for RRO review and approval that the maintenance and testing programs are effective, and meet good industry practice. The SES suggests:

R2 should become: Each TO, GO, and any DP that owns a transmission or generation protection system shall provide documentation of its protection system maintenance and testing program, and the implementation of that program, to the RRO for review and approval. The TO, GO, and DP shall demonstrate to the RRO that its program will produce reliable protection systems in accordance with good industry practice.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

   PR-019-1:

   R2: requires the GO to provide generator data to the RRO. and the TO. The Transmission Planner also has a need for good models; however, the SES is uncertain the TP needs all the data. The SES is concerned as to what the RRO and TO are obligated to do with all the data

collected. The SES would hope that at least one end product would be to ensure generator models reflect capability, and that the capability is coordinated with the generator protection. As a result, the SES would recommend the SDT provide language to state which party is responsible for ensuring this coordination and the accuracy of the models?

R2 and R1 should be interchanged as R2 represents the core of the standard.

R3: should require the generator to provide documatation showing that generator capability and protection/limiter settings are coordinated.

R3.1 should be provided sufficently in advance of the connection date, at least in preliminary form, so that system studies can be carried out.

Levels of Non-compliance: RRO and GO levels should not be combined.

PRC-024-1:

R1.1: The SES believes the SDT should work with other NERC technical committees to develop a standard "minimum criteria" for frequency and voltage excursions. The SES believes it is important that NERC set a standard in this area instead of allowing a variety of differing standards based on RRO discretion as to the establishment of these standards.

R3. The SES questions the need for exemptions. Underfrequency situations indicate a capacity shortfall. If a unit is exempt, can it be counted on as a network resource?

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments: The SES offers no opinion at this time pending the SDT's reconcilation of all comments received.

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR) standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments: The SES offers no opinion.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

   The SES commends the SDT for their hard work in publishing these proposed standards for comments and in general supports the work of the SDT with the comments contained herein. On a broader level, the SES is disappointed the SDT left many of the requirements contained in these standards up to the RRO or other entities rather than proposing a more specific minimum NERC standard. As noted in our comments, the SES is concerned that standards which offer a broad latitude in the development of their requirements usually result in a wide variety of interpertations and in time a general consensus that the standard is at best ineffective or at worst contributing to degradation of reliability. The SES would have preferred the SDT take what is admittately a more difficult challenge and propose a more definitive set of minimum standards for review and consideration.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **Wind Generator Task Force**

Lead Contact: Mahendra Patel

Contact Organization: NERC

Contact Segment:

Contact Telephone: 610-666-8277

Contact Email: patelm3@pjm.com

Additional Member Name	Additional Member Organization	Region*	Segment*

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☐ No

   Comments:

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: The WGTF notes that verifying the capabilities of wind generating plants could require different processes than those used for synchronous generators. R1.3 for both standards should state that the RRO's procedures should identify specific procedures for wind generators. The RRO's procedures for real and reactive capability should recognize that capability of the entire wind plant should be verified, rather than the capability of individual wind generators.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments:

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

Comments: PRC-019-1 The WGFT believes that the information to be collected under the intent of this standard is important. However, for wind generation, the proper measurement is for the capability of the entire wind generating plant, and not individual wind generators. Also, the language of R2 is specific to synchronous generators and not applicable to wind generator technology. The WGTF recommends that the drafting team specifically exclude wind plants from PRC-019, as developing a new section, R2.2, to address wind plants cannot be done in a short time due to the complexity of the issue. The scope of the WGTF includes developing SARs for areas that are not properly addressed by NERC standards with respect to wind technology. The WGTF is considering developing a SAR at a later date to cover the subject of PRC-019 for wind generating plants.

