NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Meeting Minutes
System Protection and Control Subcommittee

July 31, 2018 | 8:30 a.m. – 5:00 p.m. Central
August 1, 2018 | 8:30 a.m. – Noon Central

NERC Atlanta Headquarters
3353 Peachtree Road NE
Suite 600, North Tower
Atlanta, GA 30326

A face to face meeting of the System Protection and Control Subcommittee (SPCS) was held on July 31-August 1, 2018 at the MRO headquarters in St. Paul, Minnesota. A WebEx was provided for remote member and observer participation. The attendance list is provided in the Minutes below.

SPCS Chair Mark Gutzmann convened the meeting at 8:36 a.m. Central on Tuesday, July 31, 2019 and welcomed the SPCS to St. Paul, MN. Jack Norris, NERC Staff Coordinator, read the Antitrust Compliance Guidelines and Public Meeting Announcement disclaimer.

Agenda Items

1. **Agenda July 2018 Meeting - (Approve) – Mark Gutzmann**

   Chair Gutzmann asked for any additional items. Jason Espinosa asked for an item on PRC-024 and frequency trip settings. It was suggested that this item be discussed after the PRC-024 item with Rich Bauer. Mike Bocovich (MRO) asked for an item PRC-002 using event fault recorders and disturbance recorders (Utilizing Relays for DME). This item will be discussed after the PRC-019 discussion. There were no other additions. A motion was given to approve the agenda. Jonathan Sykes raised the motion and Eric Udren was the second. There was no opposition to adopting the agenda.

   Decision Item With the addition of the PRC-024 frequency trip setting and the PRC-002 event fault recorder items, the SPCS Meeting Agenda July - August 1, 2018 (Saint Paul, MN) was approved.

   Jack Norris announced that Andy Slone would be taking over the coordination role for future meetings. Then, an introduction occurred for both in-person and remote participants.

2. **Document Review - (Review) – All**

   a. Previous Meeting Minutes

      Jack Norris reviewed the last meeting minutes from the April 2018 meeting with the group. Changes were suggested and incorporated. Phil Winston gave a motion to approve the minutes with corrections, and the meeting minutes were approved with no opposition.

b. SPCS Roster

A review of the roster was performed. Several members had inaccurate data, and an update is required.

Decision Item Bill Middaugh will be the WECC Primary member. Bajaram Agrawal will be the WECC Alternate member.

****Action Item**** *Andy Slone will update the SPCS roster and post it to the NERC.com website.*

****Action Item**** *Add James Oddy, FERC, to the SPCS_Plus list. James.Oddy@ferc.gov*

i. Discuss addition of John Babu for NPCC alternate

As a continuation from the April 2018 meeting, the addition of John Babu as the NPCC alternate was discussed. Because Alex Echeverria was in attendance, the group moved forward on a proposal to make John Babu the NPCC alternate. A motion was proposed to ask if anyone was opposed to John Babu joining the group as the NPCC alternate. No opposition was given. John Babu will be the SPCS NPCC alternate.

Decision Item John Babu will be the SPCS NPCC alternate.

3. MIDAS Working Group – Jack Norris/All

Jack Norris gave an overview of the MIDASWG's activities. They focused on composite protection system definition vs. control system. The MIDASWG is considering defining protective function in the MIDAS DRI. Various questions around composite protection systems were discussed, and they will continued to be discussed at future meetings. Protection relay is not defined in the glossary of terms, and this will be discussed at the current SPCS meeting. Minutes will be distributed to the MIDASWG. A number of SPCS members are also on the MIDASWG, and there was interest in SPCS members being on the MIDASWG Plus list. Members who are interested will e-mail Jack Norris. A roster hasn't been posted yet, but it will be posted. Nominations have been requested for Chair of the MIDASWG, but no one has been nominated yet.

Any SPCS member interested in being on the MIDASWG Plus list should e-mail Jack Norris.

4. PRC-019 Implementation Guidance Document – Jason Espinosa

Jason Espinosa gave a presentation about the PRC-019 Implementation Guidance Document. There has been two high level meetings with manufacturers. The example plot within the standard conflicts with NERC operational requirements. IEEE-C37-102 is the manual steady state stability limit (SSSL) and is used to calculate the purple curve (see chart in distributed presentation). Unfortunately, this value is only relevant if the Automatic Voltage Regulator (AVR) is in manual mode. NERC standards require the AVR to be in automatic mode unless this absolutely cannot be done. The curve in AVR will have some non-linear iterative equations for the curve to see a given P-Q value (it looked like a much steeper curve). It's much more complicated than the simple curve, making it difficult to include in a standard. Industry standard sets the minimum excitation limiter based on the manual SSSL curve. The loss of field element should be set based on the VAR absorption capability (end region armature limit).

