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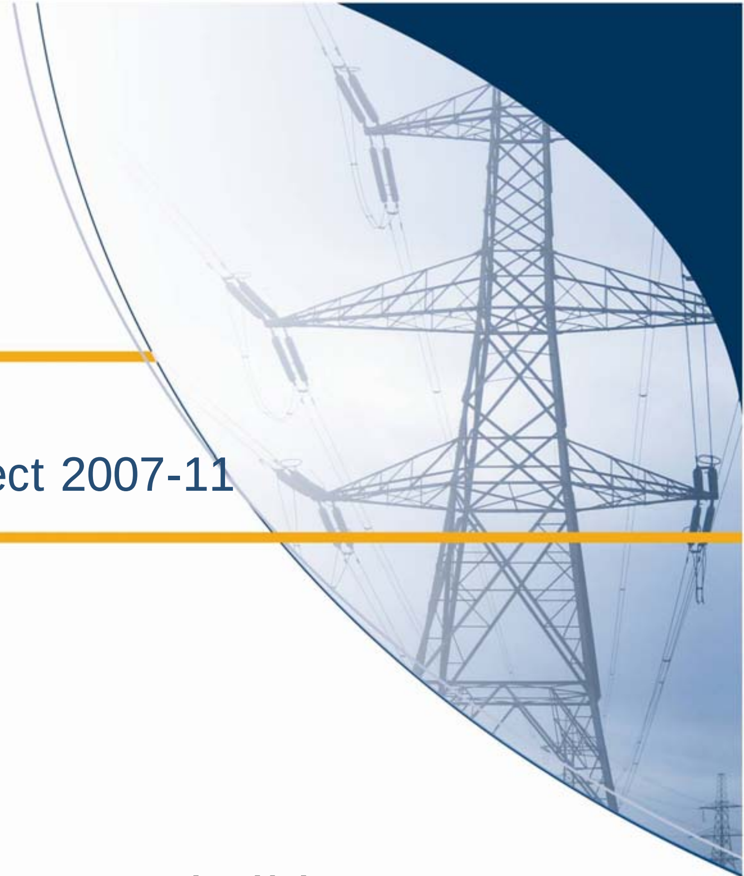

Meeting Notes

Disturbance Monitoring SDT — Project 2007-11

March 30, 2009 | 1–5 p.m. EDT
March 31, 2009 | 8 a.m.–5 p.m. EDT
April 1, 2009 | 8 a.m.–5 p.m. EDT
Tampa, Florida 33607-4512

1. Administrative

1.1. Roll Call

Stephanie Monzon conducted roll call. Those present are listed below:

- **Navin B. Bhatt — American Electric Power (Chair)**
- Terry L. Conrad — Concurrent Technologies Corp.
- James R. Detweiler — FirstEnergy Corp.
- Barry G. Goodpaster — Exelon Business Services Company
- Steven Myers — Electric Reliability Council of Texas, Inc.
- Jeffrey M. Pond — National Grid
- Jack Soehren — ITC Holdings (on phone)
- Stephanie Monzon — North American Electric Reliability Corporation
- Alan D. Baker — Florida Power & Light Company
- Bharat Bhargava — Southern California Edison Co.
- Daniel J. Hansen — Reliant Energy, Inc.
- Charles Jensen - JEA
- Tracy M. Lynd — Consumers Energy Co.
- Susan McGill — PJM
- Larry E. Smith — Alabama Power Company
- Felix Amarh — Georgia Transmission Corporation
- Robert (Bob) Millard — ReliabilityFirst Corporation
- Charlie Childs — Ametek Power Instruments
- Richard Dernbach — Los Angeles Department of Water & Power
- Willy Haffecke — Springfield Missouri City Utilities

Observers:

- Anthony Jablonski — RFC (on phone)
- Richard Ferner — WAPA
- Guy Zito — NPCC

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Stephanie will follow up with Dave T. to determine next steps to make Chuck and Richard official members of the drafting team.

2. NERC Antitrust Compliance Guidelines

Stephanie Monzon reviewed the NERC Antitrust Compliance Guidelines with the group.

3. Review Agenda for DME Meeting

The team reviewed the agenda and determined to start with the response to comments.

4. Post Mortem — Industry WebEx

The DMSDT conducted an industry webinar on March 12, 2009. The team did not discuss the webinar other than referencing some questions asked and discussing the responses. Stephanie provided the notes in the meeting materials for the team's reference.

5. First Pass Response to Comments

The first draft of the proposed standard was posted for industry comment. The comment period closed March 18, 2009. The team will review the comment report (in the meeting materials and e-mailed to the group) and begin a first pass at responses.

Day 1 — Identify Major Themes in Comments

Navin proposed sub-teams and questions for these sub teams. The team broke out into these sub-groups to discuss their assigned questions and to identify the major themes contained in the comments. The entire team reconvened at 4:30 p.m. to discuss as a group these major topics.