PRC-024-1 The WGTF encourages the RROs to coordinate their low voltage ride through standards on an interconnection wide basis in order to be consistent with the recent NERC/AWEA joint recommendation to FERC on the LVRT requirement in FERC order 661.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☐ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☐ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☐ Yes

   ☐ No

   Comments:

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments:

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☐ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☐	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☐	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **SERC Protection and Control Subcommittee (PCS)**

Lead Contact: Bridget Coffman

Contact Organization: SCPSA (Santee Cooper)

Contact Segment: 1

Contact Telephone: (843) 761-8000 x5519

Contact Email: blcoffma@santeecooper.com

Additional Member Name	Additional Member Organization	Region*	Segment*
Russell W. Patterson	TVA	SERC	1
Gary Kobet	TVA	SERC	1
Barry Jackson	Duke Power Co.	SERC	1
Charlie Fink	Entergy	SERC	1
Hong Ming Shuh	Georgia Transmission Corporation	SERC	1
Jay Farrington	Alabama Electric Cooperative	SERC	1
Nathan Lovett	Georgia Transmission Corporation	SERC	1
Marion E. Frick	South Carolina Electric and Gas	SERC	1
Mike Gazda	MEAG Power	SERC	1
Ernesto Paon	MEAG Power	SERC	1
Phil Winston	Georgia Power	SERC	1
Ronnie Bailey	Dominion Virginia Power	SERC	1
Victoria L Bannon	Duke Power Co.	SERC	1
Steven E. Waldrep	Georgia Power	SERC	1
Susan Morris	SERC	SERC	2

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: The SERC PCS objects to the following definitions:

   Misoperation:

   1. The definition of Misoperation includes all "failures to reclose." The failure to reclose should only be considered a misoperation when such reclosing has been identified as critical to the system.

   2. The first item in the definition "Any failure… to operate within the specified time " leaves much to interpretation. It should be further explained, provided with examples, or removed.

   3. Remove the 3rd bullet (Any operation when no fault or other abnormal condition has occurred). The bullet could be interpreted to include intentional operation (such as relay tests). Instead, the wording from the 5th bullet in the background document should be used, which states "Any unintentional operation when no fault or other abnormal condition has occurred. Note: The Background document contains a different definition for misoperation from the definition in PRC-003. The definitions in the background document should be consistent with the definitions in the proposed Standards.

   Mitigation Plan: substitute compliance violation for problem. In SERC the phrase mitigation plan is used to denote required actions to alleviate a non-compliance. The phrase corrective action plan is used to denote correcting any problems identified through system or problem assessments. These phrases should not be used interchangeably. Use of these phrases needs to be made consistent throughout the NERC Reliability Standards.

   Protection System: Delete the term power circuit breakers. This addition is a significant scope creep. The thrust of this standard should be on protective system controls and not isolation devices. Addition of power circuit breakers or any other piece of substation equipment should be handled through a separate SAR, if needed.

   DDR: In the definition of DDR, some of the items are applicable only to the newest, most highly evolved DDRs (mostly phasor measurement units (PMUs)), and are not applicable to all DDR's. These defining parameters should be reevaluated to account for the capabilities of various types of existing DDRs, including fault recorders (with continuous/slow speed facilities or triggered slow speed recording capability). Specifics on some of these parameters are listed in comments on "Question 8 (SMR-001 and SMR-002).

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments:

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments:

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems
   - PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
   - PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

   Comments: The SERC PCS offers the following comments on PRC-003 and PRC-004:

   -The definition of Misoperation that appears in PRC-003 but is referenced in this standard includes all 'failures to reclose'. The failure to reclose should only be considered a misoperation when such reclosing has been identified as critical to the system.

   - The first item in the definition, 'Any failure ... to operate within the specified time.....' leaves much to interpretation. It should be further explained, provided with examples, or removed.

   The SERC PCS offers the following comments on PRC-005:

   -The addition of power circuit breakers to the definition of Protection Systems in PRC-002, which is referenced PRC-005 on maintenance adds a new component of major equipment maintenance. Breakers were not in the original scope of the Phase III-IV Planning Standards, and this constitutes a major scope expansion of the original standard. Please remove circuit breakers from this standard.

