

Meeting Agenda

MRO Protective Relay Subgroup

**February 16, 2021 – 8:00 a.m. to 11:00 a.m. and
1:00 p.m. – 4:00 p.m.**

Webex



**MIDWEST
RELIABILITY
ORGANIZATION**

380 St. Peter St, Suite 800
Saint Paul, MN 55102

651-855-1760

www.MRO.net

VIDEO AND AUDIO RECORDING

Please note that Midwest Reliability Organization (MRO) may make a video and/or an audio recording of this organizational group meeting for the purposes of making this information available to board members, members, stakeholders and the general public who are unable to attend the meeting in person.

By attending this meeting, I grant MRO:

1. Permission to video and/or audio record the meeting including me; and
2. The right to edit, use, and publish the video and/or audio recording.
3. I understand that neither I nor my employer has any right to be compensated in connection with the video and/or audio recording or the granting of this consent.

MRO ORGANIZATIONAL GROUP GUIDING PRINCIPLES

These MRO Organizational Group Guiding Principles complement charters. When the Principles are employed by members, they will support the overall purpose of the organizational groups.

Organizational Group Members should:

1. Make every attempt to attend all meetings in person or via webinar.
2. Be responsive to requests, action items, and deadlines.
3. Be active and involved in all organizational group meetings by reviewing all pre-meeting materials and being focused and engaged during the meeting.
4. Be self-motivating, focusing on outcomes during meetings and implementing work plans to benefit MRO and MRO's registered entities.
5. Ensure that the organizational group supports MRO strategic initiatives in current and planned tasks.
6. Be supportive of Highly Effective Reliability Organization (HERO™) principles.
7. Be supportive of proactive initiatives that improve effectiveness and efficiency for MRO and MRO's registered entities.

MEETING AGENDA

Agenda Item	
1	Call to Order and Introduction <i>John Grimm, PRS Chair</i> <ul style="list-style-type: none">a. Determination of Quorum and Introductions <i>Mike Bocovich, PRS Technical Liaison</i>b. Standards of Conduct and Anti-Trust Guidelinesc. Robert's Rules of Order
2	Consent Agenda <i>John Grimm, PRS Chair</i> <ul style="list-style-type: none">a. Approve November 17, 2020 PRS Meeting Minutesb. Approve February 16, 2021 PRS Meeting Agenda
3	Chair's Report <i>John Grimm, PRS Chair</i>
4	Secretary's Report <i>Mike Bocovich, PRS Technical Liaison</i>
5	PRS Business <i>Mike Bocovich, PRS Technical Liaison</i> <ul style="list-style-type: none">a. Member for Oklahoma Localeb. PRS Leadershipc. Welcome to PRS Presentation
6	Short Circuit Model Updates and Sharing with Adjacent Entities <i>Larry Brusseau, Cornbelt Power</i> <i>Tyler Baxter, Cornbelt Power</i>
7	NERC Activities <ul style="list-style-type: none">a. Update on NERC SPCWG <i>Mark Gutzmann Director, System Protection & Communication Engineering, Xcel Energy</i>b. NERC MIDASUG Update <i>Mike Bocovich, PRS Technical Liaison</i>c. FERC/NERC Protection System Commissioning Program Review <i>Mike Bocovich, PRS Technical Liaison</i>
8	Misoperations <i>Mike Bocovich, PRS Technical Liaison</i> <ul style="list-style-type: none">a. Third Quarter 2020 Results and Reviewb. Technical Discussions<ul style="list-style-type: none">i. ITC Midwest Derecho Event Relay Operations <i>Sammani Ahmed and Wayne Miller, ITC Midwest</i>c. Project Updates<ul style="list-style-type: none">i. Static Output Driving High Impedance Inputsii. Instantaneous Ground Overcurrent
9	Event Analysis Report <i>Jake Bernhagen, MRO Sr. Systems Protection Engineer, David Kuyper, MRO Power System Engineer</i>
10	Update on SPS Review Team Activities <i>David Kuyper, MRO Power Systems Engineer</i>

Meeting Agenda – MRO Protective Relay Subgroup – February 16, 2021

Agenda Item	
11	PRS Roundtable Discussion <i>John Grimm, PRS Chair</i>
12	Upcoming PRS Meeting Dates <i>Mike Bocovich, PRS Technical Liaison</i> Tuesday, May 25, 2021 Tuesday, August 17, 2021 Tuesday, November 16, 2021
13	Other Business and Adjourn <i>John Grimm, PRS Chair</i>

AGENDA 1

Call to Order and Introductions

a. Determination of Quorum and Introductions

Mike Bocovich, PRS Technical Liaison

Name	Locale	Company	Term
John Grimm, Chair	Minnesota	Northern States Power	12/31/2022
Robert Soper, Vice Chair	Dakotas	Western Area Power Administration	12/31/2022
Alex Bosgoed	Canada	Saskatchewan Power Company	12/31/2022
Casey Malskeit	Nebraska	Omaha Public Power District	12/31/2022
Cody Remboldt	Dakotas	Montana-Dakota Utilities	12/31/2021
David Wheeler	AR/TX/LA/NM	Southwestern Public Services Co.	12/31/2023
Dennis Lu	Canada	Manitoba Hydro	12/31/2023
Derek Vonada	Kansas/Missouri	Sunflower Electric Power Cooperative	12/31/2022
Derrick Schlangen	Minnesota	Great River Energy	12/31/2023
Open	Oklahoma		12/31/2022
Gary Stoedter	Regional	MidAmerican Energy Company	12/31/2021
Greg Hill	Nebraska	Nebraska Public Power District	12/31/2022
Greg Sessler	Wisconsin	American Transmission Company	12/31/2023
Jeff Beasley	Regional	Grand River Dam Authority	12/31/2021
Ryan Einer	Oklahoma	Oklahoma Gas & Electric Co.	12/31/2023
Ryan Godwin	AR/TX/LA/NM	American Electric Power	12/31/2021
Scott Paramore	Kansas/Missouri	Kansas City Board of Public Utility	12/31/2021
Terry Fett	Iowa	Central Iowa Power Cooperative	12/31/2023
Wayne Miller	Iowa	ITC Holdings	12/31/2021

AGENDA 1

Call to Order and Introductions

b. Standards of Conduct and Anti-Trust Guidelines

John Grimm, PRS Chair

Standards of Conduct Reminder:

Standards of Conduct prohibit MRO staff, committee, subgroup, and task force members from sharing non-public transmission sensitive information with anyone who is either an affiliate merchant or could be a conduit of information to an affiliate merchant.

Anti-trust Reminder:

Participants in Midwest Reliability Organization meeting activities must refrain from the following when acting in their capacity as participants in Midwest Reliability Organization activities (i.e. meetings, conference calls, and informal discussions):

- Discussions involving pricing information; and
- Discussions of a participants marketing strategies; and
- Discussions regarding how customers and geographical areas are to be divided among competitors; and
- Discussions concerning the exclusion of competitors from markets; and
- Discussions concerning boycotting or group refusals to deal with competitors, vendors, or suppliers.

AGENDA 1

Call to Order and Introductions

c. Robert's Rules of Order

John Grimm, PRS Chair

Parliamentary Procedures. Based on Robert's Rules of Order, Newly Revised, Tenth Edition

Establishing a Quorum. In order to make efficient use of time at MRO organizational group meetings, once a quorum is established, the meeting will continue, however, no votes will be taken unless a quorum is present at the time any vote is taken.

Motions. Unless noted otherwise, all procedures require a "second" to enable discussion.

When you want to...	Procedure	Debatable	Comments
Raise an issue for discussion	Move	Yes	The main action that begins a debate.
Revise a Motion currently under discussion	Amend	Yes	Takes precedence over discussion of main motion. Motions to amend an amendment are allowed, but not any further. The amendment must be germane to the main motion, and cannot reverse the intent of the main motion.
Reconsider a Motion already resolved	Reconsider	Yes	Allowed only by member who voted on the prevailing side of the original motion. Second by anyone.
End debate	Call for the Question <i>or</i> End Debate	No	If the Chair senses that the committee is ready to vote, he may say "if there are no objections, we will now vote on the Motion." Otherwise, this motion is not debatable and subject to majority approval.
Record each member's vote on a Motion	Request a Roll Call Vote	No	Takes precedence over main motion. No debate allowed, but the members must approve by majority.
Postpone discussion until later in the meeting	Lay on the Table	Yes	Takes precedence over main motion. Used only to postpone discussion until later in the meeting.
Postpone discussion until a future date	Postpone until	Yes	Takes precedence over main motion. Debatable only regarding the date (and time) at which to bring the Motion back for further discussion.

Meeting Agenda – MRO Protective Relay Subgroup – February 16, 2021

Remove the motion for any further consideration	Postpone indefinitely	Yes	Takes precedence over main motion. Debate can extend to the discussion of the main motion. If approved, it effectively “kills” the motion. Useful for disposing of a badly chosen motion that cannot be adopted or rejected without undesirable consequences.
Request a review of procedure	Point of order	No	Second not required. The Chair or secretary shall review the parliamentary procedure used during the discussion of the Motion.

Notes on Motions

Seconds. A Motion must have a second to ensure that at least two members wish to discuss the issue. The “second” is not required to be recorded in the minutes. Neither are motions that do not receive a second.

Announcement by the Chair. The chair should announce the Motion before debate begins. This ensures that the wording is understood by the membership. Once the Motion is announced and seconded, the Committee “owns” the motion, and must deal with it according to parliamentary procedure.

Voting

Voting Method	When Used	How Recorded in Minutes
	When the Chair senses that the Committee is substantially in agreement, and the Motion needed little or no debate. No actual vote is taken.	The minutes show “by unanimous consent.”
Vote by Voice	The standard practice.	The minutes show Approved or Not Approved (or Failed).
Vote by Show of Hands (tally)	To record the number of votes on each side when an issue has engendered substantial debate or appears to be divisive. Also used when a Voice Vote is inconclusive. (The Chair should ask for a Vote by Show of Hands when requested by a member).	The minutes show both vote totals, and then Approved or Not Approved (or Failed).

