

**SOUTHWEST POWER POOL
SYSTEM PROTECTION AND CONTROL ADVISORY GROUP MEETING**

**Tuesday November 8, 2022 1:00PM - 5:00PM (CPT)
Wednesday November 9, 2022 8:30AM - 12:00PM (CPT)**

Energy Offices, Kansas City, Missouri

SUMMARY OF MOTIONS AND ACTION ITEMS

MOTIONS:

- Steve Wadas (NPPD) motioned to approve the August 9-10, 2022 SPCAG Meeting Minutes. Lynn Schroeder (Sunflower) seconded the motion. The motion carried without opposition or abstention.

ACTION ITEMS:

- None

SYSTEM PROTECTION AND CONTROL ADVISORY GROUP MINUTES
11/8-9/2022

MINUTES

AGENDA ITEM 1 – ADMINISTRATIVE ITEMS

SPCAG Chair John Anderson (Evergy) called the meeting to order at 1:05 PM on 11/8/2022. The meeting reconvened at 8:00 AM on 11/9/2022.

William Holden (SPP) took attendance and established a meeting quorum. A record of member attendance is an attachment to these minutes.

William Holden (SPP) read the SPP Antitrust Statement.

Chairman John Anderson (Evergy) reviewed the agenda and made requested changes:

- Removed the MRO RAM process (Update)

A record of the updated Agenda is an attachment to these minutes.

Steve Wadas (NPPD) motioned to approve the August 9-10, 2022 SPCAG Meeting Minutes. Lynn Schroeder (Sunflower) seconded the motion. The motion carried without opposition or abstention.

AGENDA ITEM 2 – REMEDIAL ACTION SCHEMES

THUNDERHEAD

William Holden (SPP) informed the group that the Thunderhead RAS is conditionally approved by the SPP Reliability Coordinator and is in the process of being activated. The group will be notified once the RAS has been initially activated which will commence the condition period for the RAS in-service not to exceed two years.

RAPID CITY

Jeremy Severson (BEPC) provided an update on the upcoming Rapid City RAS Retirement. The analysis performed by Schweitzer remains underway along with discussions with NPPD.

POLICY REVISION REQUEST

Matt Jackson (SPP) provided an update on the MOPC action item for TWG to coordinate with ORWG to develop policy paper. RR505 (<https://www.spp.org/documents/67644/rr505.zip>) was approved by the TWG and subsequently amended and approved by the ORWG with the

insertion of the sentence in the appendix “The RAS generation thresholds shall be reviewed annually to ensure they are aligned with SPP’s spinning reserve requirements.”.

With the SPCAG having transitioned from a working group to an advisory group, there were no concerns expressed with the removal of the SPCAG as the working group owner of Section 8 of the SPP Planning Criteria as part of RR505.

Glenn Bryson (AEP) stated that implementing “out-of-step” blocking is avoided when possible and often removed from previous applications. From his experience, “out-of-step” tripping has rarely been implemented.

AGENDA ITEM 3 – RATE OF CHANGE SUPERVISED UFLS

Kevin Jones (Xcel) presented on a UFLS program methodology intended to improve frequency response for system separation conditions. There were concerns expressed on the quality of Inverter Based Resource (IBR) modeling and whether the current version of the SPP UFLS plan, https://spp.org/Documents/65486/SPP_PC_UFLS_Plan_Rev_4.7.pdf, evaluated SPS separation from the Eastern Interconnection under light load conditions.

AGENDA ITEM 4 – GRAIN BELT EXPRESS PROJECT

Carlos Rodriguez (Invenergy) and Dan Kell (Hatch) provided an overview of the Grain Belt Express bi-pole high voltage direct current (HVDC) project with an initial phase of 2,500 MW increasing to 5,000 MW at the receiving end. Discussion items included: IBR short circuit current contribution values; Interconnection Agreement (IA) underutilization of reactive power capabilities on sending end; generation tripping response of design may be a Remedial Action Scheme (uncertain at this time whether the 600 MW limit from RR505 would apply); and inclusion of 4-elements of protection relays (not found in the MDAG model) within the forthcoming protection coordination study. An open offer was made for providing HVDC educational sessions.

AGENDA ITEM 5 – SPP SYSTEM PLANNING SHORT CIRCUIT MODEL

Eric Sullivan (SPP) provided an update on the initiative and opportunity for feedback on the current short circuit model development.

Lynn Schroeder (Sunflower) provided a summary of the NERC SPCWG Inter-Entity Short Circuit whitepaper. Discussion items included: challenges with updated models for NERC PRC-027; methods for model validation through comparing imbalance fault currents; and identification of IBR modeling issues when large amounts of negative sequence current are calculated.

Nick Stueve (Evergy) demonstrated a short circuit model comparison tool that requires a bus mapping as a first step.

William Holden (SPP) advised that the annual TPL assessment includes a short circuit analysis with PSS/E ASCC and ANSI calculated 3PH and SLG fault current value results posted to GlobalScape (i.e. Compliance and Advanced Studies (CEII, RSD)\CAS (Global Access)\East\TPL-001\2021\3_Analysis\2_Short_Circuit). Transmission planners should have access to the results which may be utilized for comparison with protection models.

AGENDA ITEM 6 – AMBIENT ADJUSTED RATINGS IMPLEMENTATION TASK FORCE

William Holden (SPP) provided an update on behalf of staff secretary Jack Williamson (SPP). Members discussed that relay settings prescribed in PRC-023 may require review by the NERC SPCWG particularly following details released with FERC Order 881-A. It was stated that voltage supervision is important to prevent trip on load. A concern was expressed on SPP operations implementation of an hourly variable effective limit alarm setpoints.