Team #1: Jeff, Chuck and Felix (Q4-6)

Completed through Q4 — Common Themes:

- Three lines/substation caused confusion
- Team does not adequately describe "disturbance"
- Locations is an issue — legacy equipment will have to be integrated with new equipment

Team #2: Barry, Willy, Jack and Larry (Q7-9)

- Number of stations
- Size of generators
- What does event mean?
- Define locations (the team will have to better define locations in the standard)

Team #3: Tracy, Dan (Q12-13)

- DDR requirements should cover the same stations that are covered in R1

- Confusion about legacy equipment
- Request to clarify continuous recording — sub team to address this comment and propose a response
- Issues with triggering and change triggering
- Confusion regarding January 2011 date and the implementation schedule
- 960 samples is too high — the sub team will be proposing responses to these comments
- Confusion about the 2 millisecond and the sample rates
- Acts of nature

Team #4: Susan, Alan, and Jim (Q16-17)

- There are requirements in the compliance section
- Unclear what is 50% compliance in the implementation plan
- Current implementation is too aggressive – can we do it over a phased in period?
- Coordination between TO and GO

Team #5: Navin, Bob, and Richard (Q1-3, Q10-11, Q14, Q15, Q18)

- Maintenance and Testing — majority support to not include maintenance and testing
- DDR location issues — need to clarify location
- Ownership is an issue
- Regional variance — no variances
- Substation definition

Day 2 — Prioritize Common Themes for Discussion

<u>Question # 1</u> — No substantial issues although there were comments that addressed issues brought up in other questions. Small group will recommend responses to be reviewed by the team over e-mail.

- DDR Location
- Criteria for disturbance monitoring (PNNL)

<u>Question #2</u>:

- Implementation schedule
- Moving requirements to additional compliance section of the standard
- Maintenance and testing requirements
- Generator size (MRO)
- Imposing new requirements on GO's — E ON US
- Relationship between TO and GO — ownership issue (Jim will take the lead on drafting a response to these comments and/or make suggested revisions to the draft standard — see action items list)

- Bus potential (ring buses — line and bus potentials) SERC PCS (to be handled by this sub team. Jim suggested that we look at the RFC DME standard to leverage language that addresses similar requirements)

Question #3:

- Maintenance and testing requirements
- Allow for missing data - FPL
- Time gap if M&T requirements are included in another standard
- DME is not as important as Protection and Control equipment

Team Discussion — the following topics were identified as requiring team discussion:

1. Purpose of Standard
2. DME Location
3. Thresholds (200 kV, 7 lines, etc.)

The team discussed making the threshold 10,000 MVA at the bus. This does not apply to all categories — and no kV threshold. This captures the major buses.

The team is trying to accommodate industry recommendation of other voltage levels other than 200 kV (below) and recommending that 10,000 MVA as criteria because it is directly related to the impact that these busses will have on the region from a stability perspective.

a. **Substation Definition**
Bus is defined as the representation in short circuit program of the node that indicated you have interconnected lines and join have a short circuit capacity — that node occurs at a voltage level. A substation can have several buses and several bus elements. The standard should not refer to substations but rather buses. The point of interconnect should be defined as the high side of the GSU.

b. **Disturbance/Event Definition** — the FAQ should include a reference to EOP-004's reference to Disturbance. The team decided not to define Disturbance since it is already defined in the NERC Glossary (albeit very vague). The team felt that if they clarified the location and threshold that it was not necessary to define Disturbance.

DDR
20 lowest impedance buses for each TO and GO was proposed. Need several proposals for the DDR Threshold — Chuck, Alan, Felix, Jack, Richard, and Jim. Need regions to provide short circuit data. We need a data request to TOs and GOs for short circuit data (voltage, amps and MVA). This sub team will work on a

spreadsheet including the information to be provided in the request. Stephanie will work with Gerry to issue the data request to the Regions.

SOE (Day 3 — the team continued their discussion regarding SOE threshold)
Larry to come up with proposal for SOE threshold for Day 3 discussion. Larry began the discussion on Day 3 by asking if the team had concerns with the 10,000 MVA criteria for SOE. In addition, Larry asked if circuit breaker status is sufficient. Some comments indicated that it is not adequate to do SOE on circuit breaker status only. The team; however, feels that circuit breaker status is sufficient to analyze the event.

Discussion on location — where do we want SOE? The same as the location (10,000 MVA) for FR?

GO's
Generator Owners connected to BES Substation buses having available three phase short circuit MVA of 10,000 MVA or above (calculated under normal operating conditions with all facilities and units in service) and either of the following

- A generating unit of 20 MVA or higher nameplate rating or
- Generating plants with an aggregate plant total nameplate capacity of 75 MVA or higher

Fault Recording
10,000 MVA (irrespective of the number of elements connected) and above for TOs:

Exceptions considered on Day 3:

- Radial lines that do not have generation are excluded (if the team decides to use a number of lines) — **keep as reference but don't include exception in standard**
- And don't have to monitor both ends of the line
- Exempt entire bus if all lines connected to the bus are monitored at the next bus at the same voltage level.