Then, the group reviewed asynchronous modes of operation. There are 3 common modes for asynchronous generation: Constant Power Factor, Q_{min}/Q_{max} , and Current Limiting. These can be changed dynamically based on system definitions. The group has discussed these modes with the manufacturers and how it will fit PRC-019 and if any additional language in the standard is needed.

Also, inverters go through firmware updates on a regular basis. There is a potential that these updates could cause the protection settings to change. An entity should verify that firmware upgrades do not affect PRC-019 coordination.

Since inverters are current limiting devices, the overcurrent protection should be considered for PRC-019. Inverters will react in the same manner as synchronous generators during low and high voltage conditions on the grid. As of right now, the momentary cessation is being treated as a trip function. The voltage limiters and protection set-points must coordinate all the way up until the point of interconnection (typically high-side of Generator Step-up Unit).

Further discussion occurred on whether a separate PRC-019 type standard should be pursued for the inverter based resources. In general, for inverter based resources, the discussion centered on whether to augment current standards or to introduce new standards specifically for inverter based resources (IBDs). Additional discussion will be needed to resolve this issue as it impacts NERC Standards. Continuing on with the current efforts was felt to be more fruitful in the short term. It was recommended to explore with Ryan Quint and the IRPTF to see about adding the PRC-019 issue in regards to inverters to the IRPTF's report conclusions.

Action Item *Andy Slone to contact Ryan Quint to determine feasibility of adding mention of PRC-019 issue for IBDs to the IRPTF's report conclusions.*

A concern was mentioned about generators not performing coordination testing until after the generator is tied into the system. Also, there were concerns about the expectations during auditing of PRC-019 for entities.

During the discussions, it was mentioned that there were no Planning Committee (PC) reviewers yet for this document. Andy Slone agreed to approach the PC to find PC reviewers prior to submitting the report to the PC. This will allow a review to occur without two PC meetings being necessary to approve the document.

The timeline for the paper's completion for PC approval was scheduled for 2018Q3, but, it now it is expected in 2019Q1. The PRC-019 team is meeting on 1 August at the MRO offices to continue work on the paper.

Action Item *Andy Slone will request PC reviewers by speaking with Mark Olson, PC Staff Coordinator, for the PRC-019 task force paper.*

Action Item *Andy Slone will check PC work plan that PRC-019 Guidance Document is listed for 2019Q1 and will work with Mark Olson to change it to reflect the current schedule.*

5. Utilizing Relays for Disturbance Monitoring – Michael Bocovich

Michael Bocovich led a discussion on utilizing relays to satisfy requirements of PRC-002. Fault recording using relays was discussed including how to capture the event utilizing cross triggering,

GOOSE communications, and trigger on voltage and current settings. Event record storage from relays was also discussed including automatic retrieval/storage and manual remove retrieval of records.

6. **Discuss TPL Standards Changes – All**

   The proposed TPL-001-5 Standard is out for a 45 day comment period (July 30, 2018 – September 14, 2018). Discussion amongst the group centered on footnote 13 found on pp. 26-27 of the standard. This area deals with the non-redundant components of a protection system that the transmission planner must take into account. These single points of failure on the protection system are laid out in footnote 13. After discussion about the particular types of equipment to be included in footnote 13, Chair Mark Gutzmann polled the group to determine if the SPCS should endorse or not endorse the proposed language for footnote 13. There was no clear consensus, so the SPCS will neither endorse nor not endorse the proposed language for footnote 13 in the draft TPL-001-5 standard.

7. **Review SPCS Document Library – All**

   A discussion centered on a spreadsheet developed to determine statuses for each document in the SPCS document library. Various documents need to be archived. Bob Cummings may have a spreadsheet listing those archival documents. Many of the documents are no longer relevant because of newer standards.

   Action Item *Andy Slone will ask Bob Cummings for latest archival documents spreadsheet and verify wanted changes were implemented.*

8. **Impact of Inverter-Based Generation on Bulk Power System Dynamics and Short-Circuit Performance Report – All**

   Jack Norris gave a review of the IEEE report on Impact of inverter-based generation on Bulk Power System Dynamics and Short-Circuit Performance. Of particular importance to the SPCS is the lack of negative sequence directional relaying for inverter-based resources (IBRs). Jack asked if there was interest for the group to support writing a whitepaper or other document around this area. Of particular interest was the issue of potentially generating negative sequence currents in IBRs and handling the issue of high penetration of IBRs if they are unable to generate negative sequence currents during unbalanced conditions.