AGENDA ITEM 7 – THREE TERMINAL LINE WHITEPAPER

John Anderson (Evergy) provided an update that the document has been requested to be posted to the SPCAG page.

AGENDA ITEM 8 – RELIABILITY GROUPS

NERC SPCWG AND LESSONS LEARNED

Lynn Schroeder (Sunflower) provided a presentation with updates on the August and October NERC SPCWG meetings. Liaison reports included IEEE PRSC C37.117 – underfrequency task force to determine if guide should be updated and IRPS PRC-004 – SAR to address IBR issues. Project updates included FERC 881 – group looking at % margin difference with temperature ranges in sample areas and PRC-019 – Implementation Guide and expected Revision to Standards.

No new lessons learned posted since last update for protection. NERC website provided the following link for lessons learned organized by date issued:

<https://www.nerc.com/pa/rrm/ea/Pages/Lessons-Learned.aspx>

SPP NERC

Shannon Mickens (SPP) provided an overview of NERC reliability standards review and resultant white paper by the SPIDERWG for relevancy with increasing levels of Distributed Energy Resources (DER).

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MRO PRS MEETING

David Wheeler (Xcel) communicated that the MRO meeting minutes and agenda were included in the meeting materials.

AGENDA ITEM 9 – IEEE 2800-2022 RESOURCES AND EDUCATION MATERIALS

Manish Patel (Southern Company) provided a brief overview of recently published IEEE Std 2800 which establishes uniform technical minimum requirements for the interconnection, capability, and lifetime performance of inverter-based resources interconnecting with transmission and sub-transmission systems are established in this standard. Included in this standard are performance requirements for reliable integration of inverter-based resources into the bulk power system, including, but not limited to, voltage and frequency ride-through, active power control, reactive power control, dynamic active power support under abnormal frequency conditions, dynamic voltage support under abnormal voltage conditions, power quality, negative sequence current injection, and system protection. This standard also applies to isolated inverter-based resources that are interconnected to an ac transmission system via dedicated voltage source converter high-voltage direct current (VSC-HVDC) transmission facilities; in these cases, the standard applies to the combination of the isolated IBRs and the VSC-HVDC facility, and not to an isolated inverter-based resource (IBR) on its own.

AGENDA ITEM 10 – PROTECTION IN YOUR SHOP

Steve Wadas (NPPD) presented on Cooper PCB3308 internal fault and multiple trips.

AGENDA ITEM 11 – CHAIR AND VICE-CHAIR NOMINATIONS

William Holden (SPP) provided a verbal update on the status of the Chair nomination process for 2023-2024 with Chis Angland (OPPD) as nominee.

Vice-Chair nominations were discussed with a few members requesting some time for consideration. An email vote was agreed upon by the group with a 1-week voting window to commence following staff secretary email receipt of self-nominations.

AGENDA ITEM 12 – CLOSING ADMINISTRATIVE DUTIES

William Holden (SPP) reviewed new, open and closure pending action items.

Action Item 152 was closed following RC Final approval and anticipated implementation of Thunderhead RAS. Action Item 157 remained as Closure pending to allow SPCAG discussion following publication of NERC whitepaper on short circuit models. Action item 161 was closed following whitepaper posting. Action item 162 remains marked as In Progress with SPP

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Planning Modeling staff to present requested topics during SPCAG discussion of Short Circuit Models and analysis. Action item 165 remains marked as In Progress for SPCAG to explore SPP roadmap for short circuit modeling program purchase. Action item 166 remains marked as In Progress for SPCAG to create sub-group for coordination with MDAG. Action item 167 was marked as In Progress to submit an initiative request to improve the MDAG short circuit models for use with system protection and control. Action item 168 was closed following presentation by Manish Patel (Southern Company) on IEEE 2800-2022. A record of action items is an attachment to these minutes.

John Anderson (Evergy) led a discussion on potential topics for the February 8th – 9th, 2023 SPCAG meeting, including:

- Short Circuit Models (standing agenda item): update on initiative and MDAG Focus Group meetings
- MRO RAM Process Audit Experiences
 - Chris Angland
 - Steve Wadas Request for Information and responses
- Protection in your shop:
 - Automation of Wide Area Coordination, SARA (Jeff Beasley (GRDA), Q2 2023)
 - PRC-004 Powerbase Integration Process (Jeff Beasley (GRDA), Q1 2023)
 - Traveling Wave Relays (Michael Fleck (ITC), Q1 2023)
- 2023 meeting schedule
 - February 7-8, 2023 (WebEx)
 - April 25-26, 2023 (WebEx)
 - August 1-2, 2023 (In-Person) (shifted earlier, SEL conference conflict likely 8/8-9)
 - November 7-8, 2023 (In-Person)

SPCAG Chair John Anderson (Evergy) recessed the SPCAG at 5:15 PM on 11/8/2022 and adjourned the SPCAG and at 11:50 PM on 11/9/2022.

Respectfully Submitted,

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William Holden, System Protection and Control Advisory Group, Staff Secretary

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SUMMARY OF ATTACHMENTS:

SPCAG 11/8-9/2022 Agenda (pg. 9-10)

SPCAG 11/8-9/2022 Member Attendance (pg. 11)

SPCAG Action Item Tracking (pg. 12-14)

SPCAG Approved *August 9-10, 2022 SPCAG Meeting Minutes*

SOUTHWEST POWER POOL, INC.