Meeting Agenda – MRO Protective Relay Subgroup – February 16, 2021

Vote by Roll Call	To record each member's vote. Each member is called upon by the Secretary, and the member indicates either "Yes," "No," or "Present" if abstaining.	The minutes will include the list of members, how each voted or abstained, and the vote totals. Those members for which a "Yes," "No," or "Present" is not shown are considered absent for the vote.
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Notes on Voting.

Abstentions. When a member abstains, he/she is not voting on the Motion, and his/her abstention is not counted in determining the results of the vote. The Chair should not ask for a tally of those who abstained.

Determining the results. A simple majority of the votes cast is required to approve an organizational group recommendations or decision.

"Unanimous Approval." Can only be determined by a Roll Call vote because the other methods do not determine whether every member attending the meeting was actually present when the vote was taken, or whether there were abstentions.

Electronic Votes – For an e-mail vote to pass, the requirement is a simple majority of the votes cast during the time-period of the vote as established by the Committee Chair.

Majorities. Per Robert's Rules, as well as MRO Policy and Procedure 3, a simple majority (one more than half) is required to pass motions.

AGENDA 2

Consent Agenda

- a. Approve November 17, 2020 PRS Meeting Minutes

John Grimm, PRS Chair

Action

Approve November 17, 2020 PRS meeting minutes.

Report

November 17, 2020 PRS Meeting Minutes attached.



Draft Minutes of the Protective Relay Subgroup (PRS) Meeting

Webex

November 17, 2020 8:02 a.m. – 11:00 a.m. Central Daylight Savings

1:00 p.m. – 3:41 p.m. Central Daylight Savings

1. Call to Order and Introductions

PRS Chair John Grimm called the meeting to order at 8:02 a.m. Chair Grimm extended a warm welcome to all attendees, roll call was taken and introductions were made.

2. Determination of Quorum, Standards of Conduct, and Anti-Trust Guidelines

The meeting secretary Mike Bocovich determined that a quorum was present. A complete list of attendees is included as [Exhibit A](#). Pursuant to Policy and Procedure 4, MRO's Standards of Conduct, Conflict of Interest and Anti-Trust Guidelines were presented.

3. Consent Agenda

a. Approve August 11, 2020 PRS Meeting Minutes

The minutes were presented and Chair Grimm noted they were provided in the packet. Chair Grimm asked for any comments, hearing none he asked for a motion to approve.

Upon a motion duly made and seconded, the Protective Relay Subgroup unanimously approved the minutes from the August 11, 2020 PRS Meeting as drafted

b. Approve November 17, 2020 PRS Meeting Agenda

The Agenda was presented and Chair Grimm provided a brief overview and asked for any additional items, noting that Agenda 6 will take place during a closed meeting at 11:00 a.m. Bocovich noted that Agenda 8c will be stricken. Jeff Beasley asked for an update from Greg Sessler regarding PRC-027 and asked for follow up, which will be added to the PRS Roundtable. Chair Grimm noted that Terry Volkmann could also provide an update on TPL-001 activities during the roundtable as well. Chair Grimm asked for any opposition to the Agenda as edited, hearing none the Agenda was approved.

Upon a motion duly made and seconded, the Protective Relay Subgroup unanimously approved the November 17, 2020 PRS Meeting Agenda.

4. Chair's Report

Chair John Grimm welcomed attendees, noting this was the last meeting for 2020 and mentioned there will be a two hour break from 11:00 am to 1:00 pm. Chair Grimm commented on the closed meeting to vote on new members and the timing of that meeting. Chair Grimm directed everyone to the Robert's Rules of Order which are included in the packet.

5. Secretary's Report

PRS Liaison Mike Bocovich extended a welcome and provided an overview, noting that MRO will be working off site until 4/1/2021 with the caveat that COVID could extend that even more.



PRS Member Ryan Godwin left the meeting at 9:00 a.m. and returned at 10:45 a.m.

6. PRS Business

a. PRS Nominee Review

Bocovich mentioned the logistics of the PRS, members and locations within the footprint, terms and nomination period. Most positions are not contested with Minnesota and Iowa being the exception. The members will join a closed meeting, listen to the nominees' overview, after nominees are excused, have a discussion and then a vote for new members will transpire. The outcome will be presented after the break. Membership gives you the right to vote on the Agenda and minutes, but all participants are welcome to contribute whether a member or not and it is appreciated.

7. NERC Activities

a. Update on NERC SPCS

Mark Gutzmann provided an overview of the NERC System Protection and Control Working Group. The working group is working a number of items particularly work on the PRC-023 standard authorization request to remove R2 from the standard and with it several modification exclusions. This is in the standard subcommittee at NERC. PRC-019 compliance implementation guidance document is being worked on and was endorsed by the reliability and security technical committee on September 15. There is a PRC-024 compliance implementation guidance white paper being worked on actively. A Technical Report on Inverter Based Resources (IBR) is being worked on regarding impact of IBR on protection systems. There was a recent webinar on testing AC quantities, the webinar was recorded.

b. NERC MIDASWG Update

Mike Bocovich commented that there are some changes in reporting for MIDAS beginning in 2021, such as a new template; adding overcurrent on systems schemes, and consolidation of some items. These changes will be reflected in data reporting instruction in January of 2021. This will mostly affect the voluntary data, and will be implemented in the Q4 of 2020 reporting. MRO strongly encourages MIDAS completion of the voluntary data in the MIDAS submittals. There are no changes to the 1600 data request approved by FERC, those can't be changed. There could be changes in the future but not this year. Please use the new template when its time to make MIDAS submittal. Bocovich was asked to receive the modifications in advance for efficiency in reporting, as soon as the template is available a notice will be sent to the MIDAS mailing list. Any questions on MIDAS reporting please contact Mike Bocovich.

c. FERC/NERC Protection System Commissioning Program Review

Bocovich noted surveys have been sent and returned so it is up to ERO to review the answers on the surveys and look at best practices in areas that could be improved on. Participation was noted as high from members with good responses.



8. Misoperations

a. Second Quarter 2020 Results and Overview

Mike Bocovich presented data and provided an overview on misoperations data for 2020. Highlighting the comparison of 2020 to 2019 and 2018, he noted one remarkable item, which is the operations count which is almost 2/3 lower compared to previous years, bringing the misoperation rate down from Quarter 1. Bocovich further noted, fewer events and faults during the winter. Misoperations occurring that don't involve faults don't deviate as much quarter to quarter which may influence a higher misop rate when total operations are down. Bocovich stressed that investigation of the unknown and unexplainable should be completed and once it is determined to please update the MIDAS reporting to bring that number of unknowns down. Discussion ensued regarding cause code. Bocovich noted everyone is welcome to bring any issues to the PRS group to discuss and offer guidance or solutions at the next meeting. Bocovich informed the group that if you would like different data to be presented contact him to acquiesce as long as it is not entity specific information.

The PRS recessed for break at 9:25 a.m. and reconvened at 9:35 a.m.

b. Minnesota Power System Conference Submittal regarding Misoperations

John Grimm and Mike Bocovich presented the "Analysis of Composite Protection System Misoperations" which was presented November 4, at the 2020 MIPSYCON. It was noted the presentation and recording will be available on MRO's website in the near future and a PDF version should be available now on the MIPSYCON website. Discussion ensued.

c. Technical Discussions. Greg Sessler responded to a PRC-027 question that was posed on the NATF discussion board. There were four responses to the discussion board posting, most are considering settings completed prior to April 1 would not be included in an audit as evidence. The may collect it, but it would not be included as audit evidence.

d. Lessons Learned Updates

i. SF6 Breaker Cold Weather Operations

John Seidel provided an update on the current status of the lessons learned noting it was reviewed and approved by NERC with minor changes. The lessons learned was posted November 12. Several takeaways were noted. South of the Canadian border, dead tank breakers are very predominant. Dead tank breakers are very reliant on the heaters during severe cold. Thing to do to improve availability is to: conduct inspections; alarm if there is a failure of the heater to ensure you can fix it before it becomes an issue; and assure if the breaker is compromised, the EMS and RC EMS reflects condition of breaker status to prepare for contingencies. Emphasis was placed on reading the posted Lessons Learned for more information.

The PRS recessed for lunch at 10:58 a.m. and reconvened at 1:00 p.m.



ii. Static Output Driving High Impedance Inputs

Bocovich discussed a conversation with an entity within a few weeks of the last PRS meeting regarding a misoperation that appears to be associated with static outputs driving high impedance inputs. The last PRS meeting discussion was very timely. A reference to this topic on the NERC lessons learned site and a MRO PRS white paper were forwarded to the Entity. Bocovich presented these two references. Bocovich asked if anyone wanted to help with a Lessons Learned Ryan Einer and Dennis Lu agreed to help with that project. Chair Grimm asked if the group agrees another Lessons Learned (LL) is necessary or worthwhile as there was a limited LL done in the past. Chair Grimm asked for any member in opposition to a LL or whitepaper.

Upon a motion duly made and seconded, the Protective Relay Subgroup unanimously agreed to proceed with creating a LL.

iii. Instantaneous Ground Overcurrent

Mike Bocovich presented an overview on Overcurrent related misoperations. He noted 56 misoperations 2019 – June 2020 were associated with overcurrent. 39 (70%) of those misoperations were assigned a cause of “incorrect settings” all of which were microprocessor based relays. He provided links to several reference documents including a MRO PRS white paper, NERC Misoperations Report and a few NERC Lessons Learned. Mike Bocovich asked for input from the group for ways to improve this issue. Keeping the models up to date was discussed as a big problem. Mitigation for modeling errors could be to have a dedicated database personnel to ensure the data in the model is correct which is very time consuming, especially for entities without enough personnel. It was discussed that planning models are not necessarily accurate for zero sequence model data.

One entity mentioned going away from ground instantaneous overcurrent due to issues, using zone one ground distance elements for instantaneous tripping. There was discussion about changing generation dispatch and removing ground overcurrent. Caution was provided associated with mutual coupling. The PRS whitepaper was discussed. Further discussion ensued.

Chair Grimm asked again about the best way to communicate this information, the extent of this would be beyond a LL. Bocovich thought it could be appropriate to do a whitepaper, and could potentially go more in depth with the modeling issues than the previous whitepaper. Chair Grimm asked for any opposition from the PRS in creating a whitepaper, hearing none, he asked for a motion. Gary Stodter, Wayne Miller, Jeff Beasley, John Grimm, and Greg Hill all volunteered to help create the paper.