   Action Item *SPCS will reach out to SAMS, IRPTF, RS, and ERSWG to see if there are areas where the inverter based resource negative sequence issue that these group feel the SPCS could provide value.*

   a. Review Chapter 3 – Protective Relay Issues Related to Large Penetration of Inverter-Based Resources

      Prior to the question and answer session with Kevin Jones, one of the report authors for the IEEE report, the group examined the California ISO SARs for PRC-019 and PRC-024. These were not distributed as they were not publically distributable at the time of the meeting. These were related to the IEEE report because they are proposed changes to the PRC-019 and PRC-024 standards to handle IBRs. There were two proposed options:

i. Create new standards for PRC-019 and PRC-024 for inverter based resources. The current PRC-019 and PRC-024 standards would be changed to refer only to synchronous resources.

ii. Alter PRC-019 and PRC-024 to account for inverter based resources.

The SARs will be posted for public comment soon, and the SPCS could provide comment if they don't match up with SPCS's viewpoint.

Kevin Jones, one of **the Impact of Inverter Based Generation on Bulk Power System Dynamics and Short-Circuit Performance Report** authors, called in to perform a question and answer session for the report from the SPCS members. Overall, there was an emphasis from the SPCS to determine which NERC standards would impacted by the inverter based resources. Depending on how the issue is handled, it will require several NERC standards to be refactored, or new NERC standards will be needed to specifically handle inverter based resources.

Additionally, there was a question on the section of the report that referenced PRC-026. What is meant by stating: "the criteria to determine if the existing angular stability assumptions are still valid"? Does this mean the Planning Coordinator or from a Compliance viewpoint? PRC-026, uses the 120 degree angle for the standard test, but it says you can use a lesser angle if your planning coordinator shows that you can achieve stability at a lesser angle. Additional work from the IEEE PSRC and its subcommittees will be required to determine power swing settings for stable power swings.

An additional question from the group centered on the effects of the low short circuit available current at high penetration levels. Based on Kevin's response, the major issues are the directional elements with the relaying. The low short circuit current doesn't seem to impact it as much. Three entities performed three different studies that if the synchronous generation was replaced with inverter based resources. In these studies, they showed that low short circuit for a fault will only exist within about 3 buses. The method for short circuit studies will have to change to include our worst case for generation for maximum on-peak with more synchronous compared to off-peak with less synchronous resources. One of the members simply disconnected the generation to study its effects, a worst case scenario, while others were using CAPE and ASPEN models. The results were similar and matched up well even with the differing methods. More study will be needed to verify the models perform as expected. Kevin Jones invited any SPCS members who had additional questions to contact him.

9. Discuss PRC-024 Implementation Guidance Document – Rich Bauer

California ISO SAR submissions. Rich Bauer explained that the ERO Compliance group wants to change the language for PRC-024 based on the implementation guidance document and additional PC and Compliance comments from that guidance document. Different language like "if the relay setting plots outside the curve, then this is of no concern because it would meet Requirement R2 because it will trip outside of the required zone." The ERO Compliance group wants us to create an appendix in the guidance document and put that technical content in that appendix. For the implementation guidance document, there's a little bit of wordsmithing and a little bit of formatting changes. Otherwise, no additional big changes are needed. Rich Bauer is planning on

sending a redlined and clean document to the PC Executive Committee with the proposed changes. This will allow a decision to be made on whether these changes should go forward.

A motion was proposed by Phil Winston and seconded by Alex Echeverria to move the document through the SPCS for informational purposes only. There was no opposition to the motion. Mike Bocovich stated that he wanted to review the document. Rich Bauer will send the document to Mike Bocovich when he sends to the PRC-024 team.

