

Industry Webinar

Project 2007-11 Disturbance Monitoring

May 22, 2013

RELIABILITY | ACCOUNTABILITY



- Welcome, Introductions and Administrative
- NERC Antitrust Guidelines
- Webinar Objectives
- Background
- Overview Principles/Requirements in current Standard Drafting Team (SDT) Working Draft of PRC-002-2
- Closing, Next Steps
- Questions

- Two-hour webinar
- Drafting Team (DT) Presentation followed by
- Informal Question and Answer session
 - Submitted via the chat feature
 - Please reference slide number, etc.
 - Presenters will attempt to address each question
 - Some questions may require DT discussion
 - Session is intended to provide better understanding
 - Reduce the number of minor comments during the open comment periods
 - Facilitate industry consensus

- NERC Antitrust Guidelines
 - 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.

Disclaimer

- Participants are reminded that this meeting is public. Notice of the meeting was posted on the NERC website and widely distributed. The notice included the number for dial-in participation. Participants should keep in mind that the audience may include members of the press and representatives of various governmental authorities, in addition to the expected participation by industry stakeholders.
- Proposed standard text in this presentation may not reflect the finalized draft of the posted standard after this webinar.

Member

- Lee Pedowicz, Chair
- Frank Ashrafi
- Alan Baker
- Dan Hansen
- Tim Kucey
- Steve Myers
- Ryan Quint
- Jack Soehren
- Vladimir Stanisic

Registered Entity

- Northeast Power Coordinating Council
- Southern California Edison
- Florida Power & Light Co.
- NRG Energy
- PSEG Fossil LLC
- ERCOT
- Bonneville Power Administration
- ITC Holdings Corp.
- AESI Inc.

- Lee Pedowicz, Chair
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- Steve Myers
- Ryan Quint
- Jack Soehren

Navin B. Bhatt, AEP
Tracy M. Lynd, Consumers Energy Co.
Larry E. Smith, Alabama Power Company
Jack Soehren, ITC Holdings
Willy Haffecke, City Utilities of Springfield
Daniel J. Hansen, Reliant Energy, Inc.
Alan Baker, Florida Power & Light Co.
Steven Myers, Electric Reliability Council of Texas, Inc.
James R. Detweiler, FirstEnergy Corp.
Felix Amarh, Georgia Transmission Corporation
Susan L. McGill, PJM Interconnection, L.L.C.
Charlie Childs, Ametek Power Instruments
Robert W. Millard, ReliabilityFirst Corporation
Richard Dernbach, LA Department of Water & Power
Jeffrey M. Pond, National Grid
Barry G. Goodpaster, Exelon Business Services Company
Bharat Bhargava, Southern California Edison Co.
Charles Jensen, JEA
Richard Ferner, WAPA
Frank Ashrafi, SCE

Webinar Objectives

- Outline of current draft of PRC-002-2
 - Significant change from 2009 draft PRC-002-2
 - Considered Industry input to 2009 draft PRC-002-2
- Explain the need for capture data to analyze BES disturbance events
- To inform Industry of the history and current status of the development of PRC-002-2
- Respond to questions about draft PRC-002-2 principles/requirements presented
- Announce plans for outreach to Industry

Need for Disturbance Monitoring Data

- **Recommendation 12a:** The reliability regions, coordinated through the NERC Planning Committee, shall within one year define regional criteria for the application of synchronized recording devices in power plants and substations. Regions are requested to facilitate the installation of an appropriate number, type and location of devices within the region as soon as practical to allow accurate recording of future system disturbances and to facilitate benchmarking of simulation studies by comparison to actual disturbances.
- **Recommendation 12b:** Facilities owners shall, in accordance with regional criteria, upgrade existing dynamic recorders to include GPS time synchronization and, as necessary, install additional dynamic recorders.

- In FERC Order No. 693, Mandatory Reliability Standards for the Bulk-Power System (paragraph 1451) the Commission identified PRC-002-1 as a fill-in-the-blank standard. “The NOPR stated that because the regional requirements for installing DME had not been submitted, the Commission would not approve or remand PRC-002-1 until the ERO submitted the additional information.”