Upon a motion duly made and seconded the PRS unanimously approved creating a whitepaper on this topic.

The PRS recessed for break at 2:19 p.m. and reconvened at 2:30 p.m.

Item 6.b Update: Mike Bocovich stated the results of the PRS votes to the members, Chair Grimm extended congratulations.



9. Event Analysis Report

Jake Bernhagen, MRO Sr. Systems Protection Engineer provided an overview noting that so far this year, MRO has closed 58 total events, with a backlog from the beginning of the year. 39 of the events were determined to be substantive or non-category 0 events, and 19 were determined to be category 0. Of the 39 non-category 0 events, 36 were determined to be a category 1h or 1a, and others categorized as 2f were closed out. The goal is to be caught up to within 6 months. This year there have been reported: 20 non-events (category 0); 19 category 1 events; and one category 2 event. He appreciates everyone's participation in the EA process and noted its value. Chair Grimm extended appreciation for the hard work.

10. Update on SPS Review Team Activities

David Kuyper, MRO Power Systems Engineer gave an update on the SPS review team noting that this year was a sporadically busy year, due to unforeseen circumstances. This is the final update of the group and extended gratitude to get through the backlog. SPP took RAS review responsibilities on a few reviews due. A late submission for a new RAS was approved just a few weeks ago. Grimm reiterated that this will no longer be a topic of discussion going forward during these meetings, the RAS review functions will be retired from this group. Grimm extended gratitude to David Kuyper.

11. PRS Roundtable Discussion

Chair Grimm asked for any topics to discuss at the roundtable.

A member noted they had an operation on a 3 terminal line and investigation found out that the relays have directional element which got fooled and gave the terminal permission to trip. Part of the review process is to look to see if the problem exist in other places of the system. The settings for directional element were set according to the relay manufacturer's recommendations 10 -15 years ago. In 2016 the manufacturer published an application guide updating recommended settings for these elements. Over 400 (maybe 500) relays were discovered with the same issue. Updating 500 relay settings in a timely manner is not practical. Discussion ensued regarding review of old settings, update new settings, level of risk, common vulnerabilities, and compliance. Bocovich mentioned that if you have specific questions or concerns regarding compliance you can send an email to HEROs@MRO.net for answers or to address compliance issues.

Chair Grimm asked Terry Volkmann for an update on TPL-001; Volkmann commented that they are trying to get methodology out for Midwest ISO to reduce protection system review, as they are still working on that, there is nothing to report. There is nothing in the standards that require a GO or DP that owns protection system elements to do a single point of failure analysis it all rests within the TPL-001-5, the transmission planner is responsible. They are trying to get something into a joint document between MISO and TP on modeling regarding single point of failure identification. Volkmann asked if this was a worthy effort, working with nonaffiliated entities without compliance responsibility. Comments were made that Volkmann's approach was reasonable.

12. Upcoming PRS Meeting Dates

Mike Bocovich noted that the next meeting was tentatively set for Tuesday, February 16, 2021, and hearing no objections it was determined to hold the meeting on February 16, 2021 with the time of 8:00



a.m. – 11:00 a.m. and 1:00 p.m. – 4:00 p.m. The dates of Tuesday, May 25, 2021 for Q2, Tuesday, August 17, 2021 for Q3 and November 16, 2021 for Q4 for a meeting of the PRS were tentatively set.

13. Other Business and Adjourn

Having no further business to discuss, the meeting was adjourned at 3:41 p.m.

Upon a motion duly made and seconded, the Protective Relay Subgroup unanimously approved to adjourn the meeting.

Prepared by: Dana Klem, Reliability Assessment and Performance Analysis Administrator.

Reviewed and Submitted by: Mike Bocovich, PRS Technical Liaison

DRAFT



Exhibit A – Meeting Attendees

Subgroup Members Present	
Name	Company, Role
John Grimm (Chair)	Northern States Power
Robert Soper (Vice Chair)	Western Area Power Administration
Alex Bosgood	Saskatchewan Power Company
Casey Malskeit	Omaha Public Power District
Cody Remboldt	Montana-Dakota Utilities
David Wheeler	Southwestern Public Services Co.
Dennis Lu	Manitoba Hydro
Derek Vonada	Sunflower Electric Power Cooperative
Derrick Schlangen	Great River Energy
Forrest Brock	Western Farmers Electric Cooperative
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Ryan Godwin	American Electric Power
Scott Paramore	Kansas City Board of Public Utilities
Terry Fett	Central Iowa Power Cooperative
Wayne Miller	ITC Holdings
MRO Staff	
Name	Title
Dana Klem	Administrator, RCS and RAPA



Jake Bernhagen	Sr. Systems Protection Engineer
John Seidel	Principal Technical Advisor
Lisa Stellmaker	Executive Administrator
Mike Bocovich	Principal System Protection Engineer
Max Desruisseaux	Sr. Power System Engineer
Guests	
Name	Company
Allen Halling	Evergy
Craig Talbot	Minnesota Power
Chad Whisman	American Electric Power
David Oswald	Liberty Utilities
Ian Berger	Duke Energy
John Anderson	Evergy
Mark Gutzmann	Xcel Energy
Martin Moon	3AC Engineering
Michael Fleck	ITC
Terry Volkmann	Consultant for Glencoe Light & Power

AGENDA 3

Chair's Report

John Grimm, PRS Chair

Action

Discussion

Report

Chair Grimm will provide an oral report during the meeting.

AGENDA 4

Secretary's Report

Mike Bocovich, PRS Technical Liaison

Action

Information

Report

Mike Bocovich will provide an oral report during the meeting.

AGENDA 5

PRS Business

- a. Member for Oklahoma Locale
- b. PRS Leadership

Mike Bocovich, PRS Technical Liaison

Action

Information

Report

This information will be covered in the closed session meeting.

AGENDA 5

PRS Business

c. Welcome to PRS Presentation

Dana Klem Reliability Analysis Administrator

Action

Information

Report

Dana Klem will present on this topic at the meeting.

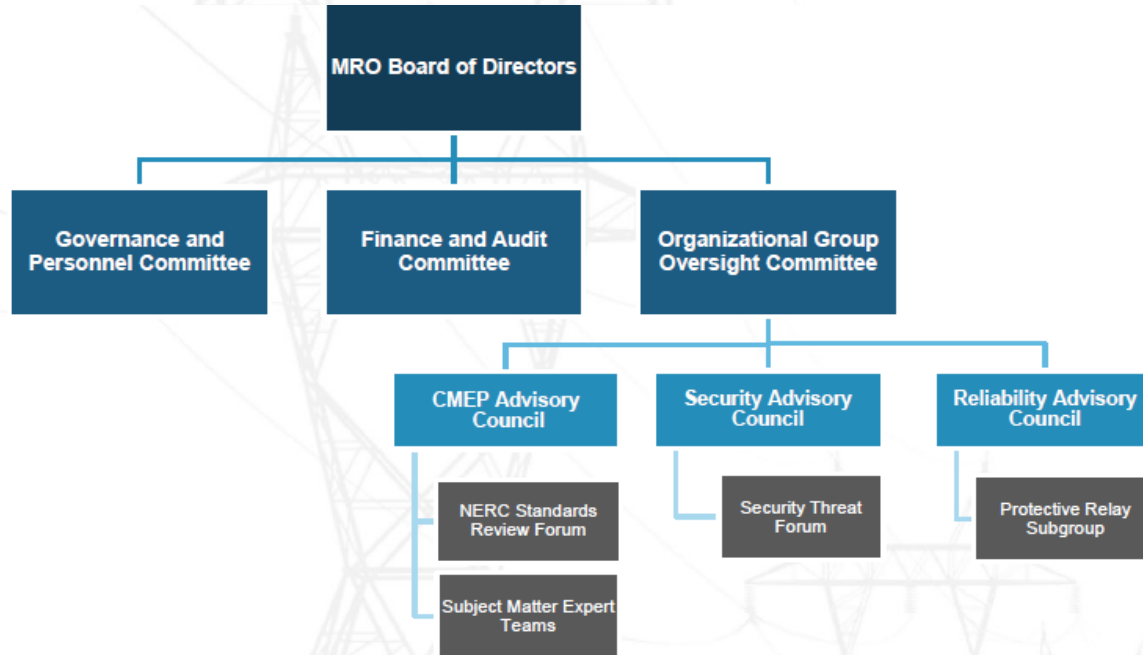


MIDWEST
RELIABILITY
ORGANIZATION

Midwest Reliability Organization

Information for Members of the MRO
Reliability Advisory Council (RAC) and
Protective Relay Subgroup (PRS)

Advisory Council Structure



Organizational Group Oversight Committee (OGOC)

- **The OGOC:**

- Establishes and oversees MRO organizational groups and policies applicable to organizational groups
- Ensures organizational groups are effective and efficient and do not duplicate the work of others
- Designates individuals to represent MRO on NERC organizational groups
- The Organizational Group Oversight Committee Charter is posted on [MRO's public website](#)



OGOC Roster

Name	Role	Sector or Locale	Company	Term End
Keri Glitch	Chair	Transmission System Operator	MISO	12/31/2022
Paul Crist	Vice Chair	Municipal Utility	Lincoln Electric System	12/31/2021
Dehn Stevens	Member	Investor Owned Utility	MidAmerican Energy Company	12/31/2021
Dr. Paul Barber	Member	Independant Director	Independent	12/31/2022
Gordon Pietsch	Member	Cooperative	Great River Energy	12/31/2022
Iqbal Dhani	Member	Canadian Utility	Saskatchewan Power Corporation	12/31/2022
Jeanne Tisinger	Member	Independant Director	Independent	12/31/2022
Jennifer Flandermeyer	Member	Regional	Eergy	12/31/2021
JoAnn Thompson	Member	Investor Owned Utility	Otter Tail Power Company	12/31/2021
Lloyd Linke	Member	Federal Power Marketing Agency	Western Area Power Administration	12/31/2022
Tony Clark	Member	Canadian Utility	Manitoba Hydro	12/31/2021



Guiding Principles for Council Members

- **These MRO Organizational Group Guiding Principles complement charters. When the Principles are employed by members, they will support the overall purpose of the organizational groups.**
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 1. Make every attempt to attend all meetings in person or via webinar.
 2. Be responsive to requests, action items, and deadlines.
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 7. Be supportive of proactive initiatives that improve effectiveness and efficiency for MRO and MRO's registered entities.



