NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Meeting Notes

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

March 5, 2014
2:00-4:00 p.m. Eastern

Conference Call

Administrative

1. **Introductions and chair remarks**

   The meeting was brought to order by Bill Middaugh, chair, at 2:03 p.m. Eastern Tuesday, March 5, 2014. He thanked everyone for joining and for taking time out of the day to work on Needs, Goals, and Objectives (NGO) which will be used to formulate the standard. Mr. Barfield took roll of members, FERC and NERC staff, and industry 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	Member
Fabio Rodriquez	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

Name	Company	Member/ Observer
Michael Gildea (Reliability Standards Advisor)	North American Electric Reliability Corporation	Observer
Kelly Simmons	Xcel Energy, Inc.	Observer
Sudhir Thakur	Exelon Generation	Observer
Phil Winston	Southern Company	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 all nine members were present.

3. **NERC Antitrust Compliance Guidelines and Public Announcements**[1]

   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 posted on the NERC project page is the initial roster approved by the Standards Committee.

5. **Review meeting agenda and objectives**

   Mr. Barfield reviewed the meeting agenda and objectives. Previous business including having ERCOT, MISO, and Southern Company's RC concerning what RC staff think about including the RC as an applicability entity for power swings. Also, the team will cover the needs, goals, and objects to help the team stay on point during this meeting.

Agenda

1. **Previous business and action items**

   Mr. Schmall started previous business off with a report from ERCOT concerning the RC applicability. He spoke with Reliability Coordinator (RC) staff and received favorable feedback with including the RC in identifying circuits. They were concerned with how they would identify

[1] See Agenda

the circuits. What criteria would be used and who would develop it were two concerns by the RC staff. Overall, they echoed the things listed in the SPCS report[2] gave them concern, but Mr. Schmall said that the concerns were not significant. Mr. Tackett noted that MISO RC staff would want to be in the communication loop on power swings. They understand the issue and are concerned about it since they do operational assessments. Mr. Phan noted at Hydro Québec that the RC and TP would not be applicable to the standard because they do not perform the assessments or dynamic studies. Hydro Québec believes the principal entities are the PC on the planning side and the GO and TO on the relay side. Mr. Phan is going to provide a brief synopsis of their thoughts.

2. Continue with applicability discussion

Mr. Barfield presented a straw man of the NGO that was crafted during a leadership call with Mr. Middaugh and Mr. Jones prior to the call. Mr. Middaugh made an initial pass through the NGO document to provide an overall review before discussing. Mr. Ding asked if there is a need as to consider the reliable tripping of protection systems for unstable protection. Mr. Barfield noted that the main focus from Order No. 733 is to develop a standard that requires the use of protective relay systems that can differentiate between faults and stable power swings and when necessary, phases out protective relay systems that cannot meet this requirement. Mr. Tackett noted that the needs (NGO) should be framed not to be specific to the relay experiencing a stable power swing because it may not be the relay that needs to operate. The relay scheme may need to send a transfer trip to another relay in response to a swing. Mr. Schmall suggested wording along the lines of ensuring relays that are susceptible for tripping on out-of-step (OOS) conditions actually trip for OOS conditions.

Mr. Schmall believed that adding the information about tripping on unstable power swings is scope creep. Mr. Rodriquez agreed that this standard is not the place for unstable power swings. Mr. Middaugh noted that including unstable power swings does not preclude the team from addressing as a corollary to the stable power swing. For example, the SPCS and Order No. 733 commenters noted that using "islanding" as a consideration in developing the standard. Mr. Barfield noted that it is okay to keep in mind as a benefit, but the directive was to develop a standard that requires the use of protective relay systems that can differentiate between faults and stable power swings and when necessary, phases out protective relay systems that cannot meet this requirement. He also agreed with Mr. Schmall and Rodriquez that in doing so would be scope creep in terms of the directive. The key point is to keep this in mind to avoid other issues.