Background

- Initial DT convened the summer of 2007
- Posting of initial standard draft on February 2, 2009, for 45-day comment period
- First meeting to respond to comments held March, 2009
- DT changes since March, 2009
- Monitoring Value Analysis (MVA) Task Team formed in 2009 to conduct technical analysis; work completed in 2010

- Completed Response to (2009) Comments in October 2010
- Standards Committee placed Project into informal development status in the fall of 2010
- Standards Committee returned the Project to formal development status in January, 2013

- Time synchronization +/- 2 ms to UTC
- Time stamp to within 4 ms of status change
- SOE (Sequence of Events Recording); FR (Fault Recording);
DDR (Dynamic Disturbance Recording)
- Location Criteria for SOE, FR, and DDR
 - MVA Task Team formed
 - Collected data from member utilities who volunteered to supply the data
 - MVA Task Team recommended a location criteria methodology based on the data supplied
- DDR 960 samples/second sample rate as compared to storage rate of calculated quantities
- Maintenance and Testing Requirements

- Why Replace PRC-002-1?
 - FERC Order No. 693 decision not to approve PRC-002-1 left a “gap” in the availability of reliability information and analysis input data that would be needed in the event of significant BES events in the future
 - Develop continent-wide, mandatory requirements to fill the “gap”
 - Establish and enforce the requirements within a performance-based standard
- Why Retire PRC-018-1?
 - All PRC-018-1 requirements associated with PRC-002-1 can be incorporated into PRC-002-2

- Overall PRC-002-2 development approach
 - Focus on what data needs to be recorded and available, versus equipment needed to acquire and store it
 - What data is needed
 - What data quality is needed (e.g. ,time and measurement accuracy)
 - BES locations from which the data is needed
 - BES equipment/devices (at or connected to those locations) for which data is needed
 - Data retention period(s) after a qualifying incident
 - Data reporting periods and formats
 - Data criticality: continuous readiness/ability to acquire it (testing and maintenance)
 - Performance-based versus prescriptive; focus on “What” versus “How”

Summary Overview

PRC-002-2 - Disturbance Monitoring Draft

- Purpose: To ensure that Facility owners are capable of providing data required to facilitate analyses of Disturbances.
 - PRC-002-2 to replace two existing standards
 - PRC-002-1 (NERC approved)
 - PRC-018-1 (FERC approved)

- Time synchronization of all Sequence of Events Recordings (SOE), Fault Recordings (FR), and Dynamic Disturbance Recordings (DDR) to within +/- 2 milliseconds of Coordinated Universal Time (UTC), time stamped with or without a local offset.

- SOE and FR at 20% of buses within each fault study area where:
 - Maximum available calculated three phase short circuit MVA is 1500 MVA or greater
 - Bus is connected at 100 kV or higher, or elements lower than 100 kV as defined in the Bulk Electric System definition
- Transmission Owners (TO) to determine buses in their system
- TOs to review their bus determinations every five years

- Record circuit interrupting device status changes (e.g., breaker position “open” to “close”)
- Each BES interrupting device at and locally on a “qualifying bus”
- Generating unit BES interrupting device connecting to a “qualifying bus” where:
 - Breaker is the primary output circuit breaker on a generator’s GSU
 - Generator has nameplate rating of 20 MVA or above, or aggregate nameplate rating of a generating facility’s units is 75 MVA or above
- TO and Generator Owner (GO) responsible for SOE on the facilities/equipment they own.

- Three phase-to-neutral voltages of a line or common bus at “qualifying buses”.
- Three phase currents and the residual or neutral currents at “qualifying buses”.
- Three phase voltages on the high or low side of associated generator step up transformers (GSUs).
- Three phase currents on the same side of the GСУ where the voltage is monitored.
- Residual or neutral current of high side wye-connected GSUs.
- TO and Generator Owner (GO) responsible for FR on the facilities/equipment they own.

- Recordings include the following:
 - A pre-trigger record length of at least two cycles and a post-trigger record length of at least 50 cycles for the same trigger point
OR
 - At least two cycles of the pre-trigger data; the first three cycles of the fault; and the final cycle of the fault
- Minimum recording rate of 16 samples per cycle.

- Minimum recording triggers:
 - Neutral (residual) overcurrent set at 0.2 pu or less of rated CT secondary current.
 - Monitored phase undervoltage set at 0.85 pu or greater.
 - Circuit interrupting device trip coil energize or circuit interrupting device status open.

- Locations :
 - At least one Dynamic Disturbance Recording location per 3,000 MW of the historical peak Load in the PC or RC area.
 - Generating Plants with a gross plant/facility aggregate nameplate rating of 1,000 MVA or greater.
 - Permanent Flowgates in the Eastern Interconnection, major transfer paths within the Western Interconnection as defined by the Regional Entity, or comparable monitored Facilities in the Québec or ERCOT Interconnections.
 - Both ends of HVDC terminals (back-to-back or each terminal of a DC circuit) on the AC portion of the converter.
 - Stations needed to monitor the Elements of all Interconnection Reliability Operating Limits.
- Review monitored locations lists every five years

- PCs and RCs responsible to determine location of DDR and quantities to be recorded.
- TOs and GOs responsible for providing DDR at their respective facilities.