   -This standard should apply to all protection systems on the Bulk Electric System (BES) not just those that 'impact' the BES

   **Note: The term BES (Bulk Electric System) needs to be more clearly defined at the NERC level.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments:

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☐ No

   Comments: The SERC PCS offers the following suggestions for the Standard Drafting Team (SDT) for the new standards (SMR-001 and SMR-002)

   The SMR-001 and SMR-002 should not go to ballot with set 1 of the phase III & IV standards because of several issues that require industry input. SMR-001 and SMR-002 should go out for comment with set 2 of the phase III and IV standards to give the NERC IDWG a chance to draft the standards and to give the industry an opportunity to offer feedback. If SMR-001 and SMR-002 go directly to ballot with no due process then that would defeat the Reliability Standards development process.

   In the definition of DDR, some of the items are applicable only to the newest, most highly evolved DDRs (mostly phasor measurement units (PMUs)), and are not applicable to all DDR's. These defining parameters should be reevaluated to account for the capabilities of various types of existing DDRs, including fault recorders (with continuous/slow speed facilities or triggered slow speed recording capability). Specifics on some of these parameters are listed in comments on "Question 8 (SMR-001 and SMR-002).

   The time synchronism requirements for DDRs set forth in R3.2.2 (100 microseconds) are excessively stringent and would invalidate most DDRs presently in service. This requirement needs to be reanalyzed and adjusted based on the capabilities of the various types of existing DDRs, including fault recorders (with continuous/slow speed facilities) and phasor measurement units (PMUs). We recommend the SDT for the new standards solicit the industry to determine a synchronism requirement.

   The SDT for the new standards should consider the following modifications to the requirement similar to draft 2 of PRC-002 R3. It should be revised to "Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities

of at least x (x = some more reasonable number) samples per second." A recording rate of 30 samples per second would preclude use of existing DDR equipment that is not capable of faster rates. Alternately, the faster rate could be limited to new installations. We recommend the SDT for the new standards solicit the industry to determine sampling and recording rate requirements.

It would appear that what eliminates a number of existing DDR's is the combination of continuous recording, recording rate, and data retention requirements that all add together to insufficient memory. Time sync accuracy also becomes an issue. The SDT for the new standards should consider existing equipment impacts as well as requirements for new installations.

9. Please provide any other comments on this set of standards that you haven't already provided.

Comments: The SMR-001 and SMR-002 should not go to ballot with set 1 of the phase III & IV standards because of several issues that require industry input. SMR-001 and SMR-002 should go out for comment with set 2 of the phase III and IV standards (on October 15, 2005) to give the NERC IDWG a chance to draft the standards and to give the industry an opportunity to offer feedback. If SMR-001 and SMR-002 go directly to ballot with no due process then that would defeat the Reliability Standards development process and will impact the ballot results.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Comment Form – Draft 2 of Set 1 of the Phase III-IV Reliability Standards

Please use this form to submit comments on the Phase III-IV Drafting Team's second draft of the first set of Phase III-IV Standards. Comments must be submitted by **October 15, 2005.** You must submit the completed form by emailing it to sarcomm@nerc.com with the words "Phase III-IV Standard Comments" in the subject line. If you have questions please contact Mark Ladrow at mark.ladrow@nerc.net or 609.452.8060.

ALL DATA ON THIS FORM WILL BE TRANSFERRED AUTOMATICALLY TO A DATABASE.

DO: **Do** enter text only, with no formatting or styles added.
Do use punctuation and capitalization as needed (except quotations).
Do use more than one form if responses do not fit in the spaces provided.
Do submit any formatted text or markups in a separate WORD file.

DO NOT: **Do not** insert tabs or paragraph returns in any data field.
Do not use numbering or bullets in any data field.
Do not use quotation marks in any data field.
Do not submit a response in an unprotected copy of this form.

