

Meeting Notes

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

March 13, 2014
2:00 p.m.-4:00 p.m. Eastern

Conference Call

Administrative

1. Introductions and chair remarks

The meeting was brought to order by Bill Middaugh, chair, at 2:04 p.m. Eastern Friday, March 7, 2014. He thanked everyone for joining. 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, Inc.	Chair
Kevin W. Jones, P.E.	Xcel Energy, Inc.	Vice Chair
David Barber, P.E.	FirstEnergy	Member
Steven Black	Southern Company Services	Member
Ding Lin	Manitoba Hydro	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
Scott Barfield-McGinnis (Standard Developer)	North American Electric Reliability Corporation (NERC)	Observer
Phil Tatro (Technical Advisor)	North American Electric Reliability Corporation (NERC)	Observer

Name	Company	Member/ Observer
Si Truc Phan	Hydro Québec	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 eight 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 new NERC policies and demonstrated where to find them on the NERC website. The policies are related to use of the email listserv and standard drafting team meeting conduct.

4. Review team roster

Mr. Barfield noted that the roster is posted on the NERC project page is the initial roster approved by the Standards Committee. No changes have been made.

5. Review meeting agenda and objectives

Mr. Barfield reviewed the meeting agenda and objectives.

Agenda

1. Previous business and action items

Team (All) –

- Take time to draft out requirements based on the Needs, Goals, and Objectives (NGO). (Complete – Mr. Middaugh provided a draft)
- Consider how to handle communication between planners and protection engineers. Does it need to be formalized? (Complete – Consider based on how the requirements develop.)

Team (Planners) –

- Planning members to consider whether it matters which particular contingencies in the planning studies are used to assess power swings. (Complete – The team planners are concerned it will be difficult to prescribe specific contingencies without getting involved with the TPL-001-4 and Planning Assessments)

Mr. Barfield –

- Discuss the potentially missing directive with NERC Legal concerning “islanding strategies” in Order No. 733, Paragraph 162. Also check the Standards Authorization Request (SAR) for

the directive. (Complete – The directive applies. There are actually three directives associated with the project and they will be listed in the Consideration of Issues and Directives)

- Reach out to Mr. Si Truc Phan for input regarding his comments distributed via email (See Attachment A below).

2. Continue with Standard Development

Mr. Middaugh drafted and provided a straw man standard for consideration. The team discussed the inclusion of the Reliability Coordinator considering that it does not need to be included in the applicability. Mr. Tatro did not have a particular issue with excluding the Reliability Coordinator from the applicability, so long as the Generator Owner and Transmission Owner when it can't set the relay securely or dependably or some other limitation (e.g. PRC-023-2, R3)¹, that they collectively communicate with the Reliability Coordinator, Planning Coordinator and TP to have the ability to provide input. Mr. Phan agreed with the approach that the Reliability Coordinator should always be involved, but not necessarily applicable to the standard. He also agreed with the approach that the standard would be applicable to the Planning Coordinator and TP. Mr. Middaugh noted the team decided earlier that the Distribution Provider would not be an applicable function entity.

The team moved to the Needs, Goals, and Objectives (NGO) which is being used to formulate a direction for developing the standard. Mr. Barfield noted that Hydro One provided comment about Goal #2 ("Ensure relays that protect Elements that are susceptible to power swings don't operate during non-fault stable power swings. (e.g., Order states that all conditions cannot be covered."). Their offered the following revision, "Ensure relays when blocked for a swing condition can still respond to faults"). The team recognized the two are related and the team needs to be sure they don't create a conflict with PRC-023. Mr. Tatro emphasized that PRC-023 aims to ensure that relays are able to operate for a fault during a power swing. Mr. Jones noted that the question raised by Hydro One could easily be implemented with microprocessor relays and believed that significant work would be required for electromechanical relays.