Transmission Owners with BES Substation buses having available three phase short circuit MVA of 10,000 MVA or above (calculated under normal operating conditions with all facilities and units in service)

GOs:
Generator Owners connected to BES Substation buses having available three phase short circuit MVA of 10,000 MVA or above (calculated under normal operating conditions with all facilities and units in service) and either of the following

- A generating unit of 150 MVA or higher nameplate rating or

- Generating plants with an aggregate plant total nameplate capacity of 300 MVA or higher

Threshold Short Circuit Level — Chuck will propose a defined term to be applied to this standard

4. Maintenance and Testing Discussion:
The team reviewed the suggestion made by WECC to move R6 from PRC-018-1 into the proposed standard. The team decided that this was a feasible approach to addressing the maintenance and testing requirements. Richard suggested that we should reword Requirement R6. Richard volunteered to reword for review by the team.

5. Allow for Missing Data

6. Unclear what is 50% compliance in the implementation plan

7. Issues with Triggering

8. Integration to Legacy Equipment

6. Discuss Technical Paper and FAQ Document

The team did not discuss the technical paper but rather discussed creating an FAQ document that would supplement the standard and explain the technical elements of the standard. The team discussed the "role" of the FAQ document. Stephanie and Bob clarified that other documents including reference documents can accompany the standard during the postings but do not become part of the standard. Only the standard is mandatory and enforceable. Below are the notes from the last meeting the team held to discuss the technical paper included for reference.

Top 100 Buses
Top 100 buses — Chuck and Felix suggested that we need similar analysis for the regions but will propose language based on the FRCC top 100 buses. It may be helpful for the other members of the drafting team look into the top 100 for their regions. Create a spreadsheet to include/append to the technical paper that includes top 100 buses by region.

- Chuck will propose a spreadsheet for FRCC. This will help to collect this information for the other regions.
- Larry Smith, and Felix to determine if conclusion can be made by the data collected.
- By – February 16, 2009

February 18 — the team reviewed Felix's e-mail/data and agreed that collecting data from other regions would be helpful in supporting the team's thresholds — top 100 buses and/or 10,000 MVA short circuit level

Major Event Analysis
Include event analysis experience and any conclusions that may be drawn from historical events (the August 14 blackout, etc.). Navin Bhatt and Tracy will work on proposed language and may reach out to Bob Cummings.

- Chuck indicated that the NERC Blackout report on the website (major outages) does not include facilities under 200kV that contributed to the outages. Chuck will send the report to Navin.

- Navin and Tracy will work on collecting more information for this section. By - February 16, 2009

February 18 — Navin will call Bob C. to discuss his concerns and comments on the draft standard. Tracy discussed the need to better understand the NERC definition of a major disturbance (what constitutes a major disturbance). Tracy will look through the "Major Disturbances of the Year" reports published by NERC (yearly) for data that would support the technical paper.

Navin will send out a 2002 Disturbance Report to the team (as a sample of the reports that will be reviewed).

Monitoring Special Protection Systems and Remedial Action Schemes:
Include the impact of under voltage load shedding and special protection system on DME thresholds. Richard will do some research on this to determine if it is in fact impactful. Larry Smith will also do some research.

February 18 — The team agreed that UVLS is applicable at the distribution level and not appropriate for the technical paper as a justification for the DME standard. The team did decide to address monitoring special protection system and remedial action schemes.

Critical Clearing Times
Include critical clearing time (on bus level very short) — recognized locations where we need to reduce back up clearing. Chuck will do some research this and try to collect information.

- Chuck will work on the clearing times for FRCC. This will help to collect this information for the other regions.

February 18 — Chuck and Felix will send out a spreadsheet with critical clearing column (breaker failure backup clearing time) but Chuck notes that the data doesn't indicate a strong correlation with critical buses.

The team will review the data for FRCC provided by Chuck and the date provided by Felix to determine if there is a correlation. The team will then determine if it should be included in the technical paper.

Jack will provide MVA spread (number of elements) for lower Michigan.

Stability
Felix to send an e-mail that elaborates on adding this topic to the technical paper.

February 18 — Felix, Chuck and Larry will work on the language to be included in the technical paper.

Pmu installation — Navin
Some team members do not think that it may be entirely appropriate to include pmu data into the technical paper since pmus are not included in the standard. This may cause confusion if included in the technical paper but not in the standard.

Navin will collect some data for the team to look over (number of installations and at kV level) we will decide whether or not to include in the technical paper after reviewing some of the data that will be collected.