SYSTEM PROTECTION AND CONTROL ADVISORY GROUP MEETING

November 8, 2022 1:00PM - 5:00PM CDT

November 9, 2022 8:30AM - 12:00PM CDT

Evergry Offices, Kansas City, Missouri

AGENDA

1. Administrative Items:
 - a. Call to Order and new members John Anderson
 - b. AttendanceWilliam Holden
 - c. Antitrust Statement.....William Holden
 - d. Agenda Review John Anderson
 - e. Review minutes of August 9-10, 2022 meeting (Approval) John Anderson
2. Remedial Action Schemes: https://spp.org/documents/62226/spp_prc-012-2_process_ei.pdf
 - a. Thunderhead RAS (Update) William Holden (5m)
 - b. Rapid City RAS Retirement (Update)William Holden (5m)
 - c. [RR505](#): Application Criteria (Discussion) Matt Jackson (30m)
3. Rate of Change supervised UFLS (Discussion)..... Kevin Jones (45m)
4. Grain Belt Express Project (Discussion) Carlos Rodriguez (60m)
5. SPP System Planning Short Circuit Model:
 - a. SPP Roadmap Initiative (Update).....Eric Sullivan (30m)
 - b. NERC Short-Circuit Model Technical Report (Discussion)..... Lynn Schroeder (30m)
6. FERC 881 ([AARITE](#)) Impacts on Protection (Discussion).....William Holden (30m)
7. Three Terminal Line Whitepaper (Update).....John Anderson (5m)
8. Reliability Groups (Update):
 - a. NERC SPCWG and Lessons Learned Lynn Schroeder (20m)
 - b. SPP NERCShannon Mickens (30m)
 - c. MRO PRS MeetingDavid Wheeler (5m)
9. IEEE 2800-2022 Resources and Education Materials (Discussion)Manish Patel (60m)
10. Protection in your shop (Discussion)John Anderson (5m)
 - a. Cooper PCB3308 Internal Fault and Multiple Trips.....Steve Wadas (30m)
11. Chair and Vice-Chair nominations John Anderson (10m)

12. Closing Administrative Duties:

- a. Review of New, Open and Closure Pending Actions.....William Holden
- b. Discuss upcoming meeting topics and location John Anderson
 - 2023 schedule
- c. Adjourn meeting John Anderson

SPCAG MEMBER ATTENDANCE:

Name	Company	Role	11/8/2022	11/9/2022
John Anderson	Evergy, Inc	Chair	✓	✓
Chris Angland	Omaha Public Power District	Vice Chair	✓	✓
Jeff Beasley	Grand River Dam Authority	Member	✓	✓
Michael Fleck	ITC Great Plains	Member	✓	✓
Shawn Jacobs	Oklahoma Gas & Electric	Member	✓	✓
David Oswald	Liberty Utilities	Member	✓	✓
Spencer Riddle	Western Area Power Administration Upper Great Plains Region	Member	✓	✓
Lynn Schroeder	Sunflower Electric Power Corp	Member	✓	✓
Steve Wadas	Nebraska Public Power District	Member	✓	✓
David Wheeler	Xcel Energy	Member	✓	✓
Ken Zellefrow	City Utilities of Springfield MO	Member	✓	✓
William Holden	Southwest Power Pool	Staff Secretary	✓	✓

SPCAG ACTION ITEMS

Action Item	Origin Date	Action Item	Update Summary	Status	Owner	Date Closed
152	07/22/20	Zachary Sharp to collect additionally requested material from Invenergy concerning the Thunderhead RAS (relay settings and control schematics), and provide to the SPCWG members for review. Zachary Sharp will set up an ad-hoc meeting for the SPCWG to discuss the material and comments from the ORWG and TWG prior to the scheduled October meeting.	<p>The ORWG delayed taking action on the Thunderhead RAS, negating the need for an ad-hoc meeting.</p> <p>10/14/20: Tom Kay gave an update to the group. Tom is going to research the open protection response time of the DC supply at the Thunderhead station and clarify what the response will be.</p> <p>5/12/21: Trey to send out relay settings to the SPCAG as soon as received. New motion approved 5/11.</p> <p>8/11/21: Thunderhead RAS approved by MOPC in July 2021. Still waiting on relay settings from Invenergy.</p> <p>8/25/21: Relay settings shared with SPCAG.</p> <p>2/9/22: Closure pending implementation of RAS</p> <p>5/11/22: Closure pending implementation of RAS</p> <p>8/10/22: Closure pending implementation of RAS</p> <p>11/9/22: Closed</p>	Closed	William Holden	11/09/22
157	02/10/21	SPP Staff to reach out to SPCAG to determine interest in developing PSSE/ASPEN/CAPE Conversion Whitepaper.	<p>5/12/21: Trey to send list to Lynn, and resend the request for participation.</p> <p>8/11/21: There's a current NERC effort to develop a whitepaper, and the SPP action is on hold until that paper is developed.</p> <p>11/10/21: Closure pending review of NERC paper, Q2 2022.</p> <p>5/11/22: Closure pending review of NERC paper, Q2 2022.</p> <p>8/9/22: Closure pending review of NERC paper, Q4 2022.</p> <p>11/9/22: Closure pending discussion of need for additional whitepaper.</p>	Closure pending	William Holden	