Mr. Tackett asked if it would be scope creep if the need (NGO) was worded like "ensure relays are secure against false tripping during stable power swings while remaining dependable to trip for faults or unstable power swings." The issue is about security and not load, and making sure relays do not trip when they shouldn't. Mr. Barfield noted that the statement read more like a

[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

goal rather than a need. Mr. Middaugh questioned if it should be an objective (NGO). Mr. Barfield responded that the objectives (NGO) should be the performance that will achieve the goals to meet the need of the NGO.

Mr. Middaugh asked if the word fault should be in the need (NGO). Mr. Lin said from his reading of the Order 733 and SPCS report he wondered if tripping for unstable power swings is an aspect of the scope. Mr. Middaugh theorized that other comments allude to this problem, but the Order 733 is only addressing what to do between faults and stable power swings. Mr. Lin is okay with not mentioning the dependability component of the protection systems. Mr. Black noted that the Order 733 does not require the team to ensure that relays will trip for unstable power swings. He offered language along the lines of: what if, "ensure the appropriate relays were allowed to trip." Meaning, that the standard would not prevent relays from tripping for an unstable power swing.

Mr. Tackett concurred with Mr. Black's sentiments. Mr. Schmall noted that this all depends on the type of protection scheme the entity has in place. For example, it may be different for Transmission Owner (TO) and Generation Owner (GO) entities. He believes that the transmission relays are more of a second line of defense to power swings. Generator relays are the first line of defense. Mr. Youngblood, noted that he did not know of any other standards that address stability for generators. Mr. Thakur agreed because PRC-025-1 does not address OOS relays. Although not in the objectives, Mr. Middaugh noted that including generator relays seems apparent. Mr. Middaugh asked the team if the goals as presented were satisfactory. Mr. Lin, Mr. Schmall, and Mr. Tackett affirmed the question. He also asked about the needs statement of the NGO and several agreed. He further inquired if the team concurred with the SPCS report that the standard should identify the facilities that are susceptible to stable power swings. Several agreed. Mr. Lin asked the planners on the team if in planner's point of view is it easy enough to identify these facilities? Mr. Tackett responded with a question, "do we (team) mean that identifying facilities that are susceptible to tripping for stable power swings" which are going to change on the specific contingency, or is the team talking about doing studies simulating relay response to power swings?" He believes if it is doing studies, it will not be an easy task. Mr. Rodriquez echoed that it is not an easy task. The SPCS report discusses a methodology to identify areas susceptible to power swings. Mr. Thakur asked what does "susceptible" mean. Mr. Rodriquez noted that areas close to generation and during faults, they are the units that will accelerate and oscillate. The SPCS report takes into account these areas that are susceptible.

Mr. Thakur provided an example of a study done for a generating plant and it was found that the swing does not pass through the GSU or the unit, but out on the transmission line. Does that mean the generating station is not susceptible? A second scenario is the swing passing through the transmission line but there is no protection to detect the power swing. Would the generating plant be characterized as being susceptible? Mr. Rodriquez notes that the types of fault and scenarios will determine susceptibility. He notes that voltage plays an important role in determining stable power swings. Mr. Thakur questioned the application across all the regions and will the team will define the types of studies. Mr. Rodriquez believes a set of guidelines would be sufficient. The regions should have the flexibility to perform the studies. Mr. Middaugh asked

if the usage of susceptibility affects the goals (NGO) or how the standard will be written. Mr. Thakur is concerned about the clarity of how facilities are defined.

Mr. Lin proposed an alternative to set "criteria" which will apply within the standard. The criteria would allow the Planning Coordinator (PC) to identify the facilities subject to the standard. Mr. Tackett thought identifying facilities that are susceptible to power swings and not to be concerned with facilities that are not impacted like short lines – develop criteria to identify facilities. Mr. Black was concerned about the use of the word ensure in #3 is more like "reduce the likelihood" that relays would operate. Mr. Tackett agreed. Mr. Black referenced that the Order 733 which recognized that entities cannot cover all conceivable contingencies. Mr. Jones agreed it should be reduce the likelihood; however, the standards' Requirements will need to be more concrete and not vague. Mr. Schmall noted that ensure and prevent are similar and that when the system is at an N-15 state that there is no way to prevent operations. Mr. Black was amenable to going back to ensure since the goal is to look at set number of facilities that are impacted by power swings. Mr. Barfield updated the goal from "reduce" to "ensure."