7. Action Items

Action Items	Status:	Assigned To:
The group must resolve how to develop requirements for maintenance and testing of disturbance monitoring equipment (DME). Possible options include, adding maintenance and testing requirements to the draft PRC-002 standard, asking the Standards Committee to transfer the maintenance and testing requirements to the standard drafting team (SDT) for Project 2007-17 Protection System Maintenance and Testing, or some other solution. Ultimately, the maintenance and testing requirements for DME should "look and feel" like the maintenance and testing requirements developed by the SDT for Project 2007-17 Protection System Maintenance and Testing.	**In Progress** **This issue will be addressed in the comment form to solicit industry feedback on how to proceed.** **Discussed at the 12/08/08 call:** **The team reviewed the status of the issue clarifying that the team was going to post the standard and solicit industry feedback on omitting these requirements. The team would use this feedback to propose an alternate to the SC or NERC staff – possibly create a supplemental to SAR to the Maintenance project.**	All
Navin to lead a small group in drafting the **measures** for the requirements. Jack Soehren, Felix Amarh, and Barry Goodpaster volunteered to assist Navin.	**Closed**	Navin Bhatt, Jack Soehren, Felix Amarh, and Barry Goodpaster
Steve Myers, Larry Brusseau, and Bob Millard to draft the **VRFs and VSLs.**	**Will Remain Open**	Steve Myers, Larry Brusseau, and Bob Millard
Chuck, Jim and Alan will be proposing language for R5.1 and R5.2.	**Completed**	Chuck, Alan and Jim.
Willy will review the comment form to ensure that references	**Completed**	Willy H.

Action Items	Status:	Assigned To:
to the standard are still correct.		
Jim will look over the mapping form to ensure that references to the standard are still correct.	Completed	Jim D.
Jim D. will take the lead on drafting a response to these comments and/or make suggested revisions to the draft standard	Created 4/1	Jim D.
Threshold Short Circuit Level – Chuck will propose a defined term to be applied to this standard	Created 4/1	Chuck J.
The team reviewed the suggestion made by WECC to move R6 from PRC-018-1 into the proposed standard. The team decided that this was a feasible approach to addressing the maintenance and testing requirements. Richard suggested that we should reword Requirement R6. Richard volunteered to reword for review by the team.	Created 4/1	Richard F.
Need several proposals for the DDR Threshold – Chuck, Alan, Felix, Jack, Richard & Jim. Need regions to provide short circuit data. We need a data request to TOs and GOs for short circuit data (voltage, amps and MVA). This sub team will work on a spreadsheet including the information to be provided in the request. Stephanie will work with Gerry to issue the data request to the Regions if the team determines this is best approach (issuing a data request).	Created 4/1	Chuck, Alan, Felix, Jack, Richard & Jim.
The sub teams will prepare draft responses to the questions that were assigned to the teams. They will email their draft response to the team by April 20, 2009 in preparation for the team conference call on April 27, 2009.	Created 4/1	Team

8. Next Steps

The team discussed next steps and determined that the focus needs to be responding to comments and revising the standard. The response to comments must be completed and posted prior to a second posting of the proposed standard. Navin commented that he would prefer that the next posting not include the compliance elements as we are still trying to finalize the technical elements of the standard. During the next conference call the team will review the sub-team's responses to comments and identify items that will need to be discussed as a group at the next in person meeting (May). The next meeting in June was scheduled because the team will most likely require another in person meeting to finalize responses to comments, revisions to the standard and create another comment form for the second posting. The team also agreed that the standard would require three to four (total) postings to complete the standard.

9. 2009 Schedule

Date and Time	Location	Comments

February 18, 2009	Conference Call	To discuss the technical paper
March 2, 2009	Conference Call	Webinar presenters and NERC staff required on this call to prep for the webinar
March 12, 2009 — 11 a.m.–12:30 p.m. EST	Industry Webinar	Need to confirm date with team and speakers
March 30, 2009 — 1–5 p.m. EST March 31, 2009 — 8 a.m.–5 p.m. EST April 1, 2009 — 8 a.m.–5 p.m. EST	FRCC Offices Tampa, FL	Confirmed by Chuck.
May 5, 2009 — 8 a.m.–5 p.m. May 6, 2009 — 8 a.m.–5 p.m.	FPL Juno Beach	Wait for confirmation from Alan
June 2, 2009 — 8 a.m.–5 p.m. June 3, 2009 — 8 a.m.–3 p.m.	Jackson, MI	Wait for confirmation from Tracy
April 27, 2009	Conference Call	To identify the comments that require discussion with the entire team during our May 5-6 meeting.

10. Other

11. Adjourn

Attachment 1 Antitrust Guidelines

I. General

It is NERC's policy and practice to obey the antitrust laws and to avoid all conduct that unreasonably restrains competition. This policy requires the avoidance of any conduct that violates, or that might appear to violate, the antitrust laws. Among other things, the antitrust laws forbid any agreement between or among competitors regarding prices, availability of service, product design, terms of sale, division of markets, allocation of customers or any other activity that unreasonably restrains competition.