Action Item	Origin Date	Action Item	Update Summary	Status	Owner	Date Closed
161	08/11/21	SPCAG to replace the Recommendation section at the end of the Three Terminal Line Whitepaper with a SPCAG Position section, and post to spp.org.	<p>11/9/21: No progress to report</p> <p>2/9/22: SPP to revise draft whitepaper and pursue posting.</p> <p>5/11/22: Chair and Secretary to revise draft whitepaper and pursue posting.</p> <p>8/10/22: Chair and Secretary to revise draft whitepaper and pursue posting.</p> <p>11/9/22: Closed</p>	Closed	Jeff Beasley Lynn Schroeder Chris Angland William Holden John Anderson	11/09/22
162	11/10/21	SPP Planning Modeling staff to present requested topics during SPCAG discussion of Short Circuit Models and analysis	<p>2/9/22: SPP solicited members for topics, survey being conducted for preferred fault model software with review of results at the May 22' meeting. Zach Sabey committed to provide updates on external Short Circuit data collection efforts.</p> <p>5/11/22: Eric Sullivan (SPP) shared MDAG survey results on short circuit model software and other preferences. The topic for discussion at the August meeting was selected to be update on short circuit build and any quality checks to be discussed.</p> <p>8/9/22: Erin Cathey (SPP) presented on the SPP Roadmap Process, Aspen presented on Short Circuit model conversion, and A/I #167 opened to submit an initiative request to improve the MDAG short circuit models for use with system protection and control</p> <p>11/9/22: Eric Sullivan (SPP) provided an update on the initiative and opportunity for feedback on the current short circuit model development.</p> <p>Lynn Schroeder (SECI) provided a summary of the NERC SPCWG Inter-Entity Short Circuit whitepaper. Nick Stueve (Evergy) demonstrated a short circuit model comparison tool</p>	In progress	Zach Sabey	

Action Item	Origin Date	Action Item	Update Summary	Status	Owner	Date Closed
165	05/11/22	SPCAG to explore SPP Roadmap for Short Circuit modeling program purchase.	8/10/20: Process presented to the group, A/I #167 opened to submit an initiative request to improve the MDAG short circuit models for use with system protection and control 11/9/22: Eric Sullivan (SPP) provided an update on the initiative	In progress	William Holden	
166	05/11/22	SPCAG to create sub-group for coordination with MDAG.	8/10/22: SPCAG members have been attending MDAG Focus Group meetings 11/9/22: Eric Sullivan (SPP) provided an update on opportunity for feedback on the current short circuit model development.	In progress	John Anderson	
167	08/09/22	Submit an initiative request to improve the MDAG short circuit models for use with system protection and control	11/9/22: Eric Sullivan (SPP) provided an update on the initiative	In progress	William Holden	
168	08/10/22	Share available resources and education materials on IEEE 2800-2022 (i.e. NATF webinars)	11/9/22: Closed - Manish Patel (Southern Company) provided a brief overview of recently published IEEE Std 2800	Closed	Lynn Schroeder	11/09/22

**SOUTHWEST POWER POOL
SYSTEM PROTECTION AND CONTROL ADVISORY GROUP MEETING**

Tuesday August 9, 2022 1:00PM - 5:00PM (MPT)
Wednesday August 10, 2022 8:30AM - 12:00PM (MPT)

Xcel Energy Offices, Denver, Colorado

SUMMARY OF MOTIONS AND ACTION ITEMS

MOTIONS:

- Jeff Beasley (GRDA) motioned to approve the May 10-11, 2022 SPCAG Meeting Minutes. David Wheeler (SPS) seconded the motion. The motion carried without opposition or abstention.
- David Wheeler (SPS) motioned to approve the requested change to the previously approved SPP working group review recommendation to the Thunderhead RAS. Jeff Wells (GRDA) seconded the motion. The motion carried without opposition or abstention.

ACTION ITEMS:

- #167: Submit an initiative request to improve the MDAG short circuit models for use with system protection and control.
- #168: Share available resources and education materials on IEEE 2800-2022.
- A poll to determine the expected attendees for the November 8th – 9th SPCAG meeting currently planned to be held at the Evergy offices; 1200 Main Street; Kansas City, MO 64105.

SYSTEM PROTECTION AND CONTROL ADVISORY GROUP MINUTES 8/9-10/2022

MINUTES

AGENDA ITEM 1 – ADMINISTRATIVE ITEMS

SPCAG Chair John Anderson (Evergy, Inc.) called the meeting to order at 1:05 PM on 8/9/2022. New members Spencer Riddle (WAPA) and Michael Fleck (ITC) were welcomed. The meeting reconvened at 8:04 AM on 8/10/2022.

William Holden (SPP) took attendance and established a meeting quorum. A record of member attendance is an attachment to these minutes.

William Holden (SPP) read the SPP Antitrust Statement.

Chairman John Anderson (Evergy, Inc.) reviewed the agenda and made requested changes:

- Adjustment to the Thunderhead RAS item being changed from an update to approval
- Swapped the order of the Three Terminal Line Whitepaper discussion and the Ambient Adjusted Ratings Implementation Task Force update
- Adjustment to the expected duration of the MRO PRS Protection System Commissioning Webinar and Cooper PCB3308 Internal Fault and Multiple Trips
- Addition of PRC-004 Reportable Operation discussion requested by Shawn Jacobs (OKGE)

A record of the updated Agenda is an attachment to these minutes.

Jeff Beasley (GRDA) motioned to approve the May 10-11, 2022 SPCAG Meeting Minutes. David Wheeler (SPS) seconded the motion. The motion carried without opposition or abstention.

AGENDA ITEM 2 – REMEDIAL ACTION SCHEMES

THUNDERHEAD

Arash Ghodsian (Invenergy) requested a change to the previously approved SPP working group review recommendation to the Thunderhead RAS.

Replace:

“Maximum of a two-year time frame of being in-service, with the implementation of the RAS to begin no more than two years prior to the expected in-service date of the “R-Line” or other contingency project”

SYSTEM PROTECTION AND CONTROL ADVISORY GROUP MINUTES 8/9-10/2022

with:

"RAS in-service not to exceed two years".

The requested change was approved by the TWG and ORWG at the August meetings with an ongoing MOPC approval vote.