Individual Commenter Information **(Complete this page for comments from one organization or individual.)**		
Name:		
Organization:		
Telephone:		
Email:		
NERC Region		**Registered Ballot Body Segment**
☐ ERCOT ☐ ECAR ☐ FRCC ☐ MAAC ☐ MAIN ☐ MAPP ☐ NPCC ☒ SERC ☐ SPP ☐ WECC ☐ NA - Not Applicable	☒	1 - Transmission Owners
	☐	2 - RTOs, ISOs, Regional Reliability Councils
	☒	3 - Load-serving Entities
	☐	4 - Transmission-dependent Utilities
	☐	5 - Electric Generators
	☐	6 - Electricity Brokers, Aggregators, and Marketers
	☐	7 - Large Electricity End Users
	☐	8 - Small Electricity End Users
	☐	9 - Federal, State, Provincial Regulatory or other Government Entities

Group Comments (Complete this page if comments are from a group.)

Group Name: **Southern Company - Transmission**

Lead Contact: Marc M. Butts

Contact Organization: Southern Company Services

Contact Segment: 1

Contact Telephone: 205-257-4839

Contact Email: mmbutts@southernco.com

Additional Member Name	Additional Member Organization	Region*	Segment*
Keith Calhoun	Southern Company Services	SERC	1
Doug McLaughlin	Southern Company Services	SERC	1
Raymond Vice	Southern Company Services	SERC	1
Jim Viikinsalo	Southern Company Services	SERC	1
Phil Winston	Georgia Power Company	SERC	3
Bobby Jones	Southern Company Services	SERC	1
Lee Taylor	Southern Company Services	SERC	1
Larry Smith	Alabama Power Company	SERC	3
Jim Busbin	Southern Company Services	SERC	1
Bobby Jones	Southern Company Services	SERC	1

* If more than one Region or Segment applies, indicate the best fit for the purpose of these comments. Regional acronyms and segment numbers are shown on prior page.

Please read the "Background Information for Second Posting of the Phase III-IV Standards" and then respond to the following questions. You do not need to answer all questions.

Enter All Comments in Simple Text Format.

Insert a "check' mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree with the proposed definitions that were added or revised?

   ☐ Yes

   ☒ No

   Comments: Southern Company Transmission objects to the following definitions: The definition of Misoperation includes all -failures to reclose.- The failure to reclose should only be considered a misoperation when such reclosing has been identified as critical to the system.

   Mitigation Plan: substitute compliance violation for problem.

2. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-020-1 — Under-Voltage Load Shedding Program Database
   - PRC-021-1 — Under-Voltage Load Shedding Program Data
   - PRC-022-1 — Undervoltage Load Shedding Program Performance

   Comments: In PRC-021-1 R1, delete the words -provide, and- in the 1st sentence. The requirement to provide the data is covered by R2. This change will make the standard requirements internally consistent with measurements M1 and M2, and other similar standards (e.g. PRC-020-1). In PRC-022-1 R1.5, delete the word mitigation and reinsert the terms corrective action.

3. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - MOD-024-1 — Verification of Generator Gross and Net Real Power Capability
   - MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

   Comments: In MOD-024-1 and MOD-025-1, and as recommended in our Draft-1 comments, we again strongly recommend: The Levels of Non-Compliance as written are on a per generator basis, and will not work well for entities that have a large number of generators. In addition, because the details of the requirements are left up to the RRO, the levels of non-compliance should be rewritten as follows: 3.1. Level 1: Verified generator data were provided and were complete for less than 100% of a generator owner's units as required by the RRO procedures. 3.2. Level 2: Verified generator data were provided and were complete for less than 95% of a generator owner's units as required by the RRO procedures. 3.3. Level 3: Verified generator data were provided and were complete for less than 90% of a generator owner's units as required by the RRO procedures. 3.4. Level 4: Verified generator data were provided and were complete for less than 85% of a generator owner's units as required by the RRO procedures.

4. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-003-1 — Regional Procedure for Requirements for Analysis of Misoperations of Transmission and Generation Protection Systems and Generator Control Systems

- PRC-004-1 — Analysis and Reporting of Transmission and Generation Protection System Misoperations
- PRC-005-1 — Transmission and Generation Protection System Maintenance and Testing

Comments: PRC-002: on R3.1.2 change -number of phrases- to -number of phases.

PRC-005: Power circuit breakers as defined in PRC-002, 003, 004 and -005 were not in the original scope of the Phase III-IV Planning Standards, and this constitutes a major scope expansion of the original standard. Please remove circuit breakers from this standard.

5. Please identify anything you believe needs to be modified before this set of standards is balloted:
   - PRC-019-1 — Coordination of Generator Voltage Regulator Controls with Unit Capabilities
   - PRC-024-1 (Old VAR-004) — Generators Performance during Temporary Frequency and Voltage Excursions

   Comments: Southern Company - Transmission believes that proposed Reliability Standard PRC - 024 is critical to transmission reliability. Minimum criteria for generators to remain connected during system frequency and voltage excursions has to be established so that reliable and secure transmission schemes, such as underfrequency load shedding and undervoltage load shedding, can be implemented. Southern Company - Transmission also encourages RROs to solicit and utilize both generator and transmission system experts in developing the RRO criteria.

6. Do you agree with the deletion of the following standards from the set of Phase III-IV Standards?

   - MOD-022 - Use of Disturbance Data to Develop and Maintain Models (Recommend dropping because the requirements are subjective and there aren't established methods for using disturbance data in models.)
   - MOD-028 - Provision of Models and Data for Transmission Power Electronic Control Devices (Recommend dropping because the requirements are redundant with MOD-012- Dynamics Data for Transmission System Modeling and Simulation and MOD-013 – Regional Reliability Organization Dynamics Data Requirements and Reporting Procedures.)
   - PRC-023 - Redundancy of Transmission Protection Systems (Purpose and requirements don't align with one another. Recommend remanding to Planning Subcommittee.)

   ☒ Yes

   ☐ No

   Comments:

7. Do you agree with the proposed implementation plan? If no, please identify specifically what you feel needs to be modified.

   ☒ Yes

   ☐ No

   Comments:

The following question is being asked in response to comments submitted by the Interconnection Dynamics Working Group (IDWG)

Background
The IDWG has determined and recommended that Disturbance Monitoring Equipment (DME) should be separated into two classes: (1) Digital Fault Recorders (DFRs)/Sequence of Event Recorders (SOERs), and (2) Dynamic Data Recorders (DDR, aka Dynamic Disturbance Recorders or Disturbance Data Recorders), including Power System Data Recorders (PSDRs), and synchrophasor measurement devices (including phasor measurement units PMUs). The NERC Planning Committee approved two SARs calling for additional requirements for DDRs and their separation from the draft DME standards, which were submitted to the SAC on July 15, 2005. (The additional DDR requirements have been addressed in the draft DME Standards shown in this posting.)

The IDWG recommends that separation is appropriate because the DDRs can also be used for system performance measurements, equipment model validation, and real-time applications that are not necessarily associated with disturbances or faults, and the devices have differing capabilities and performance parameters. Secondly, the number, location, and implementation schedule of DDR installations necessary to provide adequate system observability during dynamic events differs from the requirements for DFRs.

Two draft standards (SMR-001 and SMR-002) are attached to this form showing the DDRs requirements, measures, and associated compliance separated from fault recorder and sequence of event recorders for reference. (The current drafts of PRC-002-1 and PRC-018-1 show the inclusion of DDRs with fault recorders and sequence of event recorders.) These new System Measurement and Recording (SMR)

standards also provide the flexibility to codify requirements for other system measurement and monitoring devices as warranted in the future.