It is the responsibility of every NERC participant and employee who may in any way affect NERC's compliance with the antitrust laws to carry out this commitment.

Antitrust laws are complex and subject to court interpretation that can vary over time and from one court to another. The purpose of these guidelines is to alert NERC participants and employees to potential antitrust problems and to set forth policies to be followed with respect to activities that may involve antitrust considerations. In some instances, the NERC policy contained in these guidelines is stricter than the applicable antitrust laws. Any NERC participant or employee who is uncertain about the legal ramifications of a particular course of conduct or who has doubts or concerns about whether NERC's antitrust compliance policy is implicated in any situation should consult NERC's General Counsel immediately.

II. Prohibited Activities

Participants in NERC activities (including those of its committees and subgroups) should refrain from the following when acting in their capacity as participants in NERC activities (e.g., at NERC meetings, conference calls and in informal discussions):

- Discussions involving pricing information, especially margin (profit) and internal cost information and participants' expectations as to their future prices or internal costs.
- Discussions of a participant's marketing strategies.
- Discussions regarding how customers and geographical areas are to be divided among competitors.
- Discussions concerning the exclusion of competitors from markets.
- Discussions concerning boycotting or group refusals to deal with competitors, vendors or suppliers.
- Any other matters that do not clearly fall within these guidelines should be reviewed with NERC's General Counsel before being discussed.

III. Activities That Are Permitted

From time to time decisions or actions of NERC (including those of its committees and subgroups) may have a negative impact on particular entities and thus in that sense adversely impact competition. Decisions and actions by NERC (including its committees and subgroups) should only be undertaken for the purpose of promoting and maintaining the reliability and adequacy of the bulk power system. If you do not have a legitimate purpose consistent with this objective for discussing a matter, please refrain from discussing the matter during NERC meetings and in other NERC-related communications.

You should also ensure that NERC procedures, including those set forth in NERC's Certificate of Incorporation, Bylaws, and Rules of Procedure are followed in conducting NERC business.

In addition, all discussions in NERC meetings and other NERC-related communications should be within the scope of the mandate for or assignment to the particular NERC committee or subgroup, as well as within the scope of the published agenda for the meeting.

No decisions should be made nor any actions taken in NERC activities for the purpose of giving an industry participant or group of participants a competitive advantage over other participants. In particular, decisions with respect to setting, revising, or assessing compliance with NERC reliability standards should not be influenced by anti-competitive motivations.

Subject to the foregoing restrictions, participants in NERC activities may discuss:

- Reliability matters relating to the bulk power system, including operation and planning matters such as establishing or revising reliability standards, special operating procedures, operating transfer capabilities, and plans for new facilities.
- Matters relating to the impact of reliability standards for the bulk power system on electricity markets, and the impact of electricity market operations on the reliability of the bulk power system.
- Proposed filings or other communications with state or federal regulatory authorities or other governmental entities.
- Matters relating to the internal governance, management and operation of NERC, such as nominations for vacant committee positions, budgeting and assessments, and employment matters; and procedural matters such as planning and scheduling meetings.

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.

Development Steps Completed:

1. Nominations for the SAR drafting team members were solicited February 26 – March 9, 2007.
2. The SAR was posted for a 30 day comment period March 22 – April 20, 2007.
3. Nominations for the standard drafting team (SDT) for Project 2007-11 Disturbance Monitoring were solicited June 12 – 25, 2007.

Proposed Action Plan and Description of Current Draft:

The purpose of this standard is to establish requirements for recording and reporting sequence of events (SOE) data, fault recording (FR) data, and dynamic disturbance recording (DDR) data to facilitate analysis of Disturbances. This standard will replace PRC-002-1 and PRC-018-1.

The purpose of revising the above standards is to:

1. Ensure each of the standards is complete and the requirements are set at an appropriate level to ensure reliability.
2. Ensure they are enforceable as mandatory reliability standards with financial penalties; the applicability to bulk power system owners, operators, and users, and as appropriate particular classes of facilities is clearly defined; the purpose, requirements, and measures are results-focused and unambiguous; the consequences of violating the requirements are clear.
3. Incorporate other general improvements described in NERC's Reliability Standards Development Plan: 2007-2009 (summarized and outlined in the Reliability Standard Review Guidelines attached as Appendix A).
4. Consider the items mentioned in the Standard Review Forms (excerpted from NERC's Reliability Standards Development Plan: 2007-2009) attached as Appendix B, prepared by the NERC staff, which attempt to capture comments from the:
    - FERC NOPR (Docket # RM06-16-00 dated October 20, 2006) ,
    - FERC staff report dated May 11, 2006 concerning NERC standards submitted with ERO application,
    - Version 0 standards development, and
    - Regional Reliability Standards Working Group (RRSWG – a NERC working group involved with regional standards development).

The standard drafting team (SDT) also considered the following additional issues that were not completely captured but were stated or referenced in the above materials.