Action Item *Rich Bauer will send the draft guidance document to the PRC-024 workgroup, then it will be sent to the SPCS. Also, the results of the PC Excom will be sent as well.*

As part of the discussions for the PRC-024 Implementation Guidance Document, a topic was proposed on frequency tripping in PRC-024. In particular, entities are encountering violations when they have frequency setpoints inside of the distributed control system (DCS) for the generator. Some of these setpoints, when the RPM is converted to frequency equivalents, are within the no-trip zone. The area of contention was around footnote 1 in the PRC-024 standard:

> *1 Each Generator Owner is not required to have frequency or voltage protective relaying (including but not limited to frequency and voltage protective functions for discrete relays, volts per hertz relays evaluated at nominal frequency, multi-function protective devices or protective functions within control systems that directly trip or provide tripping signals to the generator based on frequency or voltage inputs) installed or activated on its unit.*

Instead of including that topic in the implementation guidance document, it was proposed to handle this topic in an upcoming PRC-024 Standards Authorization Request (SAR). The following question should be addressed in the PRC-024 SAR: "Would a trip point in the turbine system that is really to protect the turbine blades, would that qualify as a frequency protecting relay?" Many people disagree with footnote 1, and it's unclear whether control systems are included in PRC-024.

10. Meeting Adjourned and reconvened.

The SPCS adjourned at 5:00 p.m. Central and reconvened the following morning at 8:35 a.m. Central.

11. Discuss Under Frequency Load Shedding – Carl Turner

Carl Turner, a Planning Committee member, dialed in to the call to lead a discussion about Under Frequency Load Shedding. After the discussion of the reference documents, Carl Turner presented about under frequency load shedding. There are concerns about the way audits are being performed for UFLS for Distribution Providers (DPs). Auditors lately have really been scrutinizing the UFLS relay settings. Since the settings are part of PRC-006, the auditors are looking to see if those time delays are passing the test as per PRC-005 as well as the pick-up values to meet the regional program. In particular, the tolerance range for the pickup was being heavily scrutinized to verify that even with the tolerance range included from the test set itself that the setting mandated by PRC-006 would be met. There is a concern that if the time delays are shortened because of a tolerance issue, it would result in shedding too much load or inaccuracies during a real event.

Action Item *Regional representatives will check how this particular situation (the tolerance issue with UFLS) is being audited by their compliance groups and follow up with Mark Gutzmann and Carl Turner.*

12. Discuss Proposing NERC Glossary of Terms Definitions:

At the last meeting, several terms were proposed to have definitions created. Also, at the MIDASWG call, the protection element term was added.

Chair Mark Gutzmann asked where would these terms be used. Mainly, the terms would be used for the MIDAS Misoperation Information Data Analysis System data reporting instructions (MIDAS DRI) and based on the discussion of momentary cessation at the April 2018 SPCS meeting. For the **Trip** and **Momentary Cessation** terms, the group determined that the SAMS should be involved in determining the need for a definition.

Action Item *For the Trip and Momentary Cessation terms, ask SAMS if these terms should be defined.*

For the **Protection/Protective Relay** and **Protection Function** terms, these were related to Sudden Pressure Relaying and how those would be defined. Since there was a potential need for these terms in the MIDAS DRI, a definition for the terms was requested. Further discussion clarified that Sudden Pressure Relaying is not included in misoperation reporting, so there was no further need for a definition at this time.

13. Plan Future Meetings

Future dates will be TBD based on agenda with a plan for a meeting no later than January 2019.

14. Adjourn – Chair Mark Gutzmann adjourned the meeting at 11:40 p.m. Central on August 1, 2018.

Meeting Attendees	
Name	**Company**
Mark Gutzmann	Xcel Energy (Chair)
Jeff Iler	American Electric Power (Vice Chair)
Jack Norris	NERC (NERC Staff Coordinator)
Al McMeekin	NERC
Alex Echeverria	New York Power Authority
Andy Slone	NERC
Armin Klusman	CenterPoint Energy Houston Electric, LLC
Bill Crossland	ReliabilityFirst Corp.
Bill Middaugh	Tri-State Generation and Transmission Association, Inc. (Phone)
Chris Adam	Midwest Reliability Organization
David Penney	Texas RE
Eric Udren	Quanta Technology, LLC
Forrest Brock	Western Farmers Electric Cooperative
Glenn Hargrave	CPS Energy
James Hanson	WECC
James Oddy	FERC
Jason Espinosa	Seminole Electric
John Seidel	Midwest Reliability Organization
Jonathan Sykes	Pacific Gas and Electric
Lisa Stellmaker	Midwest Reliability Organization
Louis Guidry	Cleco
Michael Bocovich	Midwest Reliability Organization
Michael Thompson	SEL Engineering Services
Philip Winston	Georgia Power Company
Rich Bauer	NERC (Phone)
Steve Pitts	Florida Power & Light Co.
Steven Hataway	Florida Power & Light Co.
Xiaodong Sun	Ontario Power Generation Inc.