Note:

If a consensus of stakeholders **agrees** with the proposed change to separate DDR from the DME Standards PRC-002 and PRC-018 into a separate set of standards, then the Phase III-IV drafting team will, following this posting, and without seeking any additional feedback from stakeholders, make the following changes:

- Revise PRC-002 and PRC-018 to remove all references to DDRs, including requirements, measures and associated compliance
- Add SMR-001 and SMR-002 into the set of Phase III-IV standards moving forward for ballot
- Revise the definition of Disturbance Monitoring Equipment to remove the section that includes DDRs
- Add the definition of Dynamic Disturbance Recorders that appears in SMR-001.

If a consensus of stakeholders **disagrees** with the proposed change, then the Phase III-IV drafting team will leave the requirements for DDRs in PRC-002 and PRC-018 and will not change the definition of DME.

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8. Do you agree that the requirements for DDRs should be placed into the two new standards (SMR-001 and SMR-002) as proposed above?

   ☒ Yes

   ☒ No

   Comments: We vote both yes and no because they should be separated but they should not be voted on as they are. They should be separated but if SMR-001 and SMR-002 go directly to ballot with no due process then that would defeat the Reliability Standards development process.

   In the installation requirements specified in the Reliability Standard, some of the items are applicable only to the newest, most highly evolved DDRs (mostly phasor measurement units (PMUs)), and are not applicable to all DDR's. These defining parameters should be reevaluated to account for the capabilities of various types of existing DDRs, including fault recorders (with continuous/slow speed facilities or triggered slow speed recording capability).

   The 100 microseconds time synchronism requirements for DDRs are excessively stringent and would invalidate most DDRs presently in service. We recommend the SDT for the new standards solicit the industry to determine a synchronism requirement.

9. Please provide any other comments on this set of standards that you haven't already provided.

   Comments: The SMR-001 and SMR-002 should not go to ballot with set 1 of the phase III & IV standards because of several issues that require industry input. SMR-001 and SMR-002 should go out for comment to give the NERC IDWG a chance to draft the standards and to give the industry an opportunity to offer feedback. If SMR-001 and SMR-002 go directly to ballot with no due process then that would defeat the Reliability Standards development process and will impact the ballot results.

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-002-1 posted September 1 – October 15. PRC-002-1 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 standard PRC-002-1 on April 21, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-002-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 1, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	November 1 - 30, 2005
3. Conduct 1st ballot.	December 1 -10 2005
4. Consider comments submitted with 1st ballot; post consideration of comments	December 12-23, 2005
5. Conduct 2nd ballot.	December 26 – January 6
6. Post standards and implementation plan for 30-day review by Board.	January 6 – February 6, 2006

7. Board adoption date.	February 6, 2006
8. Effective date.	January 1, 2007

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.

Dynamic Data Recorder (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

The following definition is provided here for reference but is introduced in PRC-002-1:

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title:** **Define Regional Dynamic Data Recording and Reporting Requirements**

2. **Number:** SMR-001-1

3. **Purpose:** Ensure that Regional Reliability Organizations establish requirements for installation of Dynamic Data Recording equipment and reporting of dynamic data to facilitate analyses of events.

4. **Applicability**

   Regional Reliability Organization.

5. **Proposed Effective Date:** January 1, 2007.

B. Requirements

R1. The Regional Reliability Organization shall establish the following installation requirements for Dynamic Data Recording equipment:

R1.1 Location and monitoring requirements including the following:

R1.1.1 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

R1.1.2. Elements and number of phases to be monitored at each location

R1.1.3. Electrical quantities to be recorded for each monitored element shall be sufficient to determine the following:

- Voltage, current, and frequency.
- Megawatts and megavars.

R1.1.4. Equipment characteristic requirements, including the following:

- Capability for continuous recording.
- Time synchronized to UTC within 100 microseconds (2.2 degrees) or better. The time synchronism may be expressed in local time, as long as the local time zone used is clearly stated.
- Data sampling rate of at least 1600 samples per second and recording rate of the RMS value of electrical quantities of at least 30 samples per second.