1. Modify PRC-002-1 to remove RRO in the applicability and eliminate the reference to RRO in PRC-018-1.
2. Create continent wide requirements applicable to Transmission Owners and Generation Owners.
3. The new standard (PRC-002-2) is being proposed based on the requirements of the existing PRC-002-1 and PRC-018-1 standards and a recommendation for replacing both of these existing standards is being proposed. The requirements in PRC-018-1 are being incorporated into PRC-002-2 with the exception of the maintenance and testing requirements in PRC-018-1.
4. Satisfy the standards procedure requirement for five-year review of the standards.

Future Development Plan:

Anticipated Actions	Anticipated Date
1. Develop and post reply comments to initial posting of standard	March 30 – April 20, 2009
2. Post for second 30-day comment period	June, 2009
3. Post for 30-day pre-ballot period.	September, 2009
4. Conduct initial ballot	December, 2009
5. Post response to comments on first ballot	January, 2010
6. Conduct recirculation ballot	February, 2010
7. Board adoption date.	To be determined.

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.

Substation[1] - An enclosed assemblage of equipment, e.g. switches, circuit breakers, buses and transformers, under control of qualified persons, through which electric energy is passed for the purpose of switching or modifying its characteristics.

[1] This definition is from IEEE C2-2002

A. Introduction

1. **Title:** Disturbance Monitoring and Reporting Requirements

2. **Number:** PRC-002-2

3. **Purpose:** To ensure that Facility owners collect the data needed to facilitate analyses of Disturbances on the Bulk Electric System (BES).

4. **Applicability:**

4.1. Transmission Owners with BES Substation~~s~~ buses having available three phase short circuit ~~MVA~~level of 10,000 MVA or above (calculated under normal operating conditions with all facilities and units in service) ~~Facilities rated at 200 kV or above~~

4.2. Generator Owners ~~with any one of the following~~ connected to ~~the transmission system at 200 kV or above~~BES Substation buses having available three phase short circuit ~~MVA~~level of 10,000 MVA or above (calculated under normal operating conditions with all facilities and units in service) and either of the following~~:~~

- Generating units having a single generating unit of 500 MVA or higher nameplate rating
- Generating plants with an aggregate plant total nameplate capacity of 1500 MVA or higher

5. **Effective Date:**

Requirements R1 through R11:

- The first day of the first calendar quarter four years after applicable Regulatory Approval, or in those jurisdictions where no regulatory approval is required, the first day of the first calendar quarter two years after Board of Trustees adoption:
  - Each Responsible Entity shall be at least 50% compliant on monitored equipment
- The first day of the first calendar quarter four years after applicable Regulatory Approval, or in those jurisdictions where no regulatory approval is required, the first day of the first calendar quarter four years after Board of Trustees adoption:
  - Each Responsible Entity shall be 100% compliant on monitored equipment.

Requirements R12 and R13

- First day of first calendar quarter eighteen months after applicable regulatory approval, or in those jurisdictions where no regulatory approval is required, the first day of the first calendar quarter after Board of Trustees adoption.

B. Requirements

R1. Each Transmission Owner shall record (or have a process in place to derive) the Sequence of Events data for changes in circuit breaker position (open/close) for each of ~~its~~ the circuit breakers~~-~~ it owns at~~s~~ BES Substation buses having available three phase short circuit level of 10,000 MVA or above (calculated under normal operating conditions with all facilities and units in service). ~~operated at 200 kV and above at each Substation that meets the following criteria:~~

~~**R2.** Contains any combination of three or more transmission lines operated at 200 kV or above and transformers having primary and secondary voltage ratings of 200 kV or above.~~

~~**R2.1.** Connected at 200 kV or above through generating unit step up transformer(s) (GSU(s)) to a generating plant having either a single generating unit of 500 MVA or higher nameplate rating, or through a GSU(s) to a generating plant with an aggregate plant total nameplate capacity of 1500 MVA or higher.~~

Generator Owners connected to BES Substation buses having available three phase short circuit level of 10,000 MVA or above (calculated under normal operating conditions with all facilities and units in service) and either of the following

- Generating units having a single generating unit of 500 MVA or higher nameplate rating
- Generating plants with an aggregate plant total nameplate capacity of 1500 MVA or higher

R2. Each[A1] Generator Owner shall record (or have a process in place to derive) the Sequence of Events data for changes in circuit breaker position (open/close) for ~~its~~ the equipment it owns and connected to BES Substation buses having available three phase short circuit level of 10,000 MVA or above (calculated under normal operating conditions with all facilities and units in service) and either of the following

R2.1. Generating units having a single generating unit of 20 MVA or higher nameplate rating

R2.2. Generating plants with an aggregate plant total nameplate capacity of 75 MVA or higher

~~R2.~~identified in Table 2-1:

Table 2-1: Generator Owner's Requirement R2 for Sequence of Events Data	
Location	**Equipment**