Chris Angland (OPPD) sought SPPs perspective on the RAS Entity PRC-012-2 Attachment 1 submission. William Holden (SPP) outlined the status of the Thunderhead RAS within the SPP Reliability Coordinator and Planning Coordinator NERC Reliability Standard PRC-012-2 Process Document for the Eastern Interconnection (<https://spp.org/documents/62226/spp%20prc-012-2%20process%20ei.pdf>). The process is initiated with the Attachment 1 submission followed by the SPP Reliability Coordinator (RC) initial review, Working Group review and recommendation, coordination with neighboring RCs, and concluding with the Final SPP RC approval. The currently executed GIA identifies the R-Line (Holt-Thedford-Gentleman 345 kV) as network upgrades with a late 2025 timeline for installation and completion.

David Wheeler (SPS) motioned to approve the requested change to the previously approved SPP working group review recommendation to the Thunderhead RAS. Jeff Wells (GRDA) seconded the motion. The motion carried without opposition or abstention.

CROSSROADS SAGAMORE

David Wheeler (SPS) and William Holden (SPP) confirmed for the group that the SPS Crossroads Sagamore RAS has been successfully retired and decommissioned.

RAPID CITY

Jeremy Severson (BEPC) gave an update on the upcoming Rapid City RAS Retirement. The RAS is no longer expected to be necessary following upgrades to the DC Tie including local control and voltage dependent limiter as well as various new transmission facilities in the area since the RAS was brought on-line. Analysis performed by Schweitzer, to confirm that the RAS is no longer necessary, is underway with study models provided. Study results are anticipated within the next few months.

POLICY REVISION REQUEST

Matt Jackson (SPP) provided an update on the MOPC action item for TWG to coordinate with ORWG to develop policy paper. RR505 (<https://www.spp.org/documents/67644/rr505.zip>) has been posted and is currently in the comment period ending 8/18/2022. The Revision Request

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(RR) Routing Criteria (<https://spp.org/documents/28322/rr%20routing%20criteria.xlsx>) lists TWG as the Primary Working Group, RTWG as the Secondary Working Group, and the RCAG as an Advisory Group. The document states that "as needed Advisory Groups and User Forums (e.g. RCAG, SPCAG, CUF) should be consulted to provide their groups expertise." The SPCAG is not explicitly listed, however, the SPCAG is the currently identified owner of Planning Criteria Section 8 being amended by the RR. Review of comments and continued discussion, particularly on the MW threshold values, is anticipated in the September TWG and ORWG meetings. Any comments from the SPCAG would be beneficial in these discussions.

AGENDA ITEM 3 – SPP SYSTEM PLANNING SHORT CIRCUIT MODEL

Erin Cathey (SPP) presented on the SPP Comprehensive Roadmap Development Process (<https://spp.org/stakeholder-center/spp-roadmap/>) in alignment with SPCAG Action item #165. It was stated that SPP staff involved with the group may submit a request on behalf of the group directly by email to Erin rather than through RMS. An SPP directed impact analysis would commence following submission of an initiative request. The overall SPP initiative portfolio is refreshed annually around October, however new initiative requests are considered at time of submission.

Xu Zhang (Aspen) provided a walkthrough of Aspen Oneliner conversion of a PSS/E .raw file of a network positive sequence model accompanied by a zero sequence data file. The walkthrough included a demonstration of some GUI features of a one-line diagram to illustrate a subset of the network model. The conversion process into ASPEN one-liner is performed by the application as the data files are loaded based on selected conversion options.

Sherman Chan (Aspen) identified no bus limitation to model conversions. Thanh Nguyen (Aspen) confirmed that that a model with 299,646 buses converted without issue. In response to inquiry on software limitations, mutual coupling was identified as having a limit of 800 transmission lines in each group with no other limits changed in recent software versions. It was noted that a 12 character limit had been increased to 16 characters. As part of the software conversion issues, Aspen was stated as using both bus name and kV as a unique identifier vs PSS/E bus number. Aspen allows bus number 0 to be non-unique but all other buses must have a unique number.

Lynn Schroeder (SUNC) inquired about transformer connection code and IBR type variances in conversion or challenges. Thanh Nguyen (Aspen) explained that a single conversion is not an issue, conversion and back again is problematic due to unique identifier variances. Transformers in Aspen are represented from a set of options, some PSS/E formats are incompatible and data may be lost during conversion. There is a log file with data conversion issues that outlines any conversion issues encountered.

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SYSTEM PROTECTION AND CONTROL ADVISORY GROUP MINUTES 8/9-10/2022

Steve Wadas (NPPD) inquired on whether there was a way to compare planning and protections models for a subsystem. It was stated that data submission for positive sequence models often don't include proper connection codes for transformers which is a common variance in models across systems.

Thanh Nguyen (ASPEN) stated that IBRs may require manual action for appropriate representation. It was also discussed that zero Impedance branches are represented with a small impedance branch to facilitate computation. Additional questions may be submitted to support@aspeninc.com.

Lynn Schroeder (SECI) provided an update on the NERC SPCWG Inter-Entity Short Circuit whitepaper approval process which is anticipated to be approved at the September RSTC meeting prior to posting on the SPCWG page. Highlights under best practices included: annual or more frequent review of neighboring system, equivalencing 2-3 buses into neighboring system, bus number consistency, and quality assurance checks for N-1 conditions. Highlights under recommendations included: short circuit models provided in short circuit software rather than powerflow software, converted models should be fully validated, acquisition and inclusion of neighboring system data, modeling of IBRs is evolving and requires improvement, system-wide model rather than boundary equivalents at tie-lines, boundary equivalents for conditions beyond peak, improved method for efficient data exchange between short-circuit software.