- Electrical quantities of each bus element needed to produce the following DDR output data:
 - Single phase-to-neutral or positive sequence voltages where any normal system configurations do not remove all voltage sources from service simultaneously.
 - The phase current on the same phase at the same voltage or positive sequence current.
 - Power and Reactive Power (MW and MVAR) flows expressed on a three-phase basis corresponding to all current measurements.
 - Frequency calculated from all voltages measured at the location.

- Electrical quantities, of each GSU associated with the DDR location, needed to produce the following DDR output data:
 - Any one phase-to-neutral, phase-to-phase, or positive sequence voltage at either the GSU's high side or low side voltage level. The voltage can be the high side connecting bus voltage or the generator bus voltage.
 - The phase current on the same phase at the same voltage, two phase currents for phase-to-phase voltages, or positive sequence current.
 - Power and Reactive Power (MW and MVAR) flows expressed on a three-phase basis corresponding to all current measurements.
 - Frequency calculated from all voltages measured at the GSU.

- All DDR will have:
 - Input sampling rate of at least 960 samples per second.
 - Output reporting rate of electrical quantities of at least 30 times per second.
- Continuous DDR and storage capability required unless DDR equipment used was installed prior to the effective date of this Standard.

- Non-continuous DDR acceptable if DDR equipment used was installed prior to the effective date of this standard.
- Non-continuous DDR must be triggered for at least one of the following:
 - Delta Frequency trigger 'to be determined'.
 - Rate of change of Frequency trigger 'to be determined'.
- Non-continuous DDR must be of at least three contiguous minutes duration.

- SOE, FR, and DDR data recorded for and pursuant to PRC-002-2 must be available for at least 10 calendar days after recording
- Data requested by NERC, a Regional Entity, Planning Coordinator (PC) or Reliability Coordinator (RC) must be:
 - Provided, if requested within the above 10-day retention period
 - Provided within 30 calendar days of request
 - Reported in current COMTRADE (IEEE C37.111)-compatible form/format
 - In data files named in conformance with current IEEE C37.232 'Recommended Practice for Naming Time Sequence Data Files'
- Data storage location (e.g., locally at site or in a remote storage system) is the decision of responsible Entity

- Entities required to record and report SOE, FR, or DDR data pursuant to PRC-002 will also:
 - Document and conduct a time-based maintenance and testing program for stand-alone Disturbance Monitoring Equipment (DME) whose only purpose is disturbance monitoring. The maintenance and testing program shall include:
 - If not continuously monitored a quarterly verification is required of:
 - communication channels used for accessing records remotely if the entity relies on remote access
 - time synchronization
 - analog quantities
 - A provision to ensure that failed units return to service within 90 days after discovery of failure. If a DME device will be out of service for greater than 90 days, the owner shall keep a record of restoration plans and efforts to restore the DME to service.

- Today's important takeaways
 - Significant change from 2009 PRC-002-2 draft
 - Disturbance Monitoring data to close reliability gap
 - Performance based
 - Focus on data
 - Not equipment
 - Need for consistency of data recording across continent
 - Retirement of PRC-018-1 incorporated into PRC-002-2
 - Workshop
 - July 30 from 1 – 5 p.m. and July 31 from 8 a.m. – Noon in Tempe, AZ
 - August 6 from 1 – 5 p.m. and August 7 from 8 a.m. – Noon in Atlanta, GA



Questions and Answers

- Please submit your questions via the chat window
 - This session was intended to help general understanding
 - Please reference slide number, etc.
 - Presenters will respond to as many as possible
- Comments for the official record
 - Must be submitted during open comment period
 - Webinar and chat comments are not a part of the project record

- NERC Standards Developer, Barb Nutter
 - Email at barbara.nutter@nerc.net
 - Telephone: 404.446.9692
 - To receive project announcements and updates
 - Request to be added to DMSDT_Plus
- Next Steps
 - Workshop
 - July 30 from 1 – 5 p.m. and July 31 from 8 a.m. – Noon in Tempe, AZ
 - August 6 from 1 – 5 p.m. and August 7 from 8 a.m. – Noon in Atlanta, GA