Mr. Lin noted that power swing blocking relay in PRC-023 is set beyond the maximum loading point. He was uncertain if such a setting could always be applied without replacing the relay or the extent of the issue. Mr. Tatro noted that the SPCS considered similar issues. Mr. Tackett noted that the FERC directive recognized that it is not practical to address all situations concerning stable power swings. He suggested having a footnote to explain how to handle such a situation. Mr. Middaugh believed that the directive ("to phase out relay") would not apply for this case. Mr. Tatro noted that the SPCS Report² recommended for cases where the relay cannot be set securely or dependably for a stable

¹ Each Transmission Owner, Generator Owner, and Distribution Provider that uses a circuit capability with the practical limitations described in Requirement R1, criterion 6, 7, 8, 9, 12, or 13 shall use the calculated circuit capability as the Facility Rating of the circuit and shall obtain the agreement of the Planning Coordinator, Transmission Operator, and Reliability Coordinator with the calculated circuit capability.

² 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%2020/SPCS%20Power%20Swing%20Report_Final_20131015.pdf

power swing that the standard have the latitude to implement an alternative solution. The team considered revisions provided by Michael Gildea (NERC staff) concerning the NGO. The team accepted several suggestions which added clarity. The worked on items for consideration in the Application Guidelines within the NGO. The result of the NGO is found at the end of the meeting notes. Following the NGO work, the team moved to developing language for the draft standard.

Mr. Barfield recommended the team not address the Purpose statement in the standard because it is easy to become entrenched in the words that will end up changing based on requirements. He also raised the concern about the Reliability Coordinator that was discussed in the NGO earlier in the meeting. Mr. Tatro responded that further consideration is not needed at this time. Mr. Barfield asked the group if having the standard applicable to only the Transmission Planner for providing the identified Elements sufficient. Mr. Jones believed that approach would be too narrow and limiting. Some Planning Coordinators may want to have input. Mr. Tatro recommended to skip the Applicability and see what functional entities result from the requirements and then address the Applicability. The team agreed.

The team considered the Facilities within the Applicability section. Mr. Lin questioned the use of a defined NERC glossary term in the heading "4.2 Facilities." It was explained that this is merely a heading and not intended to reference the NERC defined term. The removed the wording "Protection Systems installed for the purpose of detecting Faults on Bulk Electric System (BES) Elements that may operate for Stable Power Swings in the absence of Faults" and discussed other options. Mr. Black questioned if the team had considered making the standard applicable to Facilities at 200 kV and above. Mr. Barfield noted the team had not previously discussed nor was there any reference to it in Order No. 733. Mr. Tatro that PRC-023-1 had some specificity for Facilities between 100 kV and 200 kV as identified by the Transmission Planner. He also noted that the FERC, in subsequent orders, expressed concern about Facilities below 200 kV because of events in the August 14, 2003 Blackout. In consideration that the current approach of this standard is focusing on a select set of Elements that it should include Facilities between 100 kV and 200 kV. The reasoning is that PRC-023-1 addresses all Elements in the BES, but this standard does not. Mr. Youngblood agreed that Elements should be listed in the 4.2 Facilities section and specific relays within the requirements. Mr. Tackett raised a question about how to link the relay owner to the Element owner. Language that was used in PRC-025-1 was reviewed for inclusion in this standard. The team added the following clause to the applicable Generator Owner and TO: "that applies protective relays at the terminals of the Elements listed in Section 4.2, Facilities" like PRC-025-1. The team agreed that the approach made since because the requirements reference both Elements and the load-responsive protective relays.

Mr. Tatro suggested for 4.2 Facilities to use wording like "Elements on which the electrical center will pass during a power swing." Mr. Middaugh questioned if wording like "Element on which the apparent impedance will pass" would be clearer. Mr. Schmall was concerned that the language is too constrictive based on Requirement R1. Mr. Ding suggested just including all the BES Elements and let the requirements narrow the Elements. Mr. Tackett suggested using something like "power swings that will challenge relays on Elements. Mr. Barfield was concerned that the team was making determinations in the Applicability rather than the requirements. The team considered splitting the Applicability of Facilities into two pieces, one for the planners and the other for the relay owners.

After considering the technical correctness of the options and issues, the team concluded the best way to address 4.2 Facilities would be to use something similar to PRC-025-1. Questions were raised about whether to carve out autotransformers and generator step-up (GSU) transformers or only reference transformers in general. The team agreed that “transformer” is correct. The following was the end result:

- 4.2 The following Bulk Electric System (BES) Elements:
 - 4.2.1 Transmission lines.
 - 4.2.2 Generating units.
 - 4.2.3 Transformers.

3. Review of the schedule

Mr. Barfield reviewed the schedule reminding team members to add a placeholder to their calendars for an in-person meeting for the 2nd and 3rd week of June to respond to comments from the 45-day ballot.