R2. The Regional Reliability Organization shall establish the following requirements for the storage and retention of the dynamic data for specific system events.

R2.1 All DDR data for identified events shall be archived for at least three years.

R2.2 All DDR data shall be retained for at least ten days.

R3. The Regional Reliability Organization shall establish requirements for facility owners to report dynamic data recorded by their DDR installations. The data reporting requirements shall include the following:

R3.1 Criteria for events that require the collection of data from DDRs.

R3.2 List of entities that must be provided with recorded dynamic data.

R3.3 Timetable for response to data request.

R3.4 Availability of recorded dynamic data in COMTRADE format (in conformance with IEEE Std. C37.111-1997 or its successor standard).

R3.5 Naming of data files in conformance with the latest version of IEEE Recommended Practice for Naming Time Sequence Data Files (draft standard PC37.232).

R3.6 Data content requirements and guidelines.

R4. The Regional Reliability Organization shall establish requirements for DDR maintenance and testing.

R5. The Regional Reliability Organization shall provide its requirements (and any revisions to those requirements) including those for DDR installation; dynamic data reporting; dynamic data storage and retention; and DDR maintenance and testing 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 dynamic monitoring and reporting.

C. Measures

M1. The Regional Reliability Organization's requirements for the installation of DDR equipment shall address Requirement 1.

M2. The Regional Reliability Organization's requirements for storage and retention of dynamic data include those elements identified in Requirement 2.

M3. The Regional Reliability Organization's dynamic data reporting requirements include all elements identified in Requirement 3.

M4. The Regional Reliability Organization shall have requirements for the maintenance and testing of DDR equipment as required in Requirement 4.

M5. The Regional Reliability Organization shall have evidence it provided its Regional dynamic monitoring and reporting requirements as required in Requirement 5.

M6. The Regional Reliability Organization shall have evidence it conducted a review at least once every five years of its regional requirements for dynamic monitoring and reporting.

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

NERC.

1.2 Compliance Monitoring Period and Reset Timeframe

One calendar year.

1.3 Data Retention

The Regional Reliability Organization shall retain documentation of its DDR 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 dynamic 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 Dynamic reporting requirements were not specified as required in Requirements 3.1 through 3.5.

2.1.2 DDR maintenance and testing requirements were not specified.

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

2.2.1 Equipment characteristics were not specified for DDRs.

2.2.2 Time synchronization requirements were not specified for DDRs as required in Requirement 1.2.2.

2.2.3 Requirements do not provide criteria for equipment location or criteria for monitored elements or monitored quantities as required in Requirement 1.1.

2.3 Level 3: Disturbance data storage and retention requirements were not specified for DDRs as required in Requirement 2.

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

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking

Draft of Proposed Standard Associated with DDRs

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 contains the requirements, measures and compliance related only to Dynamic Data Recorders (DDR) as extracted from the second draft of PRC-018-1 posted September 1 – October 15. PRC-018-1 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.
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 standard PRC-018-1 from April 22 – June 13 2005 and its consideration of those comments on August 30, 2005.

Description of Current Draft:

This is the first draft of a standard, stating only Dynamics Data Recorder (DDR) requirements, measures and compliance extracted from the second draft of PRC-018-1 posted September 1 – October 15, to be posted as related to a specific question on the comment form for industry comment from September 1 – October 15, 2005.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Review comments from industry posting; post consideration of comments.	October 15 - November 30, 2005
2. Post standards and implementation plan for 30-day pre-ballot review.	December 1 - 30, 2005
3. Conduct 1st ballot.	January 1 -10 2006
4. Consider comments submitted with 1st ballot; post consideration of comments	January 11- February 18, 2006
5. Conduct 2nd ballot.	February 18 – February 28, 2006
6. Post standards and implementation plan for 30-day review by Board.	March 1-30, 2006
7. Board adoption date.	April 6, 2006
8. Effective dates:	

o 100% compliant Requirement 2 through Requirement 5 for already installed DDR	October 1, 2007
o 25% compliant with Requirement 1	April 1, 2008
o 50% compliant with Requirement 1	April 1, 2009
o 75% compliant with Requirement 1	April 1, 2010
o 100% compliant with Requirement 1	April 1, 2011

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.