MRO Reliability Advisory Council

The MRO Reliability Advisory Council is a MRO Organizational Group that provides advice and counsel to MRO's Board of Directors (board), the board's Organizational Group Oversight Committee, staff, members and registered entities on topics such as transmission adequacy and availability, resource adequacy, integration of renewables, essential reliability services, event analysis, system protection, and reliability assessments. The MRO Reliability Advisory Council increases outreach and awareness in these key areas.

<https://www.mro.net/committees/rac/Pages/default.aspx>



RAC Council Membership

- **MRO's Council consists of 15 members:**
 - Pursuant to [Policy and Procedure 3](#) - Establishment, Responsibilities, and Procedures of Organizational Groups and MRO Sponsored Representative on NERC Organizational Groups, membership on councils is based on experience and expertise.
 - No more than two members of the MRO (Council) may be an employee of a single entity or affiliated entities.
 - At least three sectors will be represented on the MRO (Council). To the extent practicable, membership will reflect geographic diversity and balanced sector representation.
 - Individuals with expertise and experience in the areas of transmission planning, resource planning, power systems engineering, system operations, as well as control and protection systems serve on the MRO RAC.



Reliability Advisory Council Roster

Member	Term End	Company
Dick Pursley, Chair	12/31/22	Great River Energy
Jason Weirs, Vice Chair	12/31/21	Otter Tail Power Company
Allen Klassen	12/31/21	Evergy
Binod Shrestha	12/31/22	Saskatchewan Power Company
CJ Brown	12/31/21	Southwest Power Pool, Inc.
Dallas Rowley	12/31/22	Oklahoma Gas & Electric
Dean Schiro	12/31/23	Xcel Energy
Derek Brown	12/31/23	Evergy
Durgesh Manjure	12/31/23	MISO
Dwayne Stradford	12/31/21	American Electric Power
Gayle Nansel	12/31/22	Western Area Power Administration
John Stephens	12/31/23	City Utilities of Springfield Missouri
Nandaka Jayasekara	12/31/22	Manitoba Hydro
Nicholas Giffin	12/31/21	American Transmission Company
Ron Gunderson	12/31/23	Nebraska Public Power District



RAC Key Responsibilities

- Recommend the establishment of subgroups to support the Reliability Advisory Council work plan as appropriate. Oversee and provide direction to any subgroups.
- Support the preparation of special assessments and seasonal readiness plans by regional Reliability Coordinators and as may be directed by NERC or the MRO Board of Directors from time to time.
- Review and assess the overall reliability of the MRO region and interregional bulk electric system for long-term planning horizons based on reports from regional Planning Coordinators as may be directed by NERC or the MRO Board of Directors from time to time.
- Support the development of the annual MRO Regional Risk Assessment by identifying risks, trends, and mitigating activities.



RAC Key Responsibilities cont.

- Review significant BES events (generally, Category 2 or higher) which occurred in the MRO Region and the resulting reports and approve larger scale event reports (Category 3 and higher) to assure the appropriate analysis is performed and that any lessons learned are identified and shared with the industry.

Provide input and guidance on system protection and control matters, including Reliability Standards development, misoperation reviews, and reviews of remedial action schemes.

- Participate in and support the ERAG efforts toward collaboration on studies and assessments in the Eastern Interconnection.
- Support the applicable NERC program areas.

The Reliability Advisory Council Charter can be found [here](#).



Meetings

- The MRO RAC will meet quarterly or as necessary, in person or via conference call and/or web meeting. Once a year the MRO (Council) will meet with the OGOC the day before a regularly scheduled board meeting.
- All MRO council chairs and vice chairs will meet with the OGOC the day before the fourth quarter regularly scheduled board meeting to review the council's accomplishments during the past year and to develop work plans for the following year.
- Meetings of the RAC are open to public attendance; however, the meeting may be called into closed session by the chair or vice chair. Additional meeting requirements related to agendas and minutes, voting and proxy, and rules of conduct are outlined in MRO Policy and Procedure 3 - Establishment, Responsibilities, and Procedures of Organizational Groups and MRO Representation on NERC Organizational Groups.
- Meeting costs incurred by RAC members are reimbursable by MRO according to [MRO Policy and Procedure 2 – Expense Reimbursement](#).



Future Meeting/Event Dates

Upcoming RAC Meeting/Event Dates

Meeting/Event	Date
Quarter 1	March 24, 2021
Quarter 2	June 9, 2021
Quarter 3	August 25, 2021
Quarter 4	November 17, 2021
Reliability Conference	August 24, 2021

Guidelines for Meetings

- **Meeting Agendas:**

- Short agenda posted one month prior to meeting
- Agenda Packet posted one week prior to meeting

- **Meeting Minutes:**

- Support Staff/Liaison will review up to two weeks after meeting takes place
- Council will review for one week
- Council will vote to approve

WorkPlan



MRO RAC 2020 Work Plan

Column	Work Item	Source	Activity	Timing	Responsible Party	Item Audience	Item Type	Status	Notes
1	Conduct Outreach and Awareness	Charter/MRO Strategic Goal 2	Conduct a minimum of 2 webinars/outreach in 2020 to increase reliability and decrease risk to the reliable and secure operations of the bulk power system. Annual Reliability Conference, webinars- lessons learned, newsletter articles, Standard Application Guides	Periodically	RAC Members	OGOC	Workplan	Completed	Conduct a collaborative webinar with Security Advisory Council. MRO Staff and MRO RAC Members
2	Provide Reliability Standard Review from an Operational and Planning Perspective	MRO Strategic Goal 1	Regular interface with other councils (NSRF) as it relates to standards development	Periodically	RAC Members	OGOC	Workplan	In-Progress	Specific Ops/Planning standards for 2020. Gayle Nansel
3	Analysis on contributing causes of events and misoperations	MRO Strategic Goal 3	Review of significant BES events within the MRO Region	Periodically	RAC Members	OGOC	Workplan	In-Progress	MRO Staff and MRO RAC Members
4	Regional Risk Assessment	MRO Strategic Goal 4	Support the development of the annual MRO Regional Risk Assessment by identifying risks, trends and mitigating activities.	Qtr 3	RAC Members	OGOC	Workplan	Completed	MRO Staff and MRO RAC Members
5	Assess MRO coordination for NERC Groups	MRO Strategic Goal 6	Review NERC Representative reports and provide guidance and feedback to the representatives	Periodically	RAC Members	OGOC	Workplan	In-Progress	MRO Staff and MRO RAC Members
6	Implement Tool for Assessment Quantification and prioritize reliability risks	MRO Strategic Goal 4	Finalize tool created in 2019 to assess, quantify, and prioritize reliability risks	Qtr 2	RAC Members	OGOC	Workplan	In-Progress	Dallas Rowley
The items above this row are seeking/have been granted OGOC approval. The items below this row are example ideas on how the advisory council could implement any approved work plan items.									
	Newsletter Article 2Q	MRO Strategic Goal 4	Draft newsletter articles on an as needed basis, aiming for at least one article every quarter.	Qtr 2	RAC Members	OGOC	Workplan	Completed	Reliability/Compliance guidance- Dick Pursley, EMT Studies- ATC Nick Giffin
	Newsletter Article 3Q	MRO Strategic Goal 4	Draft newsletter articles on an as needed basis, aiming for at least one article every quarter.	Qtr 3	RAC Members	OGOC	Workplan	Completed	Doug Bowman Article



MRO Protective Relay Subgroup

The purpose of the MRO Protective Relay Subgroup (PRS) is to identify, review and discuss system protection and control issues relevant to the reliability of the bulk electric system and to develop and implement regional procedures for applicable NERC PRC standards. The PRS reports to the Reliability Advisory Council (RAC).

Link to webpage:

<https://www.mro.net/committees/rac/PRS/Pages/default.aspx>



Protective Relay Subgroup Membership

MRO's PRS consists of 19 members:

- Pursuant to [Policy and Procedure 3 - Establishment, Responsibilities, and Procedures of Organizational Groups and MRO Sponsored Representative on NERC Organizational Groups](#), membership of organizational groups shall be determined based upon experience, expertise and geographic diversity and to the extent practicable, shall include a balanced representation of the sectors.
- Membership is based on geographic representation (locale).



MRO PRS Roster

Member	Term End	Company
Alex Bosgoed	12/31/22	Saskatchewan Power Company
Casey Malskeit	12/31/22	Omaha Public Power District
Cody Remboldt	12/31/21	Montana-Dakota Utilities
David Wheeler	12/31/23	Southwestern Public Services Co.
Dennis Lu	12/31/23	Manitoba Hydro
Derek Vonada	12/31/22	Sunflower Electric Power Cooperative
Derrick Schlangen	12/31/23	Great River Energy
OPEN OK	12/31/22	
Gary Stoedter	12/31/21	MidAmerican Energy Company
Greg Hill	12/31/22	Nebraska Public Power District
Greg Sessler	12/31/23	American Transmission Co
Jeff Beasley	12/31/21	Grand River Dam Authority
John Grimm	12/31/22	Northern States Power
Robert Soper	12/31/22	Western Area Power Administration
Ryan Einer	12/31/23	Oklahoma Gas & Electric
Ryan Godwin	12/31/21	American Electric Power
Scott Paramore	12/31/21	Kansas City Board of Public Utilities
Terry Fett	12/31/23	Central Iowa Power Cooperative
Wayne Miller	12/31/21	ITC Holdings



PRS Key Responsibilities

- Develop, maintain, and implement regional procedures as needed that address the requirements of NERC PRC standards.
- Annually review the MRO summary of Misoperations to identify Lessons Learned and communicate these lessons with MRO membership.
- Trend the Event Analysis reports submitted to MRO for the purpose of identifying misoperations that are causing, or increasing the severity of, these events. Through the PRS, work with the Entities involved with these events to assure that the misoperations are effectively identified and mitigated. Assure that any protection-related Lessons Learned of value to the industry are prepared and submitted to NERC Event Analysis staff.
- Prepare as necessary additional reports/whitepapers that identify methods that can reduce the likelihood or severity of system events or misoperations that can lead to system events.
- Review Remedial Action Schemes (RAS) as necessary to verify protection system functionality and/or assess operability.
- Provide technical input related to system protection and control to MRO.