4. Action items or assignments

Team – Review Order Nos. 733, 733-1, and 733-2 to keep it fresh during standard development.

Mr. Middaugh – Look for any references in the Order Nos. 733, 733-1, and 733-2 regarding backup remote protection (P. 140-142).

5. Next steps

Team to seek ways to socialize the standard and educate industry on approach. Mr. Barfield asked if the team could meet on Monday, March 17 to keep the progress moving forward.

6. Future meeting(s)

Conference call on Monday, March 17 | 3:00-5:00 p.m. Eastern

7. Adjourn

The conference call adjourned at 4:40 p.m. ET on Thursday, March 13, 2014.

Needs, Goals, Objectives (and Application Guideline notes)

Needs: Prevent relays from tripping during a stable power swing because it is perceived as a fault, thus unnecessarily removing facilities from service.

Goals: Prevent undesirable tripping of elements that are susceptible to stable power swings. (733, P153)

1. Develop acceptable criteria for identifying facilities that are susceptible/applicable to stable power swings.
2. Ensure relays that protect Elements that are susceptible to power swings don't operate during non-fault stable power swings. (e.g., Order states that all conditions cannot be covered)
3. Minimize the burden on planners and asset owners through effective use of resources by using existing studies and taking a focused approach to facilities at risk.
4. Aim for a risk-based approach, rather than competency- or performance-based.
5. Avoid modifying other standards, unless absolutely necessary (due to project time constraints and those modifications to other standards adding complexity).
6. Avoid diminishing the ability of relays to trip reliably for faults, and for unstable power swings where islanding is necessary.
7. Consider the five bullets in the SPCS document discussing the limiting of the applicability to only those transmission lines (and generating stations) on which protective relays are most likely to be challenged during stable power swings.

Purpose: (Should describe the need and the goal).

Objectives:

1. The Planning Coordinator and Transmission Planner will identify Facilities based on the SPCS report, that include:
 - Elements terminating at a generating plant, where a generating plant stability constraint is addressed by an operating limit or Special Protection System (SPS) (including line-out conditions), including the generating unit(s) if an impedance-based protection scheme is used.
 - 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).
 - Elements that have tripped due to power swings during system disturbances.
 - Elements that form a boundary of the Bulk Electric System that may form an island. (See NERC Reliability Standard PRC -006 – Automatic Underfrequency Load Shedding, Requirement R1)

- Additional Elements that are identified as tripping for power swings in Planning Assessments (e.g., TPL-001-4).
2. Planning Coordinators and Transmission Planners must identify the Elements that are subject to stable power swings.
 3. Planning Coordinators and Transmission Planners must provide the information (e.g., maximum slip rate and R-X plane versus time plots) for a differentiating between a fault, and stable and unstable power swings to Generator Owner and Transmission Owner for the identified Elements (above).
 4. Based on the information provided by the Planning Coordinator and Transmission Planner, set relays protecting identified Facilities so that they don't trip on stable power swings.

Application Guidelines

1. Have asset owners set relays applied on identified Elements to allow Protection Systems to trip for faults and, where necessary, unstable power swings as studied, recognizing that in some cases to achieve the desired dependability it may be necessary to allow tripping for some stable power swings.
2. PRC-023-3 and PRC -025-1 focuses on steady state and PRC -026-1 will focus on stability.
3. In setting relays applied on identified Elements, do not defeat other protection means, such as, those used for emergency overload protection of equipment (733, P139) – Settings of relays should be based on the studied set of planning events and it is not necessary to consider extreme events.
4. In setting relays applied on identified Elements, do not allow modifications to accommodate non-fault related transient overloads that might leave system elements exposed to excessive loading longer than is prudent (733, P140)
5. In setting relays applied on identified Elements, make certain that phasing out of relays does not leave the electric system without reliable backup for transmission lines with failed communication or other equipment failures (733, P141) – Discussion on strategy to avoid tripping for stable power swings, remote backup protection must be considered. Microprocessor relays can do more, but other systems must be considered on how they integrate.
6. Consider “islanding strategies” in conjunction with out-of-step blocking (or tripping) requirements (733, P142) – Discuss in the Application Guidelines technical basis/rationale boxes.