

Reliability Standards – Disturbance Monitoring Conference

July 30 - 31, 2013 – Tempe, AZ
August 6 - 7, 2013 – Atlanta, GA
Day 2

RELIABILITY | ACCOUNTABILITY



- NERC Antitrust Compliance 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.

Standards Development Process Participant Conduct Policy

- Background
- FERC Staff Perspective
- PRC-002-2 Disturbance Monitoring & Reporting Requirements
 - History, Purpose, Applicability, Definitions
 - Requirements R1 thru R8
- Summary

- Kick-off – Lee Pedowicz
- PRC-002-2 Disturbance Monitoring & Reporting Requirements
 - Requirements R9 thru R17 – Ryan Quint
- Break – 15 minutes
 - Requirements R18 thru R21 – Tim Kucey
- Implementation Plan – Vladimir Stanisic/Dan Hansen
- Questions & Answers – Team
- Summary – Neil Burbure/Natara Bierria
- Wrap Up – Lee Pedowicz

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

DMSDT Working Draft

PRC-002-2 Disturbance Monitoring and Reporting
Requirements

RELIABILITY | ACCOUNTABILITY



- **Dynamic Disturbance Recording (DDR)**
 - The action of recording time sequenced data for dynamic **events characteristics** such as power swings, frequency variations, and abnormal voltage problems.
- **Fault Recording (FR)**
 - The action of recording time sequenced waveform data for short circuit or failure of Elements resulting in abnormal voltage(s) and/or current(s).
- **Sequence of Events Recording (SOER)**
 - The action of recording time sequenced data to capture change of status of Elements, which may include protection and control devices.
- **Generating Plant**
 - One or more generators at a single physical location whereby any single contingency can affect all the generators at that location.

Requirements R9 through R17

Ryan Quint, Bonneville Power Administration

- R9. Each **Responsible Entity** shall establish a list of **monitored** BES ~~bus locations and the~~ Elements for which **Dynamic Disturbance Recording** is required. The ~~location~~ list ~~shall include~~ for the Elements selected will provide Dynamic Disturbance Recording for at least the following:
 - 9.1 A minimum of one Dynamic Disturbance Recording location per 3,000 MWs of the Responsible Entity's historical peak system Load
 - ~~9.2 Generating Plants with a gross aggregate nameplate rating of 500 MVA or greater~~
 - 9.2 Generating resource(s) with:
 - Gross individual nameplate rating greater than 500 MVA
 - Gross plant/facility aggregate nameplate rating greater than 500 MVA

- R9. Each **Responsible Entity** shall establish a list of **monitored** BES ~~bus locations and the~~ Elements for which **Dynamic Disturbance Recording** is required. The ~~location~~ list ~~shall include~~ for the Elements selected will provide **Dynamic Disturbance Recording for at least** the following:

9.3 Locations necessary to monitor all Elements of:

- All permanent Flowgates and major transmission interfaces in the Eastern Interconnection
- All major transfer paths within the Western Interconnection as defined by the Regional Entity
- Major transmission interfaces in the Hydro-Québec or ERCOT Interconnection

9.4 Both ends of HVDC terminals (back-to-back or each terminal of a DC circuit) on the AC portion of the converter.

- R9. Each **Responsible Entity** shall establish a list of **monitored** BES ~~bus locations and the~~ Elements for which **Dynamic Disturbance Recording** is required. The ~~location~~ list ~~shall include~~ for the Elements selected will provide Dynamic Disturbance Recording for at least the following:
 - 9.5 Locations necessary to monitor all Elements of Interconnection Reliability Operating Limits.
 - 9.6 Any one Element within a major voltage sensitive area as defined by an in-service UVLS program.

- R10. Each **Responsible Entity** shall review the list established in Requirement R9 at least every five years.

Discussion

Requirements R9 and R10

- R11. Each **Responsible Entity** shall establish and make available to the **Transmission Owners** and **Generator Owners** the list of **Dynamic Disturbance Recording** ~~BES~~ bus locations established in Requirement R9 and **the** Elements for which data is to be recorded.
- ~~R12. Each **Transmission Owner** and **Generator Owner** shall have **Dynamic Disturbance Recording** at the BES bus locations specified by the Responsible Entity and record data on the specified Elements.~~

Discussion

Requirements R11 and R12

- R13. Each **Transmission Owner** shall record **electrical quantities** ~~of~~ for each Element ~~they own identified by the Responsible Entity~~ established in Requirement R9 in order to determine the following **Dynamic Disturbance Recording** data:
 - 13.1 Single phase-to-neutral or positive sequence voltages. ~~where any normal system configuration does not remove all voltage sources from service simultaneously.~~
 - 13.2 The phase current on the same phase at the same voltage or positive sequence current in Requirement R13, part 13.1.
 - 13.3 Real Power and Reactive Power (MW and MVAR) flows expressed on a three-phase basis corresponding to all circuits where current measurements are required.
 - 13.4 Frequency ~~calculated~~ derived from ~~all~~ at least one voltages ~~measured~~ required ~~at the location~~ in Requirement R13, part 13.1.

- R14. Each **Generator Owner** shall record **electrical quantities** ~~of~~ for each Element ~~they own identified by the Responsible Entity~~ established in Requirement R9 in order to determine the following **Dynamic Disturbance Recording** data:
 - 14.1 Any one phase-to-neutral, phase-to-phase, or positive sequence voltage at either the GSU's high side or low side voltage level.
 - 14.2 The phase current on the same phase at the same voltage in Requirement R14, part 14.1, two phase currents for phase-to-phase voltages, or positive sequence current.
 - 14.3 Real Power and Reactive Power (MW and MVAR) flows expressed on a three-phase basis corresponding to all circuits where current measurements are required.
 - 14.4 Frequency ~~calculated derived~~ from ~~all~~ at least one voltage ~~measured~~ required in Requirement R14, part 14.1.

Discussion

Requirements R13 and R14

- R15. Each **Transmission Owner** and **Generator Owner** that is responsible for **Dynamic Disturbance Recording** shall have continuous recording and storage capability for the ~~BES~~ bus locations established in Requirement R9:

Exception: If the equipment was installed prior to the effective date of this standard, triggered record data lengths of at least three minutes are acceptable.

- R16. Each **Transmission Owner** and **Generator Owner** shall have **Dynamic Disturbance Recording** data, for the ~~BES~~ bus locations and Elements specified by the Responsible Entity, **which** conforms to the following technical specifications:
 - 16.1 Input sampling rate of at least 960 samples per second.
 - 16.2 Output reporting rate of electrical quantities of at least 30 times per second.

- R17. Each **Transmission Owner** and **Generator Owner** shall set each non-continuous, trigger type, **Dynamic Disturbance Recording** to trigger for at least one of the following (based on manufacturer's equipment capabilities):
 - Off nominal Frequency trigger
 - ~~Delta Frequency trigger~~
 - Rate of change of Frequency trigger at a minimum
 - Under-voltage set no lower than 85% of normal operating voltage for a duration of 5 seconds

- R17. Each **Transmission Owner** and **Generator Owner** shall set each non-continuous, trigger type, **Dynamic Disturbance Recording** to trigger for at least one of the following (based on manufacturer's equipment capabilities):
 - Off nominal Frequency trigger
 - Eastern Interconnection Low = <59.75 Hz High = >61.0 Hz
 - Western Interconnection Low = <59.55 Hz High = >61.0 Hz
 - ERCOT Interconnection Low = <59.35 Hz High = >61.0 Hz
 - Hydro-Québec Interconnection Low = <58.55 Hz High = >61.5 Hz

- R17. Each **Transmission Owner** and **Generator Owner** shall set each non-continuous, trigger type, **Dynamic Disturbance Recording** to trigger for at least one of the following (based on manufacturer's equipment capabilities):
 - Off nominal Frequency trigger
 - ~~Delta Frequency trigger~~
 - ~~Eastern Interconnection~~ ~~ABS(df) > 0.25 Hz~~
 - ~~Western Interconnection~~ ~~ABS(df) > 0.45 Hz~~
 - ~~ERCOT Interconnection~~ ~~ABS(df) > 0.65 Hz~~
 - ~~Hydro-Québec Interconnection~~ ~~ABS(df) > 1.45 Hz~~

- R17. Each **Transmission Owner** and **Generator Owner** shall set each non-continuous, trigger type, **Dynamic Disturbance Recording** to trigger for at least one of the following (based on manufacturer's equipment capabilities):
 - Off nominal Frequency trigger
 - ~~Delta Frequency trigger~~
 - Rate-of-change of Frequency trigger at a minimum
 - Eastern Interconnection < -0.03125 Hz/sec > 0.125 Hz/sec
 - Western Interconnection < -0.05625 Hz/sec > 0.125 Hz/sec
 - ERCOT Interconnection < -0.08125 Hz/sec > 0.125 Hz/sec
 - Hydro-Québec Interconnection < -0.18125 Hz/sec > 0.1875 Hz/sec

- R17. Each **Transmission Owner** and **Generator Owner** shall set each non-continuous, trigger type, **Dynamic Disturbance Recording** to trigger for at least one of the following (based on manufacturer's equipment capabilities):
 - Off nominal Frequency trigger
 - ~~Delta Frequency trigger~~
 - Rate of change of Frequency trigger at a minimum
 - Under-voltage set no lower than 85% of normal operating voltage for a duration of 5 seconds

Discussion

Requirements R15, R16, and R17

BREAK

15 minutes

Requirements R18 through R21

Tim Kucey, PSEG Fossil, LLC

- R18. Each **Transmission Owner** and **Generator Owner** shall time synchronize all of its **Sequence of Events Recordings, Fault Recordings, and Dynamic Disturbance Recordings** for the ~~BES~~ bus locations established in Requirements R1 and R9 to within +/- 2 milliseconds of Coordinated Universal Time (UTC), time stamped with or without a local offset.

Discussion

Requirement R18

- R19. Each **Transmission Owner** and **Generator Owner** shall have all **Sequence of Events Recording**, **Fault Recording**, and **Dynamic Disturbance Recording** data available, for the ~~BES~~ bus locations established in Requirements R1 and R9, for at least 10 calendar days after each recording.

Discussion

Requirement R19

- R20. Each Transmission Owner and Generator Owner shall return to service the equipment used for Sequence of Events Recording, Fault Recording, and Dynamic Disturbance Recording at the ~~BES~~ bus locations established in Requirements R1 and R9 within 90 days from the start of maintenance, upgrades, or discovery of a failure. If a DME device will be out of service for greater than 90 days the owner shall keep a record of efforts and the plan for restoring the equipment to service.

Discussion

Requirement R20

- **R21. Each Transmission Owner and Generator Owner shall provide Sequence of Events Recording, Fault Recording, and Dynamic Disturbance Recording data, for the ~~BES~~ bus locations established in Requirements R1 and R9, to the Reliability Coordinator, Regional Entity, or NERC upon request:**
 - 21.1 All Sequence of Events Recording, Fault Recording, and Dynamic Disturbance Recording data shall be provided to the Reliability Coordinator, Regional Entity, or NERC within 30 calendar days of a request.
 - 21.2 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. C37.111-2013~~) files may be used to process and evaluate the data.
 - 21.3 All data files shall be named in conformance with IEEE C37.232-2011, or its successor, IEEE Standard for Common Format for Naming Time Sequence Data Files (COMNAME).

Discussion

Requirement R21

Implementation Plan

Vladimir Stanisic, AESI Inc. - Tempe

Dan Hansen, NRG Energy - Atlanta

- **Requirements R1,R2, R9, through R11**

- First calendar quarter six (6) months following applicable regulatory approvals, or in those jurisdictions where no regulatory approval is required, on the first day of the first calendar quarter ~~twenty-one (21)~~ TBD months following adoption by the Board of Trustees (Board).

- **Requirements R5, R6, R13, R14**

- First calendar quarter twelve (12) months following applicable regulatory approvals, or in those jurisdictions where no regulatory approval is required, on the first day of the first calendar quarter ~~twenty-one (21)~~ TBD months following adoption by the Board.

- **Requirements R3, R4, R7, R8, R12, R15 through R17**

- 25 percent compliant within three (3) years
- 100 percent compliant within four (4) years following applicable regulatory approvals, or in those jurisdictions where no regulatory approval is required, on the first day of the first calendar quarter ~~twenty-one (21)~~ TBD months following adoption by the Board.

- **Requirements R18 through R21- TBD**



Questions and Answers

Summary

Neil Burbure, NERC - Tempe

Natara Bierria, NERC - Atlanta

- Schedule with tentative dates

- Comment period (45 days) August 28–October 11, 2013
- Ballot (10 days) October 2–October 11, 2013
- Comment period (45 days) November 27, 2013 – January 10, 2014
- Ballot (10 days) December 31, 2013 – January 10, 2014
- Final Ballot March 5–March 14, 2014

Day 1

- Background
- FERC Staff Perspective
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Day 2

- PRC-002-2 Disturbance Monitoring & Reporting Requirements
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- Next Steps



Questions?