Chris Angland (OPPD) highlighted that the recommendations stated that converted models should be fully validated. Jeff Beasley (GRDA) noted that current coordination with some adjacent areas results in model data that is missing sequence data. John Anderson (Evergy) mentioned that from past experience newer resources seem to be represented with initial facility data for several years following commercial operation.

Eric Sullivan (SPP) presented on the background on the current SPP process and options to provide an SPP developed Aspen short circuit model. Impact assessments following an initiative submission will determine impacts from various groups including man-hours and other anticipated costs.

Action item #167 was created for SPP staff (William and Eric) to develop a draft initiative request to improve the MDAG short circuit models for use with system protection and control in coordination with Steve Wadas (NPPD), Lynn Schroeder (SUNC), and John Anderson (Evergy) for submission by mid-September. Status update to be brought back at the November meeting.

SYSTEM PROTECTION AND CONTROL ADVISORY GROUP MINUTES 8/9-10/2022

AGENDA ITEM 4 – INDUSTRY REC'S AND STANDARDS ON IBR INTERCONNECTION

Doug Bowman (SPP) presented on Industry recommendations and standards on Inverter Based Resource interconnection. The direction from discussion at the TWG is for SPP Staff to internally develop and pursue an implementation plan in lieu of the initial recommendation for a TWG Task Force.

Jeff Beasley (GRDA) expressed concern with impacts related to IBR response degrading system protection and controls. Differential relays on each resource interconnection radial will alleviate some of these concerns.

Steve Wadas (NPPD) sought interest from the group to learn more about IEEE 2800. This topic was requested by members to be included in the agenda for discussion at a future meeting. Jeff Beasley (GRDA) offered to provide some overview bullets. Lynn Schroeder (SUNC) mentioned available resources via NATF IEEE webinars, asked to request shareable versions be provided. Michael Fleck (ITC) mentioned associated EPRI webinars and inquired into inclusion of provisions into TO GIA requirements.

Action item #168 was created for available resources and education materials on IEEE 2800-2022 (i.e. NATF webinars) to be shared with the group.

AGENDA ITEM 5 – FAC-008-5

Michael Fleck (ITC) presented on experience with FAC-008-5 including a method to replace a circuit based approach with a node breaker based approach for considering secondary circuitry and a recent audit.

Louis Guidry (Cleco) shared a perspective on the applicability of a current transformer (CT) to determine line ratings. CTs used in high voltage applications, do not have a primary conductor and only conduct secondary currents through magnetic coupling. The primary rating of the CT is only a derived value from the ratio of secondary turns and it does not represent an actual ampacity rating of a primary conductor. The CT does not affect or limit the continuous current carrying capacity of the facility. It was stated that at least a few utilities, which exclude CT limitations from facility ratings, have been audited across various Reliability Entity regions without findings or concerns with this approach.

AGENDA ITEM 6 – AMBIENT ADJUSTED RATINGS IMPLEMENTATION TASK FORCE

Jason Bulloch (SPP) staff secretary of the AARITF provided an overview of the meetings and summarized outcomes. Notified the group of the staff secretary position transitioning to Jack

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Williamson (SPP) due to a transfer. The group is asked to assess potential impacts to protection systems, documents under the SPCAG, and on-going NERC efforts for discussion at the Q4 2022 SPCAG meeting.

AGENDA ITEM 7 – THREE TERMINAL LINE WHITEPAPER

John Anderson (Evergy, Inc.) provided an update on the status of the paper. William Holden (SPP) and John Anderson will coordinate to update the figure prior to posting the document on the SPCAG page.

AGENDA ITEM 8 – RELIABILITY GROUPS

NERC SPCWG AND LESSONS LEARNED

Lynn Schroeder (Sunflower) provided an update from the May meeting of the NERC SPCWG. Topics included: PRC-025-2 Hybrid Plants, Liaison Updates - IEEE & IRPS, February 2021 Cold weather recommendation 22 approval, Inter-Entity Short Circuit whitepaper, Compliance Implementation Guidance, and FERC 881 Discussion. There were no new lessons learned posted since the prior SPCAG meeting.

SPP NERC

Shannon Mickens (SPP) gave updates on the status of modifications to PRC-024, PRC-002-4, PRC-023-4, and Reliability Guideline - BPS-Connected Inverter-Based Resource Performance.

MRO PRS MEETING

David Wheeler (SPS) shared the agenda for the upcoming meeting and provided an overview of the topics.

MRO PRS PROTECTION SYSTEM COMMISSIONING WEBINAR

Jeff Beasley (GRDA) gave an overview of the webinar events discussion of Protection System Commissioning Report and best practices to avoid associated mis-operations.

AGENDA ITEM 9 – PROTECTION IN YOUR SHOP

Steve Wadas (NPPD) deferred his presentation on Cooper PCB3308 internal fault and multiple trips until the Q4 2022 meeting.

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AGENDA ITEM 10 – PRC-004 REPORTABLE OPERATION

Shawn Jacobs (OKGE) led a discussion on whether BES equipment operation from a direct transfer trip from non-BES equipment may be either a reportable operation or mis-operation. The information shared with the group along with the reference MIDAS DRI document (https://www.nerc.com/pa/RAPA/Documents/MIDAS_DRI_2022.pdf) supported a mutual understanding by the group that the discussed operation situation was not reportable.