Meetings

- The MRO PRS will meet quarterly or as necessary, in person or via conference call and/or web meeting.
- Meetings of the PRS are open to public attendance; however, the meeting may be called into closed session by the chair or vice chair. Additional meeting requirements related to agendas and minutes, voting and proxy, and rules of conduct are outlined in MRO Policy and Procedure 3 - Establishment, Responsibilities, and Procedures of Organizational Groups and MRO Representation on NERC Organizational Groups
- Meeting costs incurred by PRS members are reimbursable by MRO according to [MRO Policy and Procedure 2 – Expense Reimbursement](#)

Future Meeting Dates

Upcoming PRS Meeting Dates

Meeting/Event	Date
Quarter 1	February 16, 2021
Quarter 2	May 25, 2021
Quarter 3	August 17, 2021
Quarter 4	November 16, 2021

Newsletters

- **Tentative Due Dates:**
 - 03/15/21 (March/April Issue)
 - 05/14/21 (May/June Issue)
 - 07/15/21 (July/August Issue)
 - 09/15/21 (Sept/Oct Issue)
 - 11/15/21 (Nov/Dec Year-End Issue)
 - 02/01/21 (2021 Annual Report)
- **Include: Bio, photo, title and article**

Webinars

- Topic
- Title
- Short paragraph describing event
- Dates/Times for Dry-run and Webinar
- Presenters/Speaker Information
 - Title
 - Company
 - Best contact number
 - Email
- Council Support Member
- MRO Support Staff
- Presentation



Event Announcement

MRO PRS to Host High Impact Misoperations Webinar

July 21, 2020 | 1:30 p.m. - 3:00 p.m. Central

Webinar Details

MRO's Protective Relay Subgroup is pleased to announce it is hosting a webinar on High Impact Misoperations. The analysis of misoperations and their role in system disturbances has revealed that certain classes of misoperations have a more severe impact on Bulk Power System reliability than others. The two types of misoperations observed having the most impact are those associated with; i) differential relays, and ii) breaker failure relays. MRO staff, in conjunction with members of the MRO Protective Relay Subgroup, will present some techniques that can help reduce misoperations associated with these two scheme types. In addition, some best practices to ensure thorough commissioning of protection systems is included in this webinar.

Presenters

John Grimm, Principal Engineer, Xcel Energy

Jeff Beasley, Senior Protection and Control Engineer, Grand River Dam Authority

Ryan Einer, Lead P&C Maintenance Engineer, Oklahoma Gas and Electric



CLARITY

ASSURANCE

RESULTS

Important Links

RAC mailing list: mrorac@mro.net Please be sure to whitelist

PRS mailing list: mroprs@mro.net Please be sure to whitelist

RAC Public Site: <https://www.mro.net/committees/rac/Pages/default.aspx>

PRS Public Site: <https://www.mro.net/committees/rac/PRS/Pages/default.aspx>

Expense Reimbursement: [MRO Policy and Procedure 2 – Expense Reimbursement](#)

Member Responsibilities: [MRO Policy and Procedure 3- Establishment, Responsibilities](#)

Confidentiality Policy: [MRO Policy and Procedure 5 \(Confidentiality Policy\)](#)



MRO Contact Information

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MRO RAC Support Staff

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Director of Reliability Analysis

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Dana Klem

Reliability Analysis Administrator

Phone: 651-855-1741

Dana.klem@mro.net

MRO PRS Support Staff

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Principal Systems Protection Engineer

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Mike.bocovich@mro.net

Dana Klem

Reliability Analysis Administrator

Phone: 651-855-1741

Dana.klem@mro.net



AGENDA 6

Short Circuit Model Updates and Sharing with Adjacent Entities

Larry Brusseau, Cornbelt Power and Tyler Baxter, Cornbelt Power

Action

Information.

Report

Larry Brusseau and Tyler Baxter will lead a discussion during the meeting.

AGENDA 7

NERC Activities

- a. Update on NERC SPCWG

Mark Gutzmann Director, System Protection and Communication Engineering, Xcel Energy

Action

Discussion

Report

Mark Gutzmann will provide an oral report during the meeting.

AGENDA 7

NERC Activities

b. NERC MIDASWG Update

Mike Bocovich, PRS Technical Liaison

Action

Discussion

Report

Mike Bocovich will present during the meeting.

Meeting Minutes

Misoperation Information Data Analysis

System User Group

February 2, 2021 | 1:30 – 3:00 PM Eastern

[WebEx](#)

Meeting number (access code): 739 344 071; Meeting password: None

Audio Only - Join by phone: +1-415-655-0002 (US Toll); +1-416-915-8942 (Canada Toll)

Introduction and Chair's Remarks: Brian Kasmarzik (Ameren)

NERC Antitrust Compliance Guidelines and Public Announcement: Liaison Rachel Rieder (NERC)

Agenda Items

1. Testing/Maintenance Scenarios – All

Tabled for a meeting with more participants.

- a. Scenario 1: Test/Maintenance personnel at Station A while testing the protection system associated with Line 1 mistakenly initiate trip on Line 1 at Station A. Bkrs A1 and A3 trip.
- b. Scenario 2: Test/Maintenance personnel at Station A while testing the protection system associated with Line 1 mistakenly initiate trip on Line 1 at Station A. Bkr A3 trips, but Bkr A1 does not trip due to a trip coil wiring error. Stuck breaker protection for Bkr A1 asserts (assume there is no fault detector). In response, Stuck breaker protection for Bkr A1 correctly and successfully initiates all designed tripping and transfer tripping.
- c. Scenario 3: Test/Maintenance personnel at Station A while testing the protection system associated with Line 1 mistakenly initiate trip on Line 1 at Station A. Bkr A3 trips, but Bkr A1 does not trip due to a faulty coil.. Stuck breaker protection for A1 asserts (assume there is no fault detector) and correctly initiates all designed tripping and transfer tripping, except that at Station B, Remote Bkr 2 fails to trip due to a wiring error. (Assume that the Stuck Breaker Protection for Bkr A1 includes transfer tripping of Remote Bkrs 1 and 2 at Station B.) The CPS for Remote Bkr 2 asserts, and operates correctly and successfully to trip circuit breakers as designed.
- d. Tabled discussion on 01/05 and Lee Underwood reviewed past notes for any precedence and emailed to the group for discussion during this call.

2. PRC-16 Retirement Update – Rachel Rieder (All)

Item left on agenda for future call – NERC to discuss next steps and report back to MIDASUG.

3. MIDASUG Organization and 2022 DRI Change Process Going Forward – Rachel Rieder (All)

Rachel reviewed changes in [MIDASUG extranet site](#) organization.

Rafael S. suggested that a document that includes potential changes to MIDAS Portal be added to the site.

4. 2021 MIDAS Training – Rachel Rieder (All)

a. Structure

i. 2-hour portal training session

(a) Rachel will plan to present with some back-up help

ii. 5-hour (2 hour training, 1 hour break, 2 hour training) in-depth training session

(a) Need ~5 volunteers for individual sections

(b) Rachel sending out sign-up sheet

b. Deadlines

i. Early fall

(a) Possible Dates: Weeks of 9/20, 9/27, 10/4, 10/11

ii. 2 Choices for each session

c. Meeting Cadence

i. Once a month (possibly 2 times a month as deadlines approach)

ii. Rachel sending out doodle poll for meeting time survey

Changes to MIDAS:

- Columns E & F column headers on Opt-Out Waiver Form tab have been modified for further clarification

The entity listed has no CPS Operations to report for the listed quarter (Mark "Yes" if there are no operations to report, Opt-Out)	The entity listed has no Misoperations to report for the listed quarter (Mark "Yes" if there are no misoperations to report, Opt-Out)
--	--

- "Operator Action" and "Combination" removed from "Restoration Method" dropdown from Misoperation Entry Form tab
- "POR/POTT" changed to "POR/POTT/PUTT" under "System Schemes" dropdown from Misoperation Entry Form tab
- "Overcurrent" added to "System Schemes" dropdown from Misoperation Entry Form tab
- "Communication SubCauses", "Human Error" and "Not Enough Information" removed from "Comm SubCauses" dropdown from Misoperation Entry Form tab

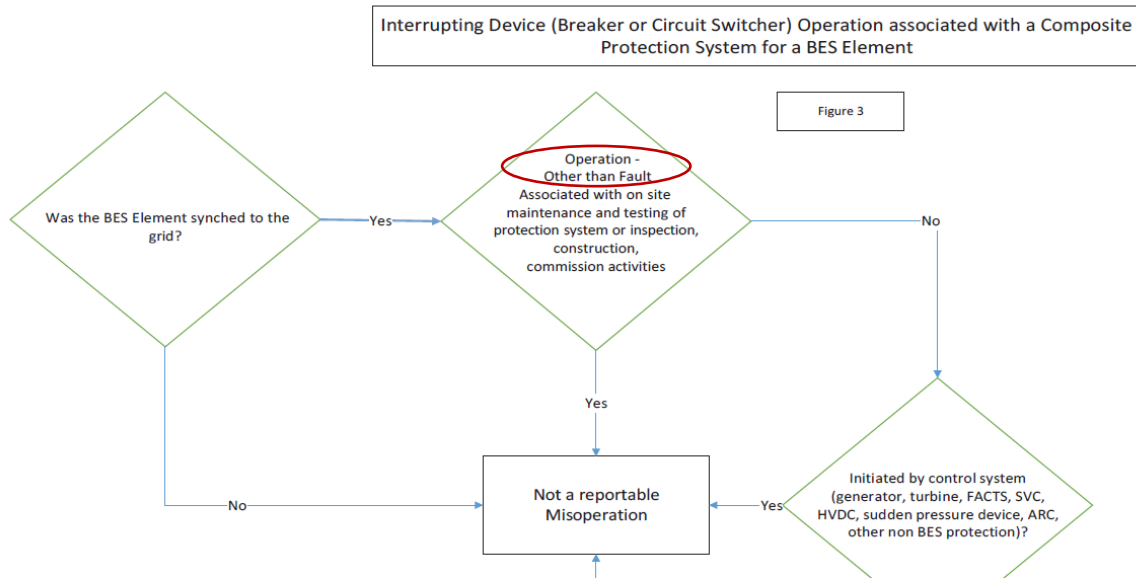
Changes to the DRI:

- Changes associated with MIDAS reporting (above)
- A few more examples were added
- Reporting on Tie-Lines, 1/N method is recommended

Table E.1: Tie Line Reporting 1/N Method			
Reporting Period	Actual Operations	Reported Operations	Rounding
1	32 ½	33	Rounded Up
2	24 ½	24	Rounded Down
Total	57	57	Accurate Total

- Misoperation Characterization Flow Diagram should have been changed, but was not!