Mr. Middaugh moved to the next goal of reducing the burden to planners and asset owners. Mr. Tackett and Mr. Black agreed with reducing the burden concept. Mr. Middaugh asked Mr. Barfield to provide background on the phased approach (i.e., Results-based concepts). Mr. Barfield provided a description of the three components of risk-based, performance-based, and competence-based requirements. He further noted that an example of risk-based is the protection system and maintenance standard PRC-005 which addresses dependability risk through a maintenance program. An example of performance-based requirements would be maintaining Area Control Error (ACE) within a certain boundary. Last, a competence-based requirement would be along the lines of training staff, understanding the issues with setting relays for stable power swings. Mr. Barfield further noted that in chapter 3 of the SPCS report, it inferred a risk-based approach. He further noted that requirements should stay away from requirements that have the entity document something which could be construed as having no reliability benefit. A standard that is administrative could fail the Paragraph 81 criteria discussed in the initial team training. Several team members affirmed support of the risk-based approach.

The next goal listed was to avoid modifying another standard because of adding complexity and duration to the project. Mr. Barfield noted that opening another standard for modification would increase the difficulty in moving the stable power swing standard forward. Mr. Tackett encouraged the team to review the new TPL-001-4 standard that will become mandatory and effective January 1, 2015. Goal #7 was noted again about limiting the applicability to transmission and generation that is challenged by stable power swings. Mr. Gildea noted to the group that the need and goal statements do not seem to read clearly. Mr. Tackett suggested a re-wording of the need statement. Mr. Barfield noted that the team may need to ask "why" the standard is needed. The team made a minor modification to the needs statement. Mr. Jones suggested removing some words from goal #6, but to leaving the condition for islanding. Mr. Gildea thought it would be better to put some boundaries on what "burden" really means. Mr. Barfield recommended a follow to Mr. Gildea with the wording "…through effective use of resources by using existing studies and taking a focused approach to facilities at risk." The team liked the approach. Mr. Barfield asked if the team should look at the five SPCS report bullets on page 21 before moving

off the goals. The last bullet of [l]ines identified through other studies, including but not limited to, event analyses and transmission planning or operational planning assessments" may present difficultly in how to make a requirement measureable. There were no questions. Mr. Middaugh asked if the team if there were any other goals that should be considered. Mr. Youngblood noted that the goals seem to lack addressing generation plants and offered adding a point in goal #7. A parenthetical for generation was added to the goal. The team was not sure why the SPCS report seemed to be biased toward transmission. The first bullet in the SPCS report about generation only speaks to "Lines 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)." Mr. Youngblood believes that large nuclear plants are not going to have stability constraints, but could be subject to power swings. He believes this could be perceived as a potential gap if left unaddressed. Mr. Middaugh asked if we should have a goal of implementing the SPCS report recommendations. Mr. Barfield agreed that it would be good to reference that the goal is to consider the SPCS report since the report uses the word consider rather than implement.

The team moved on to the objectives of the Needs, Goals, and Objectives (NGO) document. Mr. Lin questioned the objective about "Allowing essential operation." Mr. Barfield noted that Order 733 discussed that settings should allow the full Facility Rating; however, even though the language was pulled from the Power Swing section of the Order, its relevance is more in line with PRC-023. Mr. Schmall noted that a stable power swing could temporarily exceed the Facility Rating. Several team members agreed that this was not important to the project because a stable power swing is transient loading. The team decided to remove the first four objectives as they were paraphrasing of the goals. Mr. Tackett was concerned that one objective reads as though entities will have to remove facilities when it may be acceptable to add a relay to address the problem. The wording was updated to account for the condition. Mr. Barfield recommended tabling the objectives until the next call. Mr. Schmall asked for clarification at the next meeting on the NGO document.