Each generating plant having ~~either~~ a single generating unit with a nameplate rating of ~~500~~ 20MVA or higher, and connected to the BES ~~transmission system~~ at ~~200 kV~~10,000 MVA level and above	Each generator output circuit breaker, including low side breakers
Each generating plant with an aggregate plant total nameplate capacity of ~~1500~~ 75 MVA or higher, and connected to the ~~transmission system~~BES at ~~200 kV~~10,000 MVA and above	Each generator output circuit breaker, including low side breakers
Each Substation connected at 200 kV or above through GSU(s) to a generating plant having a single generating unit with a nameplate rating of 500 MVA or higher	Each circuit breaker 200 kV and above
Each Substation at 200 kV or above connected through GSU(s) to a generating plant with an aggregate plant total nameplate capacity of 1500 MVA or higher	Each circuit breaker 200 kV and above

R3. Each[A2] Transmission Owner and Generator Owner shall record the time stamp (or have a process in place to derive the time stamp) to within one quarter of a 60 Hz cycle ~~four milliseconds~~[A3] of input received for the change in circuit breaker position (open/close) for each of its circuit breakers specified in Requirements R1 and R2.

R4. Each[A4] Transmission Owner shall record (or have a process in place to derive) the following Fault Recording data for its equipment identified in Table 4-1:

~~R4.1.~~The three phase to neutral voltages on each monitored line or bus. ~~as follows:~~

- ~~On ring buses, the voltages of bus sections connected to transmission lines.~~
- ~~On breaker-and-a-half arrangements, the outer bus voltages, or the individual line voltages.~~
- ~~On straight buses, common bus voltages or the individual line voltages.~~

~~**R4.2.**~~**R4.1.** The three phase currents and the residual or neutral currents of each monitored line and transformer.

Table 4-1: Transmission Owner's Requirement R4 for Fault Recording Data	
Location	**Equipment**

Each Substation containing any combination of three (3) or more elements consisting of transmission lines operated at 200 kV or above and transformers having primary and secondary voltage ratings of 200 kV or above Each Substation connected at 200 kV or above through generating unit step up transformer(s) to a generating plant having a single generating unit of 500 MVA or higher nameplate rating Each Substation connected at 200 kV or above through generating unit step up transformer(s) to an aggregate plant with a total nameplate capacity of 1500 MVA or higher	• Each transmission line operated at 200 kV or above that does not have fault data recorded at its remote terminal • Each transmission bus operated at 200 kV or above • Each transformer having low-side operating voltage of 200 kV or above

~~R5.~~Each Generator Owner shall record (or have a process in place to derive) the following Fault Recording data for its equipment identified in Table 5-1:

~~R5.1.~~The three phase to neutral voltages or phase to phase voltages on Generator Step-up Transformers (GSU(s)) from the high voltage side or low voltage side of the GSU, or from the generator bus.

~~R5.2.~~The three phase currents of GSU(s) from the high voltage side or low voltage side of the GSU, or from the generator bus.

~~R5.3.~~The neutral current of wye connected GSU(s) high voltage windings.

~~R5.4.~~The three phase to neutral voltages on each monitored line or bus as follows:

- On ring buses, the voltages of bus sections connected to transmission lines.
- On breaker-and-a-half arrangements, the outer bus voltages, or the individual line voltages.
- On straight buses, common bus voltages or the individual line voltages.

~~R5.5.~~The three phase currents and the residual or neutral currents of each monitored line and transformer.

Table 5-1: Generator Owner's Requirement R5 for Fault Recording Data

Location	Equipment
Each generating plant having either a single generating unit with a nameplate rating of 500 MVA or higher, and connected to the transmission system at 200 kV and above Each generating plant with an aggregate plant total nameplate capacity of 1500 MVA or higher, and connected to the transmission system at 200 kV and above	Each GSU with a high side of 200 kV and above
Each Substation connected at 200 kV or above through GSU(s) to a generating plant having a single generating unit with a nameplate rating of 500 MVA or higher Each Substation at 200 kV or above connected through GSU(s) to a generating plant with an aggregate plant total nameplate capacity of 1500 MVA or higher	• Each transmission line operated at 200 kV or above that does not have fault data recorded d at its remote terminal • Each bus operated at 200 kV or above • Each transformer having low-side operating voltage of 200 kV or above

~~R6.~~Each Transmission Owner and Generator Owner shall have Fault Recording data for its equipment identified in Requirements R4 and R5 that conforms to the following:

~~R6.1.~~A single record or multiple records that include the following:

- A pre trigger record length of at least two cycles and a post trigger record length of at least 50 cycles

  OR

- At least two cycles of the pre trigger event; the first three cycles of an event; and the final cycle of an event.

~~R6.2.~~A minimum recording rate of 16 samples per cycle.