Appendix H: Misoperation Characterization Flow Diagram



AGENDA 7

NERC Activities

- c. FERC/NERC Protection System Commissioning Program Review

Mike Bocovich, PRS Technical Liaison

Action

Discussion

Report

Mike Bocovich will provide an oral report during the meeting.

AGENDA 8

Misoperations

- a. Third Quarter 2020 Results and Review

Mike Bocovich, PRS Technical Liaison

Action

Discussion

Report

Mike Bocovich will lead this discussion during the meeting.

MIDAS

3rd Quarter 2020

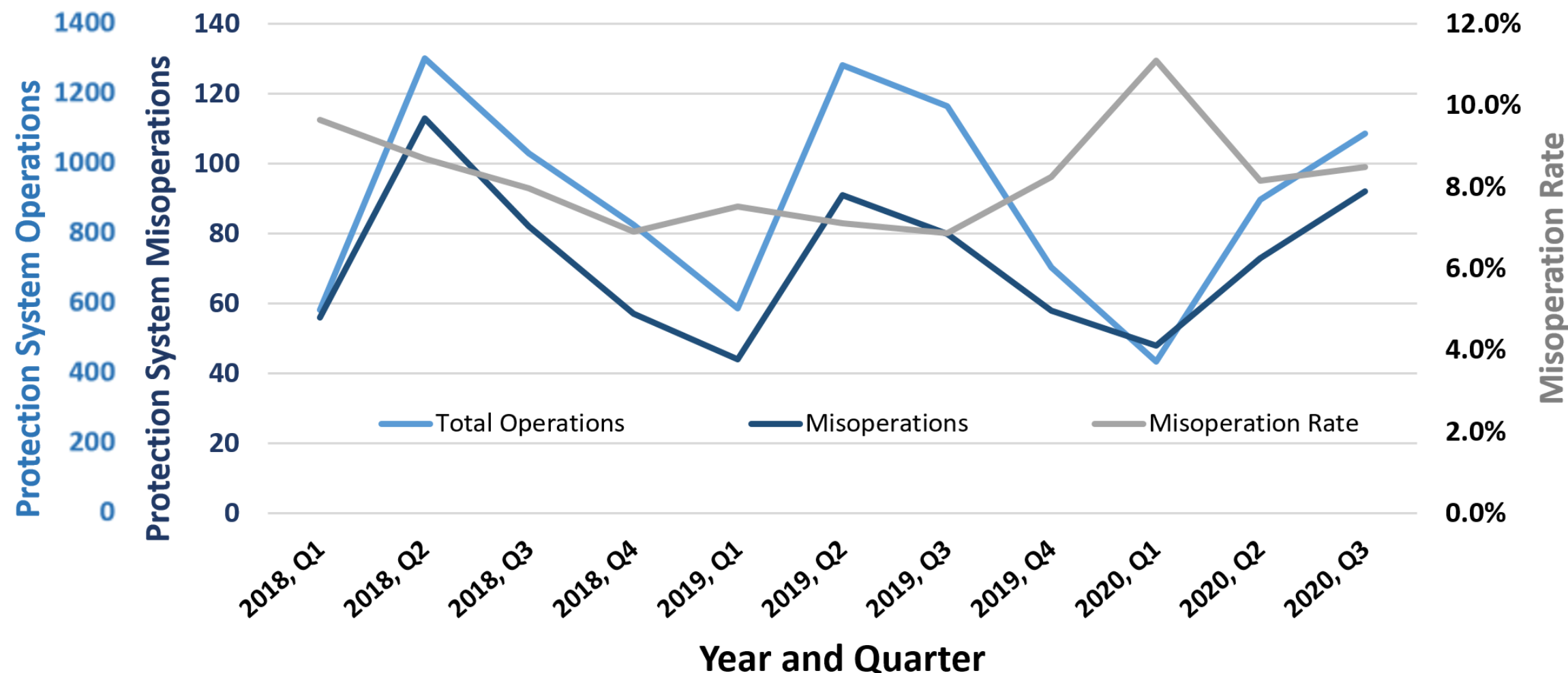
Quarter 3, 2018					Total 2018				
Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate	Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate
<100kV (BES)	0	18	0.00%	3.57%	<100kV (BES)	5	93	5.38%	4.35%
115kV	19	353	5.38%	4.69%	115kV	76	1009	7.53%	5.77%
138kV	23	287	8.01%	7.58%	138kV	102	1133	9.00%	8.39%
161kV	15	117	12.82%	9.56%	161kV	47	419	11.22%	11.16%
230kV	13	117	11.11%	9.81%	230kV	37	516	7.17%	9.05%
345kV	8	112	7.14%	9.89%	345kV	36	530	6.79%	9.30%
500kV	1	3	33.33%	7.60%	500kV	1	3	33.33%	9.23%
HVdc	2	22	9.09%	10.20%	HVdc	2	36	5.56%	4.41%
TOTAL	81	1029	7.87%	7.19%	TOTAL	306	3739	8.18%	7.82%

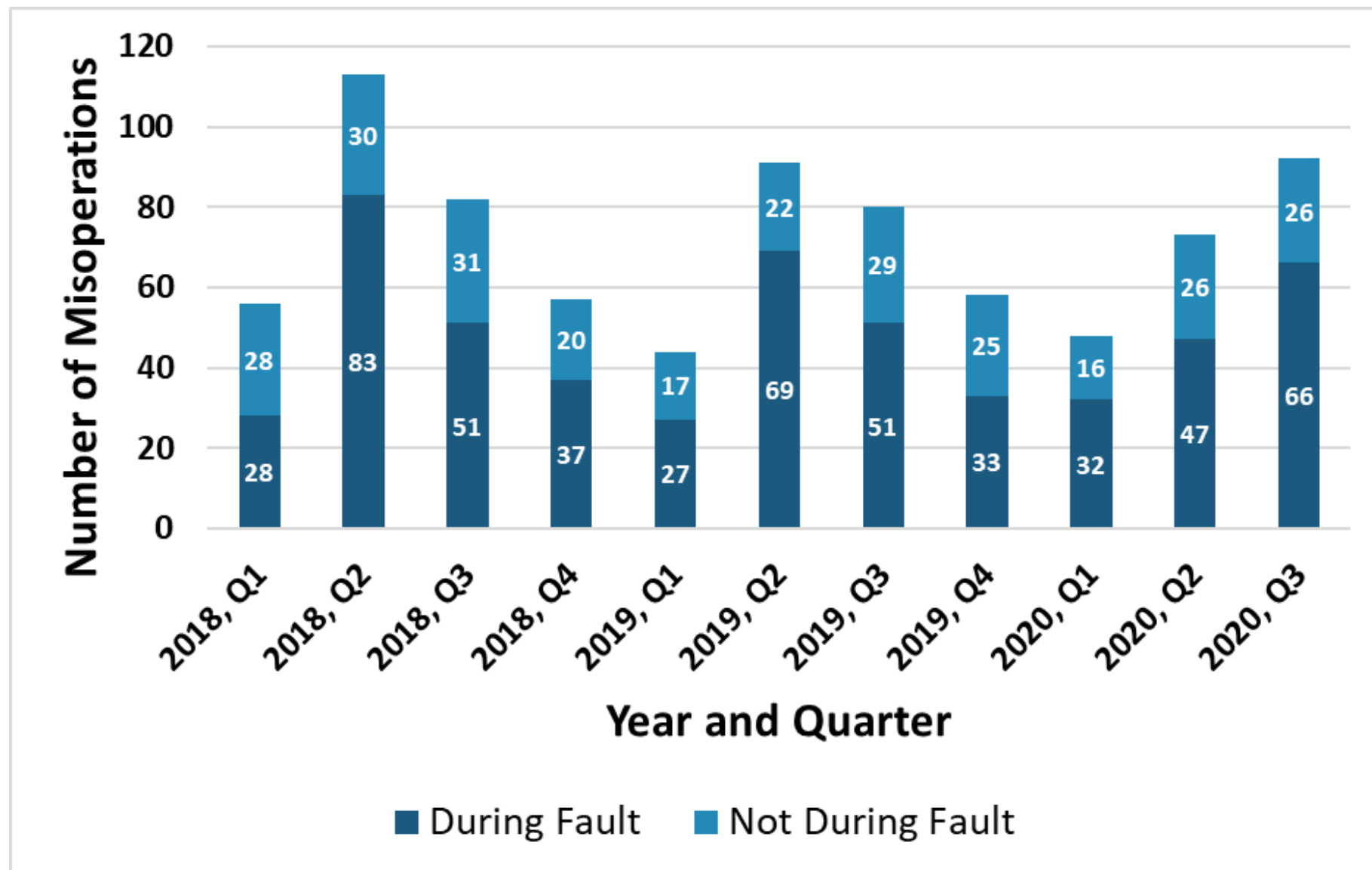
Quarter 3, 2019					Total 2019				
Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate	Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate
<100kV (BES)	1	22	4.55%	7.83%	<100kV (BES)	5	85	5.88%	5.09%
115kV	22	294	7.48%	4.32%	115kV	75	944	7.94%	5.12%
138kV	15	326	4.60%	7.66%	138kV	68	1111	6.12%	7.61%
161kV	9	133	6.77%	8.70%	161kV	37	436	8.49%	8.93%
230kV	14	137	10.22%	7.75%	230kV	33	437	7.55%	8.31%
345kV	17	211	8.06%	7.47%	345kV	53	665	7.97%	7.70%
500kV	1	3	33.33%	12.72%	500kV	1	6	16.67%	10.97%
HVdc	1	38	2.63%	1.59%	HVdc	1	46	2.17%	0.86%
TOTAL	80	1164	6.87%	6.74%	TOTAL	273	3730	7.32%	7.03%