No new definitions are proposed for this standard.

The following definitions are provided here for reference but are introduced in SMR-001-1:

Dynamic Data Recorders (DDR): Device capable of measuring and continuously recording system data during 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.

Note: In the event this definition is accepted, the definition for Disturbance Monitoring Equipment (DME) would be modified to exclude DDRs

Protection System: Protective relays, associated communication systems, voltage and current sensing devices, power circuit breakers, station batteries and DC control circuitry.

A. Introduction

1. **Title: Dynamic Data Recorder Equipment Installation and Data Reporting**

2. **Number:** SMR-002-1

3. **Purpose:** Ensure that Dynamic Data Recorders (DDR) are installed and that dynamic 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:**

   5.1 100% compliant with Requirements 2 through Requirement 5 by October 1, 2007 for already installed DDRs

   5.2 25% compliant with Requirement 1 by April 1, 2008

   5.3 50% compliant with Requirement 1 by April 1, 2009

   5.4 75% compliant with Requirement 1 by April 1, 2010

   5.5 100% compliant with Requirement 1 by April 1, 2011

B. Requirements

R1. The Transmission Owner and Generator Owner shall install DDRs in accordance with the Regional Reliability Organization installation requirements (SMR-001 Requirement R1 through R3).

R2. The Transmission Owner and Generator Owner shall maintain, and report to the Regional Reliability Organization on request, the following data on its installed DDRs:

R2.1 Make and model of equipment.

R2.2 Installation location.

R2.3 Resolution of time synchronization.

R2.4 Monitored elements.

R2.5 Monitored electrical quantities.

R2.6 Operational status.

R2.7 Date last tested.

R3. The Transmission Owner and Generator Owner shall each store and retain its dynamic data (recorded by DDRs) in accordance with its Regional requirements (SMR-001 Requirement 2).

R4. The Transmission Owner and Generator Owner shall each provide dynamic data (recorded by DDRs) in accordance with the Regional requirements (SMR-001 Requirement 3).

R5. The Transmission Owner and Generator Owner shall have a DDR maintenance and testing program in accordance with the Regional requirements (Reliability Standard SMR-001 Requirement 4).

C. Measures

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M1. The Transmission Owner and Generator Owner shall each have evidence that its DDRs 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 2.1 through 2.7 on all its installed DDRs, and shall have evidence it provided this 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 stored and retained its recorded dynamic data in accordance with its associated Regional Reliability Organization's requirements.

M4. The Transmission Owner and Generator Owner shall each have evidence it provided recorded dynamic data to all entities in accordance with its associated Regional Reliability Organization's requirements.

M5. The Transmission Owner and Generator Owner shall each have evidence its DDR maintenance and testing program is in accordance with its associated Regional Reliability Organization's requirements.

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 retain any changes to the data on DDR installations and any dynamic 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 either of the following conditions is present:

2.1.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 75% or more but not all of the locations.

2.1.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 75% or more but not all of the locations.

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

2.2.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 50% or more but less than 75% of the locations.

2.2.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 50% or more but less than 75% of the locations.

2.3 **Level 3:** There shall be a level three non-compliance if either of the following conditions is present:

2.3.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at 25% or more but less than 50% of the locations

2.3.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for 25% or more but less than 50% of the locations.

2.4 **Level 4:** There shall be a level four non-compliance if either of the following conditions is present:

2.4.1 DDRs that meet all Regional installation requirements (in accordance with Requirement 1) were installed at less than 25% of the locations.

2.4.2 Recorded dynamic data that meets all Regional data requirements (in accordance with Requirement 3) was provided for less than 25% of the locations.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking