

## Meeting Notes

### Project 2010-13.3 – Relay Loadability: Stable Power Swings Standard Drafting Team

March 28, 2014

1:00 p.m.-2:00 p.m. Eastern

Conference Call

#### Administrative

##### 1. Introductions and chair remarks

The meeting was brought to order by Mr. Middaugh, chair, at 1:00 p.m. Eastern Friday, March 28, 2014. He thanked everyone for joining to discuss the proposed standard and gave kudos to the team for the amount of progress during the previous meeting. Mr. Barfield took roll of members and observers. Those in attendance were:

Name	Company	Member/ Observer
Bill Middaugh, P.E.	Tri-State Generation & Transmission Association	Chair
Kevin W. Jones, P.E.	Xcel Energy, Inc.	Vice Chair
David Barber, P.E.	FirstEnergy	Member
Slobodan Pajic	General Electric Energy Consulting	Member
Fabio Rodriguez	Duke Energy – Florida	Member
John Schmall	Electric Reliability Council of Texas (ERCOT)	Member
Matthew H. Tackett, P.E.	Midcontinent Independent System Operator (MISO)	Member
Ken Hubona	Federal Energy Regulatory Commission (FERC)	Observer
Scott Barfield-McGinnis (Standard Developer)	North American Electric Reliability Corporation (NERC)	Observer
Michael Gildea (Regulatory)	North American Electric Reliability Corporation (NERC)	Observer
Phil Tatro (Technical Advisor)	North American Electric Reliability Corporation (NERC)	Observer
Ramzi Chahine	Hydro Québec	Observer
Si Truc Phan	Hydro Québec	Observer

Name	Company	Member/ Observer
David Youngblood	Consultant (Luminant Energy)	Observer

## 2. Determination of quorum

The rule for NERC Standard Drafting Team (SDT or team) states that a quorum requires two-thirds of the voting members of the SDT. Quorum was achieved as seven of the nine members were present.

## 3. NERC Antitrust Compliance Guidelines and Public Announcements

NERC Antitrust Compliance Guidelines and public disclaimer were reviewed by Mr. Barfield. There were no questions. Mr. Barfield also referred everyone to the two NERC policies related to use of the email listserv and standard drafting team meeting conduct.

## 4. Review team roster

Mr. Barfield referred to the roster that it has not changed and may be found on the project page under the related files section.

## 5. Review meeting agenda and objectives

Mr. Barfield reviewed the meeting agenda and objectives and asked if there were any attendees that were not aware that NERC is deploying a new Standards Balloting System (SBS). He also pointed out that he has opened a dialog with the North American Generator Forum for socializing a draft of the draft standard when the team is ready.

## Agenda

### 1. Continue with Standard Development

Mr. Barfield noted that in particular the team will attempt to review the timing elements for Requirement R3, the applicability of series reactors, and Rationales 2 through 4. Mr. Gene Henneberg (NV Energy), Mr. Schmall, and Mr. Tackett provided feedback on the latest draft standard straw man and Mr. Rodriguez will provide the follow up on series reactors for the consideration in the proposed standard's Applicability.

The first discussion topic concerned the time periods for performance within Requirements R2 and R3 that were removed during the last meeting. Mr. Winston noted that it appeared that Requirements R2 and R3 would need to be sub-parts or bullets to capture the annual performance. Mr. Tatro suggested a question to confirm concurrence that the team has the expectation that Requirements R1, R2 and R3 collectively would be done on an annual basis. The team concurred and Mr. Barfield said he would take this as an action item to discuss with NERC Legal to obtain guidance on what the team needs to do for timing. Timing in a Requirement is generally used for a measure of compliance. Mr. Schmall believed from a planning standpoint and reliability that performing the overall standard that annually is

sufficient and was not necessarily opposed to having a time period in Requirement R2 and R3. It was just that 30 days or a 90 days was too restrictive and did not benefit reliability.

After circulation of the draft standard straw man following the previous conference call meeting on Wednesday, March 26, 2014, both team members and observers provided feedback. Mr. Henneberg was not able to join the call and provided comments via email suggesting to change wording in the proposed purpose statement. The suggestion was to replace “during” with “as a result of” or “resulting from”. The Purpose statement prior to any change was:

**“Purpose:** To ensure that relays do not operate for non-Fault conditions during stable power swings.”

Another email comment about the straw man proposed standard recommended the team focus in more on the specific subject of this standard, rather than allowing other issues to intrude that might also be present during power swings—such as the subjects of the approved PRC-023-2 – Transmission Relay Loadability and NERC adopted PRC-025-1 – Generator Relay Loadability. Mr. Tatro believed the above comment related to other things that may be occurring in the system and if relays trip they would not be addressed by this standard according to the purpose statement.

After discussion, the team applied a similar revision based on Mr. Henneberg’s comments, which changed the Purpose statement to:

**“Purpose:** To ensure that relays do not operate in response to stable power swings during non-Fault conditions.”

Mr. Tatro believed the team’s edits addressed Mr. Henneberg’s comments about how the other standards mentioned above relate to this proposed standard.

Following the Purpose statement revisions, the team moved to the Applicability. Mr. Rodriquez provided a follow up to the Applicability item concerning “series reactors.” He noted that at Florida Power and Light were proposing to install a series reactor to reduce the available fault current duty on each breaker in a breaker-and-half scheme. The protection engineers in this particular case were not using impedance relays, only differential relays; therefore, the application of the standard to the use of series reactors in this case is not applicable. Mr. Rodriquez cited another example where a series reactor was being employed on the 230 kV side of a 500 kV transformer. In this case, the series reactor was a part of the transformer protection and did not have any protection of its own. Because of this, it was concluded that “series reactors” would be removed from the Applicability of the standard.

Mr. Jones posed asking industry about Applicability of series reactors and/or other Elements in the questions for commenting. Mr. Barfield noted that it may be better to propose any necessary Elements in the Applicability while socializing the standard prior to posting. This would be better than adding it after the initial comment period because it would be a new insertion and may cause lower approval upon the second ballot.

Going back to Mr. Henneberg's comments via email concerned the proposed Requirement R1, Criterion #5 which reads:

"5. Additional Elements that are identified as utilizing protective relays that are challenged by stable power swings in Planning Assessments (e.g., TPL-001-4)."

His comment noted that historically relay operations on power swings (stable or sometimes unstable) during disturbances seem to follow other, earlier outages. For example, power swing operations during August 14, 2003 ("2003 Blackout) were quite late in the system breakup. The more recent September 8, 2011 disturbance primarily involved schemes that could potentially have been prevented had the PRC-023 standard been applicable to the facilities, with no significant power swing involvement. Even the SONGS unit trips, in spite of a significant swing, tripped on other functions. His recollection was that most if not all trips were on stable swings in applications where power swing blocking was not used at all.

Mr. Henneberg also noted there has been discussion in relevant IEEE PSRC working groups about how stressed the system needs to be before an entity should expect to see swings that impinge on relay characteristics. If a Planning Assessment doesn't address events that may be more extreme than are required to be studied by the transmission planning (TPL) standards, we may not expect that assessment to necessarily say much useful about power swing performance, or perhaps even occurrence. The more extreme an event that is modeled, the less plausible the event scenario will be.

He further noted that under such conditions, how could the Planning Coordinator (PC) or Transmission Planner (TP) be expected to provide realistic, plausible and/or useful apparent impedance characteristics. Mr. Henneberg also questioned whether the PC/TP needs to extend the Extreme Events analysis that is currently required to induce a power swing. He recommended limiting the applicability to events identified in the applicable TPL studies. The team perceived Mr. Henneberg's comments as points to address within the Application Guidelines.

Relative to the proposed Requirement R2, Mr. Henneberg noted that the intended application of this standard is limited to blocking trips for stable power swings. Additionally, the white paper acknowledged that perfect analysis and operation of the Protection System should not be expected. He questioned if the PC's assessments did not identify a power swing issue on an Element, but a later event results in operation on a power swing, would the PC and/or Generator Owner (GO) or Transmission Owner (TO) be subject to a violation. Team responded no, that the entities could not be cited for a violation of an actual event because the Requirements are based on studied cases and the expected outcome. The Requirements are risk-based and not performance based under the Result-based Standard (RBS) format.

Mr. Barfield noted that the team concluded during an earlier meeting that an entity would not violate the standard because the entity determined a set of Elements based on the study and/or the entity set its relays accordingly. Others noted that if trips occur because of contingencies beyond the study case then the entities could not be held to an unknown condition, and as proposed in the standard, new cases would be evaluated under the

criteria in the proposed Requirement R1. Mr. Tatro raised awareness to the “blocking” comment that blocking is one solution and that there are other available options for mitigating power swings.

Mr. Bill Miller (ComEd) provided comments along with those received via email with Mr. Henneberg’s. Mr. Miller noted in his email comments that the Planning Coordinator or Transmission Planner identify islands as part of underfrequency studies. His understanding for the ComEd system, its entire ComEd territory is a potential island. The likelihood of this island forming for the loss of 10-15 geographically distance 345kV and up lines is extremely remote and was likely only done to satisfy the requirement for the UF study. No one thinks this is a credible island to form nor is there any history of such an island being formed. I think that a better criteria would be “Elements that have formed a boundary of an island during a system disturbance”. Another alternative might be to change the end of the criteria 4: “... that may form a credible island.”

Mr. Tatro provided his thoughts on Mr. Miller’s criteria #4 (Requirement R1) relative to the NERC System Protection and Control Subcommittee (SPCS) based on his involvement with the SPCS Report.<sup>1</sup> He noted that some planners have not identified power swings that coincide with where an island might form. He believed that the Applicability only addressing where an island might form may be too narrow. For example, if a planner studied a swing based on an island that the planner may not be able to identify a significant swing characteristic. Mr. Tatro though more work is needed on the islanding subject in either the Applicability or Application Guidelines. He also believed the suggestion “...that may form a credible island” would not provide enough clarity. Mr. Tackett thought that the islanding criteria would be based more on actual events. Mr. Middaugh suggested preparing text to present back to Mr. Miller. Mr. Tatro suggested reviewing other documents that use islanding language to be consistent with other applications before reaching out to Mr. Miller for more feedback. Mr. Tackett agreed to assist Mr. Tatro on the islanding topic.

Mr. Miller further questioned if Requirement R2 is meant to relate to the forthcoming TPL-001-4 (effective January 1, 2014). Also the use of the capitalized “Transmission System Planning Performance Requirements” in Requirement R2. Several attendees noted that it would be better to remove the reference “Transmission System Planning Performance Requirements” and place specific criteria in Attachment 1. Mr. Barfield noted that a footnote could be used to reference where the basis on the Attachment 1 criteria came from. That way if TPL-001-4 changed, the criteria would remain applicable to the proposed standard. The team agreed to remove the reference from the proposed Requirement R2.

Miller - Does this requirement mean that the planner must look at just Planning Events or Planning Events and the most severe Extreme Events? What needs to be reviewed should be as clear as possible.

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<sup>1</sup> NERC System Protection and Control Subcommittee, Protection System Response to Power Swings, August 2013 [http://www.nerc.com/comm/PC/System%20Protection%20and%20Control%20Subcommittee%20SPCS%20/SPCS%20Power%20Swing%20Report\\_Final\\_20131015.pdf](http://www.nerc.com/comm/PC/System%20Protection%20and%20Control%20Subcommittee%20SPCS%20/SPCS%20Power%20Swing%20Report_Final_20131015.pdf)

Mr. Miller's last email comment questioned if the TP or PC be the one to determine if operation of the Protection System for a stable power swing is acceptable and not the TO or GO since the TP and/or PC study system impact. Mr. Tatro noted that past standards that required entities to "agree" on something created problems and recommend that the last bullet of the proposed Requirement R4 use language, such as "in consultation with the PC and TP. Mr. Schmall asked if the team needs to place some bounds on what is acceptable under the fourth bullet. Mr. Tatro theorized that an approach would be along the lines of balancing Protection System security and dependability and not so much performance under required transmission performance. Mr. Youngblood suggested providing the criteria in the Application Guidelines. The team agreed and noted to revisit the text once the Application Guidelines were written.

## **2. Review of the schedule**

Mr. Barfield advised the team they can remove the second week of June for an in-person meeting off of their calendars, but to retain the third week based on when he expects to obtain Standards Committee (SC) approval for the initial posting and based on the staging of the posting of other projects.

## **3. Action items or assignments**

Team – No specific items.

Mr. Barfield –

- Prepare document templates for next week's in-person meeting (e.g., Implementation Plan, VRF/VSL Guidelines, and Response to Regulatory Directives)
- Confer with NERC Legal about the time periods for Requirements R1, R2 and R3. The team agrees that all three would be done on an annual basis.

Mr. Tackett & Mr. Tatro – Review other relevant documents concerning "islanding" to determine how to respond to Mr. Miller's email comments.

## **4. Next steps**

Attend meeting in-person meeting in Atlanta to prepare a formal draft of the proposed standard and other ancillary documents for initial posting. Obtain SC approval to post the initial draft of the proposed standard. Target for providing the draft to the SC is by Wednesday, April 9 to provide a five-day notice for review.

## **5. Future meeting(s)**

In-person meeting the week of March 31 beginning at 1:00 p.m. Eastern.

## **6. Adjourn**

The meeting adjourned at 2:08 p.m. Eastern on Friday, March 28, 2014.

**Copy of draft for reference:****A. Introduction**

1. **Title:** Relay Performance During Stable Power Swings
2. **Number:** PRC-026-1
3. **Purpose:** To ensure that relays do not operate in response to stable power swings during non-Fault conditions.
4. **Applicability:**
  - 4.1. **Functional Entities:**
    - 4.1.1 Planning Coordinator
    - 4.1.2 Transmission Planner
    - 4.1.3 Transmission Owner that applies protective relays at the terminals of the Elements listed in Section 4.2, Facilities.
    - 4.1.4 Generator Owner that applies protective relays at the terminals of the Elements listed in Section 4.2, Facilities.
  - 4.2 **Facilities:**

The following Bulk Electric System (BES) Elements:

    - 4.2.1 Transmission lines.
    - 4.2.2 Generating units.
    - 4.2.3 Transformers.
    - 4.2.4

**B. Requirements**

- R1.** Each Planning Coordinator and Transmission Planner shall evaluate its portion of the Bulk Electric System (BES), once each calendar year, to identify Generation and Transmission Elements that meet any of the following criteria:

**Criteria:**

1. Elements located at or terminating at a generating plant, where a generating plant stability constraint is addressed by an operating limit or a Special Protection System (SPS) (including line-out conditions),
2. Elements that are associated with a System Operating Limit (SOL) that has been established based on stability constraints identified in system planning or operating studies (including line-out conditions).
3. Elements that have tripped due to power swings during system disturbances.
4. Elements that form a boundary of a potential island of the BES as identified by the Planning Coordinator or Transmission Planner that may form an island.

5. Additional Elements that are identified as utilizing protective relays that are challenged by stable power swings in Planning Assessments (e.g., TPL-001-4).

**R2.** Each Planning Coordinator and Transmission Planner shall determine the stable power swing apparent impedance characteristics associated with each of the Elements identified in Requirement R1 based on the simulation of disturbances according to the criteria in Attachment 1. *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning, Long-term Planning]*

**R3.** Each Planning Coordinator and Transmission Planner shall provide the stable power swing apparent impedance characteristics determined in Requirement R2 to the Transmission Owner(s) and Generator Owner(s) that own a Protection System applied to a terminal of the associated Element. *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning, Long-term Planning]*

**R4.** Each Transmission Owner and Generator Owner that receives apparent power swing impedance characteristics as a result of Requirement R3 shall, within three months: *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning, Long-term Planning]*

- Show that the existing Protection Systems will not operate for the provided stable power swing characteristics, or
- Revise its Protection System settings as necessary to prevent operating for the provided stable power swing characteristics, or
- Develop a Corrective Action Plan to modify or replace Protection System components that operate for the provided stable power swing characteristics, or
- Demonstrate that operation of the Protection System for a stable power swing is acceptable in consultation with the Planning Coordinator and Transmission Planner.



Need lead in to the basis of the standard (SPCS Report) so the following makes sense in terms of the changes/direction of the team.

Rationale 1: The System Protection and Control Subcommittee (SPCS) developed a set of criteria for the drafting team to consider while developing this standard. The drafting team agreed that those criteria were appropriate to include for evaluation as to which protective relays are likely to be challenged or to operate during stable power swings. The drafting team replaced “lines” with “Elements” as proposed in the SPCS report to more accurately include items, such as generators, lines, transformers, or series reactors that may use protective relays that are subject to operation during stable power swings. The drafting team modified the fifth criterion to specifically include Elements that are identified as being challenged by stable power swings that occur during Planning Assessments since those assessments will be performed by Planning Coordinators and Transmission Planners pursuant to other standards. The drafting team contends that the criteria should be evaluated annually as a part of the assessments that are performed.

Rationale 2: The drafting team asserts that power swing impedance characteristics resulting from simulated disturbances are necessary so that the likelihood of protective relays being challenged by stable power swings can be ascertained. The drafting team assigned the responsibility for developing those impedance characteristics to the Planning Coordinators and Transmission Planners because they maintain the models and tools that have the capability to develop the power swing impedance characteristics.

Rationale 3: The drafting team recognizes that the Protection System owners need the power swing impedance characteristics so that the relay operating characteristics can be evaluated to determine if they will be challenged by the power swing. The drafting team assigned the responsibility to the Planning Coordinator and Transmission Planner for providing those power swing impedance characteristics to the Transmission Owners and Generator Owners that apply protective relays that might be challenged by stable power swings.

Rationale 4: The drafting team recognizes that the protective relay owners will have the settings necessary for comparison to the power swing impedance characteristics. The drafting team assigned the responsibility to compare the power swing impedance characteristics and the protective relay operating characteristics to the Transmission Owners and Generator Owners that apply protective relays that might be challenged by stable power swings. The drafting team asserts that meeting one of the four outcomes in Requirement R4 assures that the reliability goal of this standard will be met. The drafting team contends that three calendar months is sufficient time to complete one of the four outcomes in Requirement R4.