Quarter 3, 2020				
Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate
<100kV (BES)	1	16	6.25%	
100kV		1	0.00%	
115kV	27	277	9.75%	
138kV	22	310	7.10%	
161kV	21	156	13.46%	
230kV	8	135	5.93%	
345kV	12	145	8.28%	
500kV	1	4	25.00%	
HVdc		41	0.00%	
TOTAL	92	1085	8.48%	0.00%

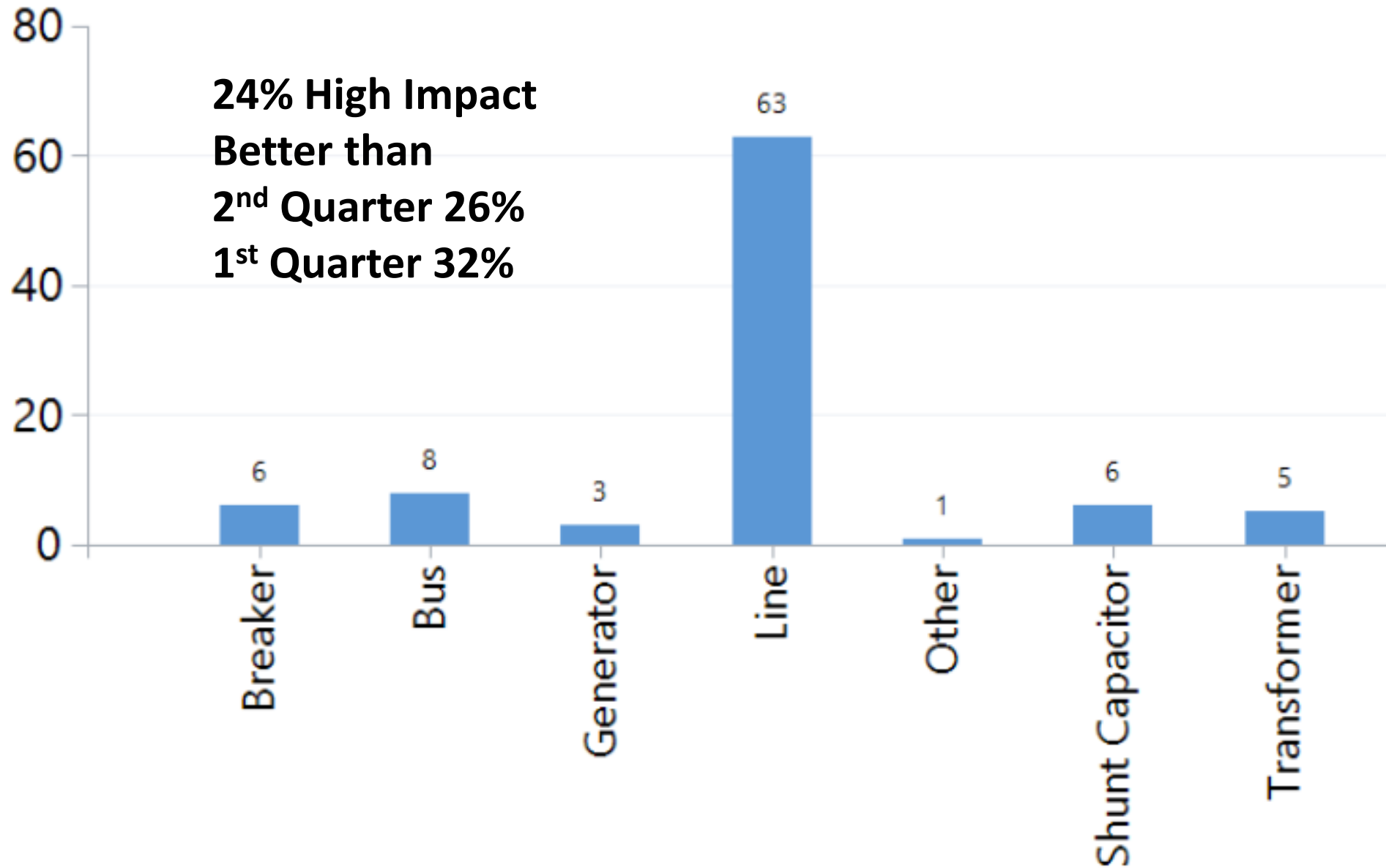
Total 2020				
Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate
<100kV (BES)	2	43	4.65%	5.22%
100kV	0	5	0.00%	2.92%
115kV	53	616	8.60%	4.01%
138kV	58	702	8.26%	7.78%
161kV	42	341	12.32%	8.76%
230kV	23	304	7.57%	9.38%
345kV	31	336	9.23%	7.49%
500kV	3	11	27.27%	10.42%
HVdc	1	56	1.79%	2.08%
TOTAL	213	2414	8.82%	6.90%

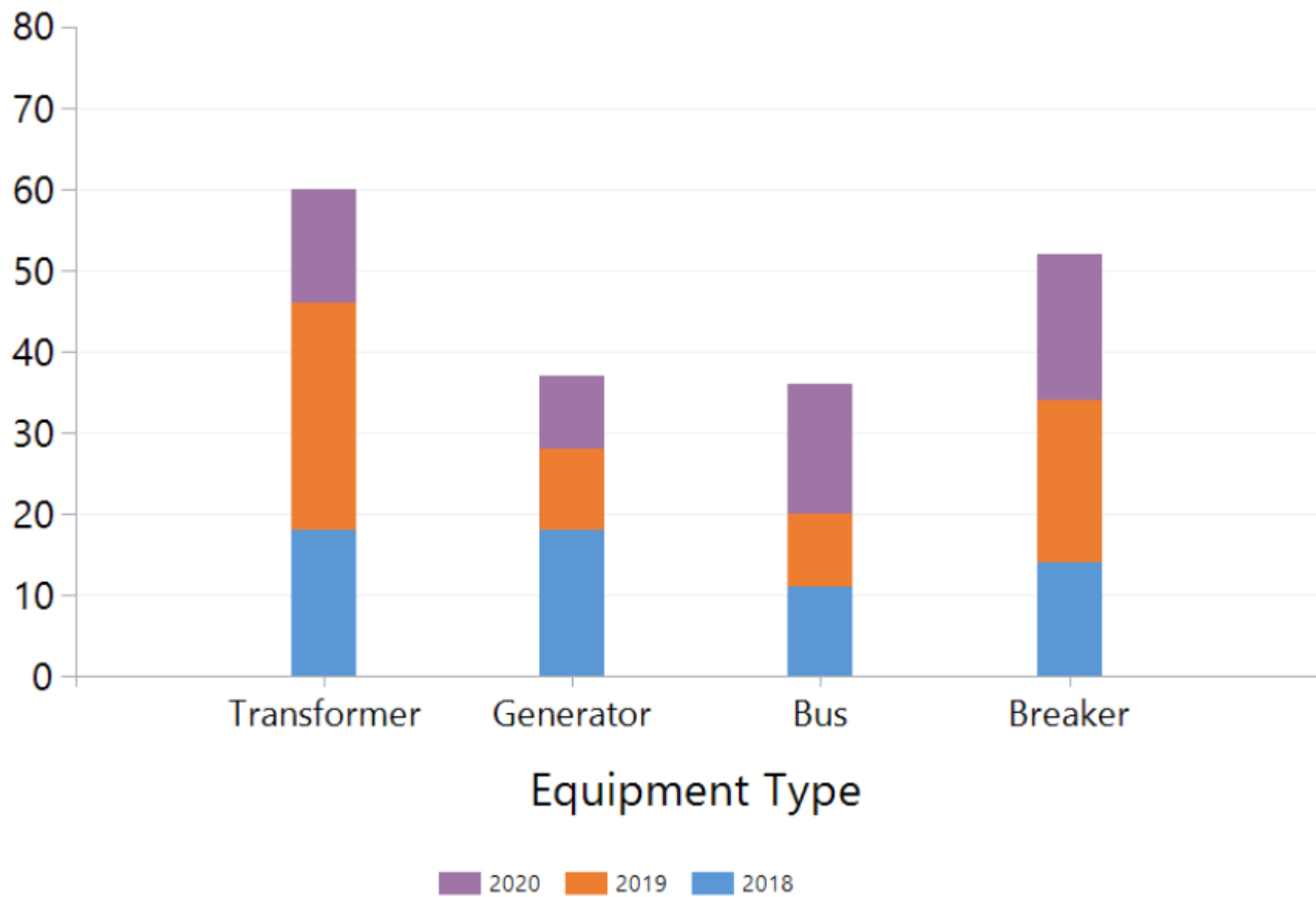
Protection System Operations and MisOp Rate