AGENDA ITEM 11 – CHAIR AND VICE-CHAIR NOMINATIONS

William Holden (SPP) provided a verbal update on the status of the Chair nomination process for 2023-2024. John Anderson (Evergy) provided his intent not to seek continuation as SPCAG Chair. Nominations were solicited by email with a single nomination received. Chis Angland (OPPD) was nominated and received a unanimous recommendation by the group over email. The nomination and recommendation were shared for consideration by the Corporate Governance Committee nominee selection and subsequently for the Chair appointment by the Board of Directors. **Email notices will be provided to members as the process progresses.**

Vice-Chair nominations will occur during the November 8th – 9th, 2022 SPCAG meeting.

AGENDA ITEM 12 – CLOSING ADMINISTRATIVE DUTIES

William Holden (SPP) reviewed new, open and closure pending action items.

Action Item 152 remained as Closure pending until RC Final approval and implementation of Thunderhead RAS. Action Item 157 remained as Closure pending to allow SPCAG discussion following publication of NERC whitepaper on short circuit models. Action item 161 remains as In Progress with Chair and Secretary to revise draft whitepaper and pursue posting. Action item 162 remains marked as In Progress with SPP Planning Modeling staff to present requested topics during SPCAG discussion of Short Circuit Models and analysis. Action item 165 remains marked as In Progress for SPCAG to explore SPP roadmap for short circuit modeling program purchase. Action item 166 remains marked as In Progress for SPCAG to create sub-group for coordination with MDAG. Action item 167 was created to submit an initiative request to improve the MDAG short circuit models for use with system protection and control. Action item 168 was created to share available resources and education materials on IEEE 2800-2022. A record of action items is an attachment to these minutes.

John Anderson (Evergy, Inc.) led a discussion on potential topics for the November 8th – 9th, 2022 SPCAG meeting, including:

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- Short Circuit Models (standing agenda item): update on initiative and MDAG Focus Group meetings
- Education materials on IEEE 2800-2022
- Protection in your shop:
 - Internal fault and multiple trips (Steve Wadas (NPPD), Q4 2022)
 - Automation of Wide Area Coordination, SARA (Jeff Beasley (GRDA), Q1 2023)
 - Traveling Wave Relays (future topic, no users to date)
- Vice-Chair nominations
- 2023 meeting schedule

William Holden (SPP) informed the group that the SPP meeting criteria list a guideline of at least 10 expected attendees for in-person meetings. A poll will be sent out to determine the expected attendees for the November 8th – 9th SPCAG meeting currently planned to be held at the Evergy offices; 1200 Main Street; Kansas City, MO 64105. In the event that the expected attendees is insufficient the meeting may need to be converted to a net conference.

SPCAG Chair John Anderson (Evergy, Inc.) recessed the SPCAG at 4:42 PM on 8/9/2022 and adjourned the SPCAG and at 12:00 PM on 8/10/2022.

Respectfully Submitted,

William Holden, System Protection and Control Advisory Group, Staff Secretary

**SYSTEM PROTECTION AND CONTROL ADVISORY GROUP MINUTES
8/9-10/2022**

SUMMARY OF ATTACHMENTS:

SPCAG 8/9-10/2022 Agenda (pg. 11-12)

SPCAG 8/9-10/2022 Member Attendance (pg. 13)

SPCAG Action Item Tracking (pg. 14-15)

SOUTHWEST POWER POOL, INC.

SYSTEM PROTECTION AND CONTROL ADVISORY GROUP MEETING

August 9, 2022 1:00PM - 5:00PM MDT (2:00PM - 6:00PM CDT)

August 10, 2022 8:00AM - 12:00PM MDT (9:00AM - 1:00PM CDT)

Xcel Energy Offices, Denver, Colorado

AGENDA

1. Administrative Items:
 - a. Call to Order and new members John Anderson
 - b. AttendanceWilliam Holden
 - c. Antitrust Statement.....William Holden
 - d. Agenda Review John Anderson
 - e. Review minutes of May 10-11, 2022 meeting (Approval) John Anderson
2. Remedial Action Schemes: https://spp.org/documents/62226/spp_prc-012-2_process_ei.pdf
 - a. Proposed Thunderhead RAS (Approval)Arash Ghodsian (15m)
 - b. Sagamore Retirement (Update).....William Holden (5m)
 - c. Rapid City RAS Retirement (Update) Jeremy Severson (5m)
 - d. Policy RR (Update)..... Matt Jackson (15m)
3. SPP System Planning Short Circuit Model:
 - a. SPP Roadmap Initiative Process: A/I #165 (Update).....Erin Cathey (10m)
 - b. [MDAG](#) Focus Group: A/I #166 (Update)..... Lynn Schroeder (10m)
 - c. NERC SPCWG whitepaper (Update)..... Lynn Schroeder (10m)
 - d. Model conversion (Update)Thanh Nguyen (ASPEN Inc.) (30m)
 - e. SPCAG Activities (Discussion).....Eric Sullivan (60m)
4. Industry Rec’s and Standards on IBR Interconnection (Discussion).....Doug Bowman (60m)
5. FAC-008-5 (Discussion)..... Michael Fleck (30m)
6. [Ambient Adjusted Ratings Implementation Task Force](#) (Update)..... Jason Bulloch (10m)
7. Three Terminal Line Whitepaper (Discussion) John Anderson (10m)
8. Reliability Groups (Update):
 - a. NERC SPCWG and Lessons Learned Lynn Schroeder (20m)
 - b. SPP NERCShannon Mickens (30m)
 - Project 2020-02 Modifications to PRC-024 (Generator Ride-through)