~~R7.~~Unless a Transmission Owner has Dynamic Disturbance Recording (DDR) data meeting all of the requirements of R7.1, R7.2, R7.3, and R7.4 recorded no further than two Substations away, then for each Substation having a total of seven or more transmission lines connected at 200 kV or above, the Transmission Owner shall record (or have a process in place to derive) the following DDR data:

~~R7.1.~~At least one phase-to-neutral voltage at each voltage level of 200 kV and above.

~~R7.2.~~Frequency (at least one at the required Substation).

~~R7.3.~~At least one phase current (on the same phase and at the same voltage as the voltage monitored in R7.1) (for each line operated at 200 kV and above).

~~R7.4.~~Power and Reactive Power (MW and MVAR) flows expressed on a three-phase basis (for each line operated at 200 kV and above)

~~R8.~~Each Generator Owner shall record (or have a process in place to derive) the following DDR data at each of its generating plants with an aggregate nameplate rating of 1500 MVA or higher for each GSU that has a transformer high side connected at 200 kV or above:

~~R8.1.~~At least one phase-to-neutral voltage or one phase-to-phase voltage at either the GSU's high side or low side voltage level, or the generator bus voltage.

~~R8.2.~~Frequency (at least one at the required Substation)

~~R8.3.~~At least one phase current (on the same phase and at the same voltage as the voltage monitored in R8.1) or two phase currents for phase-to-phase voltages for each GSU.

~~R8.4.~~Power and Reactive Power (MW and MVAR) flows expressed on a three-phase basis (per each monitored element) for each GSU.

~~R9.~~Each Transmission Owner and Generator Owner that has DDR devices (to meet Requirement R7 or R8) shall manage its DDR data in accordance with the following technical specifications:

~~R9.1.~~Use the same phase for voltage and current recordings.

~~R9.2.~~Collect at least 960 samples per second to calculate RMS electrical quantities.

~~R9.3.~~Store calculated RMS values of electrical quantities at a rate of at least 6 times per second.

~~R10.~~Each Transmission Owner and Generator Owner that installs a DDR device after January 1, 2011 to meet Requirements R7, R8 and R9 shall install a device that is capable of continuous recording.

~~R11.~~Each Transmission Owner and Generator Owner that has a DDR device (to meet Requirements R7, R8 and R9) that does not have continuous recording capability shall set its device to trigger and record according to the following:

~~R11.1.~~For rate-of-change of frequency.

~~R11.2.~~For oscillation triggers, set to trigger for low frequency oscillations in 0.1 to 4 Hz range.

~~R11.3.~~Set data record lengths at a minimum of three minutes.

~~R12.~~Each Transmission Owner and Generator Owner shall synchronize all of its Sequence of Event, Fault Recording, and DDR functions to within +/- 2 milliseconds of Universal Coordinated Time (UTC) with the associated hour offset.

~~R13.~~Each Transmission Owner and Generator Owner shall have all recorded Sequence of Event, Fault Recording, and DDR data available (locally or remotely) for 10 calendar days after a Disturbance.

Each Transmission Owner and Generator Owner required to have DMEs shall have a maintenance and testing program for those DMEs that includes:

Maintenance and testing intervals and their basis.

Summary of maintenance and testing procedures.

C. Measures

M1. (To be added later)

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

(To be added later.)

1.2. Compliance Monitoring Period and Reset Time Frame

Not applicable.

1.3. Data Retention

1.3.1 Each Transmission Owner and Generator Owner shall retain all data provided to the Regional Entity, Reliability Coordinator or NERC for at least three years following the event.

1.3.2 Each Transmission Owner and Generator Owner shall each maintain, and report to the Regional Entity, Reliability Coordinator or NERC within 30 calendar days of a request, the following information for Sequence of Event, Fault Recording, and Dynamic Disturbance Recording data:

- Location
- Make and model of equipment
- Type of data source (Sequence of Events, Fault Recording, or Dynamic Disturbance Recording).
- Monitored elements, such as transmission circuit, bus section, circuit breakers, etc.

1.4. Compliance Monitoring and Assessment Processes

(To be added later)

1.5. Additional Compliance Information

1.5.1 Each Transmission Owner and Generator Owner shall meet all of the following criteria when reporting Sequence of Event, Fault Recording , and Dynamic Disturbance Recording data to its Regional Entity, Reliability Coordinator, or NERC:

- All Sequence of Event, Fault Recording, and Dynamic Disturbance Recording data shall be provided to the Regional Entity, Reliability Coordinator, or NERC within 30 calendar days of a request,
- All Fault Recording and Dynamic Disturbance Recording data shall be in a format such that any software system capable of viewing and analyzing COMTRADE (IEEE Std. C37.111-1999 or successor) files may be used to process and evaluate the data,
- All known delays in interposing relays shall be reported along with the SOE data,
- All data files shall be named in conformance with IEEE C37.232-2007, or its successor, Recommended Practice for Naming Time Sequence Data Files.

2. Violation Severity Levels (To be added later)

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL

E. Regional Variances