Mr. Simmons noted that his planning colleagues were uncertain on what criteria the protection staff would need to check for stable power swings. Mr. Barfield asked if Mr. Simmons was asking the question relates to how the protection and planning staff communicate the issue of stable power swings. He was not certain.

Mr. Thakur offered a perspective from a generation standpoint. First, studies are not typically done to determine if OOS protection is required or not for generations. Because of that, Exelon protects their large generation plants with OOS protection. Second, if a study is done and shows a stable swing, they have to decide at what point they will trip. Exelon found it was difficult to set relays for stable power swings with multiple contingencies, but upon a second look with situations that are more likely they found it was possible to set the relays adequately.

The team reviewed TPL-004-1 - Transmission System Planning Performance Requirements, with regard to the study of power swings. Mr. Middaugh asked for planners on the team to provide input. Mr. Tackett and Mr. Rodriquez provided some thoughts that power swings relate to contingencies P2 through P7. Mr. Rodriquez notes that in Florida through the studies that are done, they are aware of the areas that are problematic. Because of these areas, they model the

relays in the problematic locations (i.e., unstable power swings). Mr. Middaugh asked the planners if the new standard, TPL-001-4 will require planners to identify stable power swings. Mr. Rodriquez agreed that the new standard does identify stable power swings. For example, a planner would know that a power swing is unstable with the voltage drops below 0.7 per unit, but if it stays in the 0.8 and higher range the power swing is stable.

Mr. Middaugh questioned if the "Planning Assessment" in the transmission planning standard will provide the necessary information that the stable power swing standard can rely upon. Mr. Rodriquez believes that the new standard would allow for making determinations. They would work with what they are doing in the planning standard. Mr. Schmall does not believe the current and future planning standards are different with regard to stable power swings. He does not believe the planning standards provide the necessary granularity to identify the facilities for the stable power swing standard. Mr. Pajic noted that power swings could be identified through the planning standard. He also notes that the WECC regional standard looks at other factors.

Mr. Phan provided comments during the meeting which time did not allow addressing. They are listed at the end of the notes in Attachment A.

3. Review of the schedule

Time during this call did not permit reviewing the schedule.

4. Action items or assignments

All team members

- Review TPL-001-4

5. Next steps

As time permits, go back and re-read the SPCS report since it will be the foundation of the standard. If any team members come across a document of value, provide it to Mr. Barfield for inclusion on the team information sheet.

6. Future meeting(s)

Conference call at noon Eastern on Friday, March 7, 2014.

7. Adjourn

The conference call adjourned at 4:24 p.m. ET on March 5, 2014.

Attachment A (From Mr. Si Truc Phan, Hydro Québec)

Following the last conference call, here is the Quebec Interconnection's position on the applicable functions:

- **Planning Coordinator**

Generally, PCs participate on different committees/working groups at the ERO level. They have to demonstrate the reliability of their BES network by performing Transmission Assessment Studies within their entities and also to their Regional Entity. As an example for NPCC: TFSS, TFSP, SS-37, SS-38.

PCs are responsible to coordinate the integration of all new facilities elements within its footprint.

- **Transmission Owner**

TOs are responsible of the relay settings and protections of their systems.

Also, TOs coordinate the settings with the GOs within their jurisdiction.

- **Generator Owner**

Upon PCs' request, GOs are responsible to provide their data to PCs in order to perform Power Swing Simulations (load flow and dynamic studies).

- **Neither DP nor RC perform any assessment of the Dynamic Studies, therefore we don't feel they should be included.**

We think that this standard should address only the operation of relays under stable power swings.

Because of its characteristics, the Quebec Interconnection (already islanded and predominantly hydraulic generation) has been considered as an islanded network.

Our philosophy is to maintain all available generations on-circuit during stable power swings.

For unstable power swings we use Special Protection Systems.