- Project 2021-04 Modifications to PRC-002
- Project 2021-05 Modifications to PRC-023-4
- BPS-Connected Inverter-Based Resource Performance
- c. MRO PRS MeetingDavid Wheeler (5m)
- d. MRO PRS Protection System Commissioning Webinar..... Jeff Beasley (20m)
- 9. Protection in your shop (Discussion)John Anderson (5m)
 - a. Cooper PCB3308 Internal Fault and Multiple Trips.....Steve Wadas (30m)
- 10. PRC-004 Reportable Operation (Discussion).....Shawn Jacobs (10m)
- 11. Chair and Vice-Chair nominations John Anderson (10m)
- 12. Closing Administrative Duties:
 - a. Review of New, Open and Closure Pending Actions.....William Holden
 - b. Discuss upcoming meeting topics and location John Anderson
 - 11/8-9/2022 (Eversource location in Kansas City, MO)
 - 2023 schedule
 - c. Adjourn meeting John Anderson

SPCAG MEMBER ATTENDANCE:

Name	Company	Role	8/9/2022	8/10/2022
John Anderson	Evergy, Inc	Chair	✓	✓
Chris Angland	Omaha Public Power District	Vice Chair	✓	✓
Jeff Beasley	Grand River Dam Authority	Member	✓	✓
Michael Fleck	ITC Great Plains	Member	✓	✓
Shawn Jacobs	Oklahoma Gas & Electric	Member	✓	✓
David Oswald	Liberty Utilities	Member		
Spencer Riddle	Western Area Power Administration Upper Great Plains Region	Member	✓	✓
Lynn Schroeder	Sunflower Electric Power Corp	Member	✓	✓
Steve Wadas	Nebraska Public Power District	Member	✓	✓
David Wheeler	Xcel Energy	Member	✓	✓
Ken Zellefrow	City Utilities of Springfield MO	Member		
William Holden	Southwest Power Pool	Staff Secretary	✓	✓

SPCAG ACTION ITEMS

Action Item	Origin Date	Action Item	Update Summary	Status	Owner	Date Closed
152	07/22/20	Zachary Sharp to collect additionally requested material from Invenergy concerning the Thunderhead RAS (relay settings and control schematics), and provide to the SPCWG members for review. Zachary Sharp will set up an ad-hoc meeting for the SPCWG to discuss the material and comments from the ORWG and TWG prior to the scheduled October meeting.	<p>The ORWG delayed taking action on the Thunderhead RAS, negating the need for an ad-hoc meeting.</p> <p>10/14/20: Tom Kay gave an update to the group. Tom is going to research the open protection response time of the DC supply at the Thunderhead station and clarify what the response will be.</p> <p>5/12/21: Trey to send out relay settings to the SPCAG as soon as received. New motion approved 5/11.</p> <p>8/11/21: Thunderhead RAS approved by MOPC in July 2021. Still waiting on relay settings from Invenergy.</p> <p>8/25/21: Relay settings shared with SPCAG.</p> <p>2/9/22: Closure pending implementation of RAS</p> <p>5/11/22: Closure pending implementation of RAS</p> <p>8/10/22: Closure pending implementation of RAS</p>	Closure pending	William Holden	
157	02/10/21	SPP Staff to reach out to SPCAG to determine interest in developing PSSE/ASPEN/CAPE Conversion Whitepaper.	<p>5/12/21: Trey to send list to Lynn, and resend the request for participation.</p> <p>8/11/21: There's a current NERC effort to develop a whitepaper, and the SPP action is on hold until that paper is developed.</p> <p>11/10/21: Closure pending review of NERC paper, Q2 2022.</p> <p>5/11/22: Closure pending review of NERC paper, Q2 2022.</p> <p>8/9/22: Closure pending review of NERC paper, Q4 2022.</p>	Closure pending	William Holden	
161	08/11/21	SPCAG to replace the Recommendation section at the end of the Three Terminal Line Whitepaper with a SPCAG Position section, and post to spp.org.	<p>11/9/21: No progress to report</p> <p>2/9/22: SPP to revise draft whitepaper and pursue posting.</p> <p>5/11/22: Chair and Secretary to revise draft whitepaper and pursue posting.</p> <p>8/10/22: Chair and Secretary to revise draft whitepaper and pursue posting.</p>	In progress	Jeff Beasley Lynn Schroeder Chris Angland	

Action Item	Origin Date	Action Item	Update Summary	Status	Owner	Date Closed
					William Holden John Anderson	
162	11/10/21	SPP Planning Modeling staff to present requested topics during SPCAG discussion of Short Circuit Models and analysis	<p>2/9/22: SPP solicited members for topics, survey being conducted for preferred fault model software with review of results at the May 22' meeting. Zach Sabey committed to provide updates on external Short Circuit data collection efforts.</p> <p>5/11/22: Eric Sullivan (SPP) shared MDAG survey results on short circuit model software and other preferences. The topic for discussion at the August meeting was selected to be update on short circuit build and any quality checks to be discussed.</p> <p>8/9/22: Erin Cathey (SPP) presented on the SPP Roadmap Process, Aspen presented on Short Circuit model conversion, and A/I #167 opened to submit an initiative request to improve the MDAG short circuit models for use with system protection and control</p>	In progress	Zach Sabey	
165	05/11/22	SPCAG to explore SPP Roadmap for Short Circuit modeling program purchase.	8/10/20: Process presented to the group, A/I #167 opened to submit an initiative request to improve the MDAG short circuit models for use with system protection and control	In progress	William Holden	
166	05/11/22	SPCAG to create sub-group for coordination with MDAG.	8/10/22: SPCAG members have been attending MDAG Focus Group meetings	In progress	John Anderson	
167	08/09/22	Submit an initiative request to improve the MDAG short circuit models for use with system protection and control		Not Started	William Holden	
168	08/10/22	Share available resources and education materials on IEEE 2800-2022 (i.e. NATF webinars)		Not Started	Lynn Schroeder	