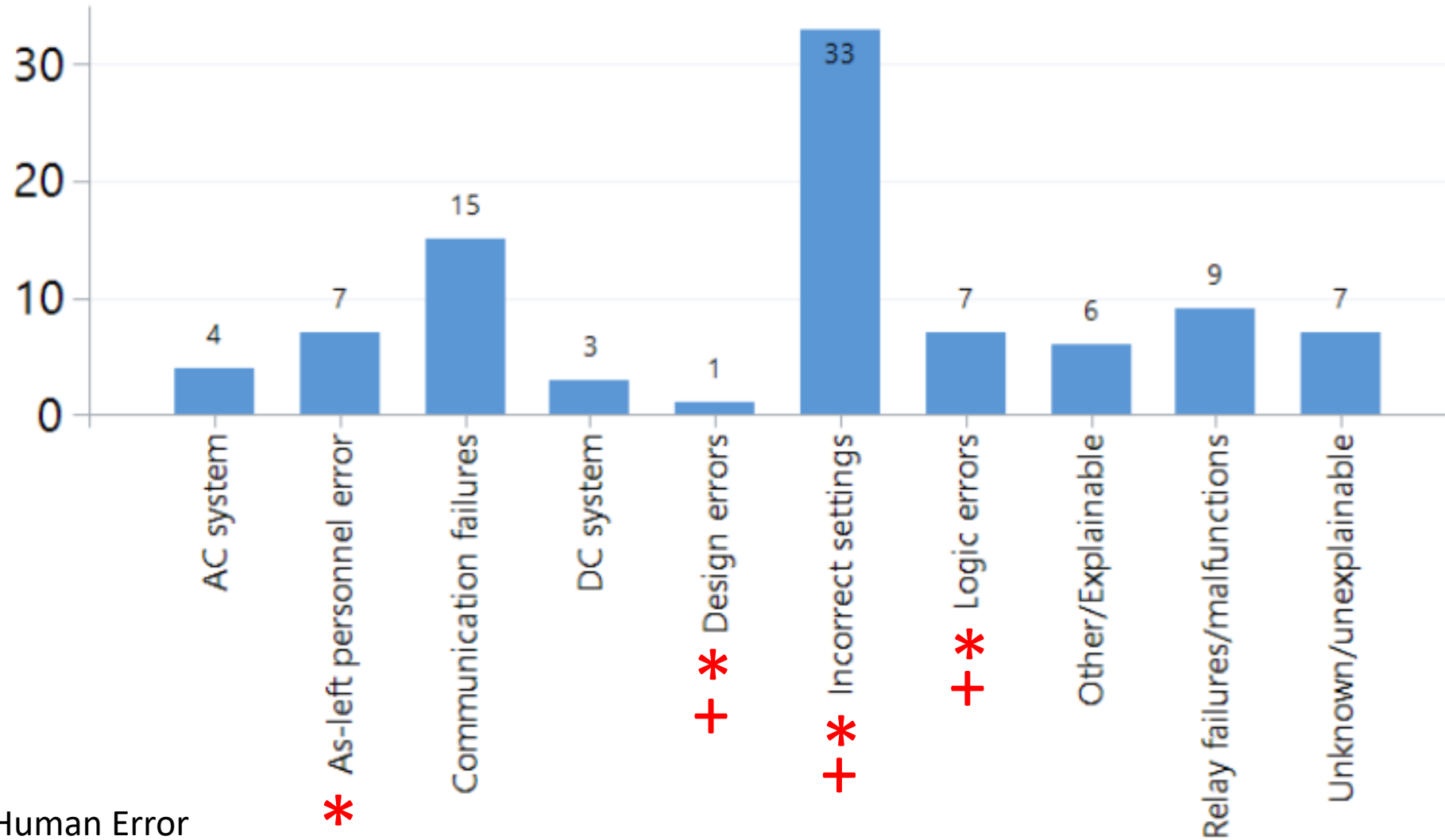


3rd Quarter 2020



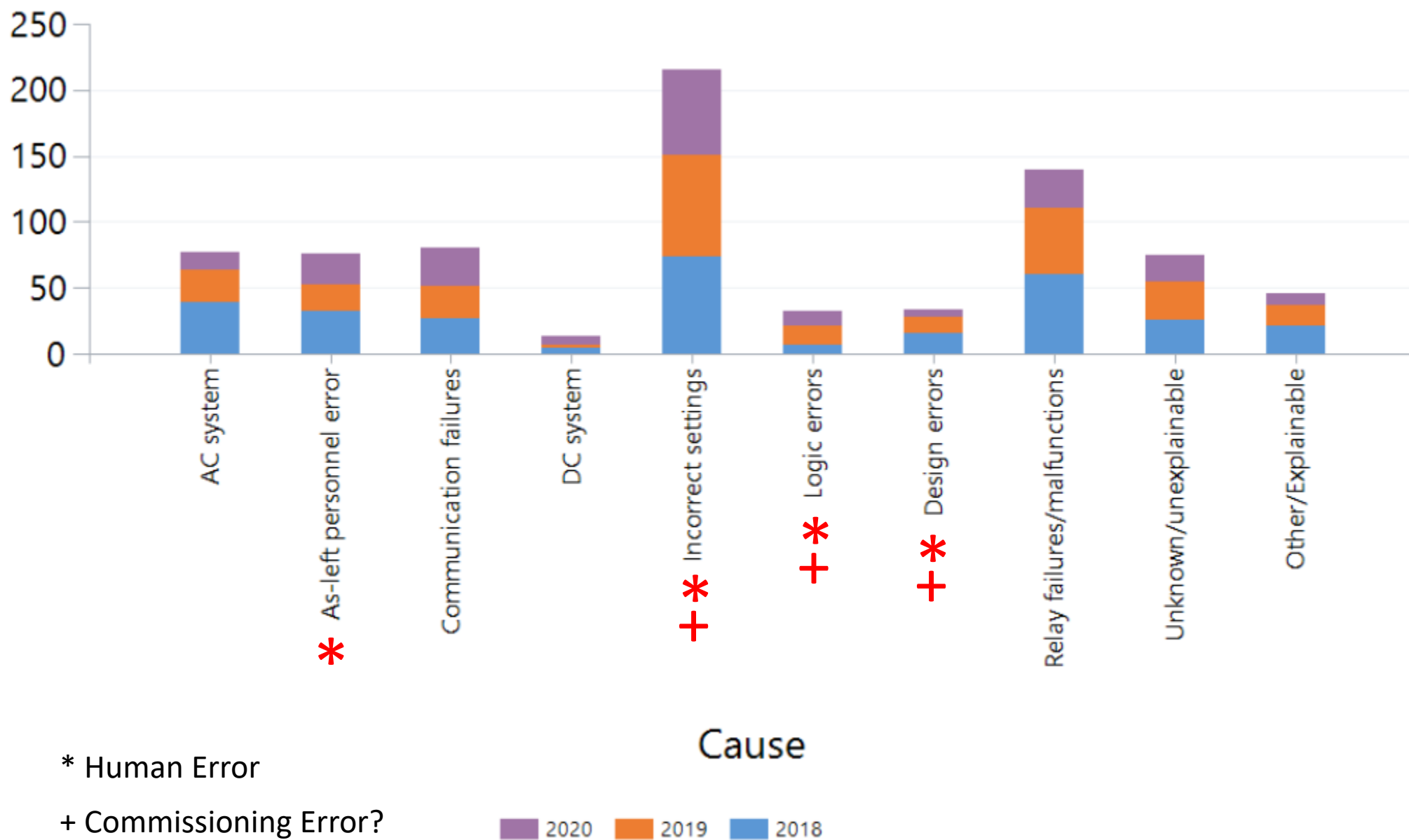


3rd Quarter 2020

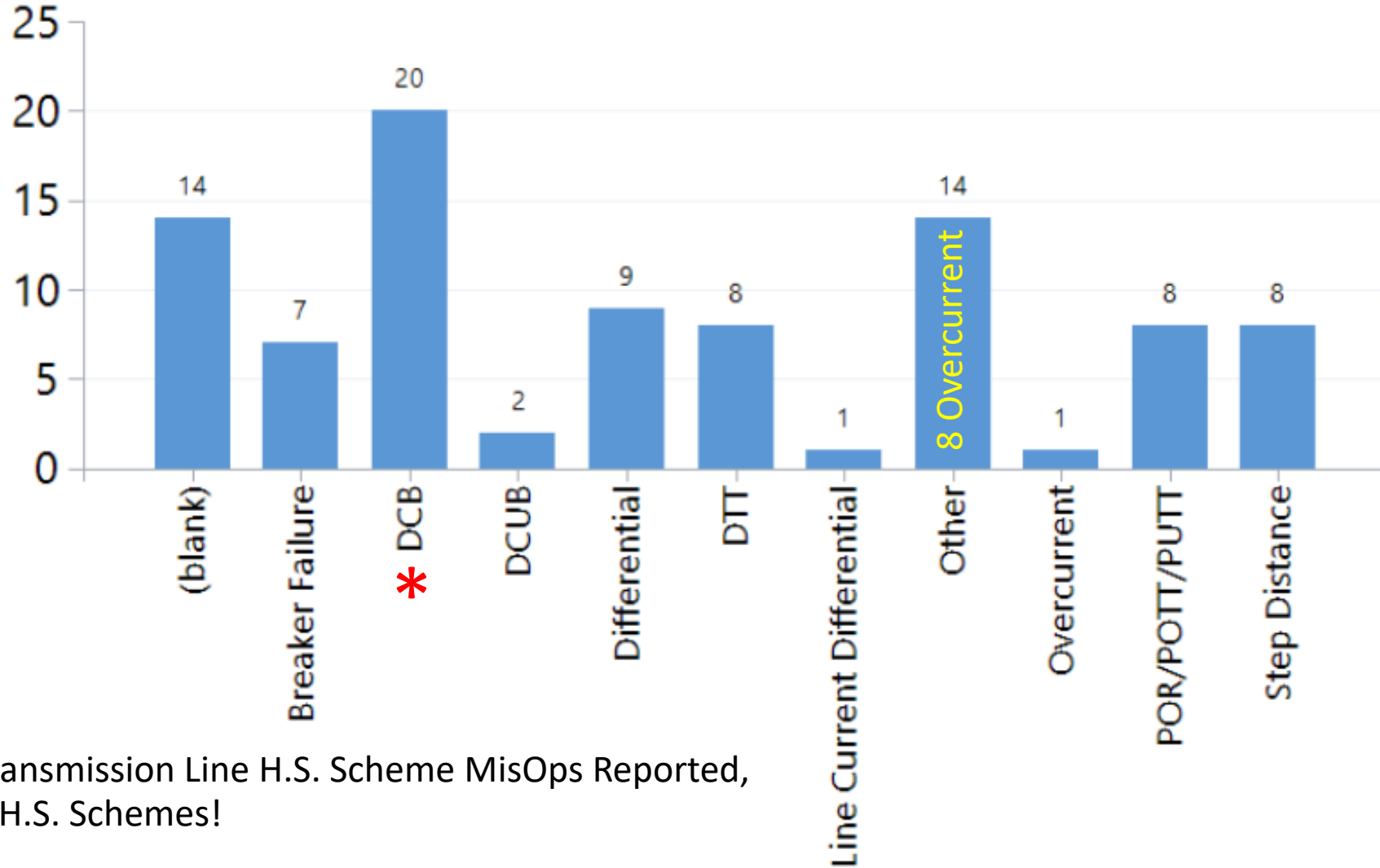


* Human Error

+ Commissioning Error?

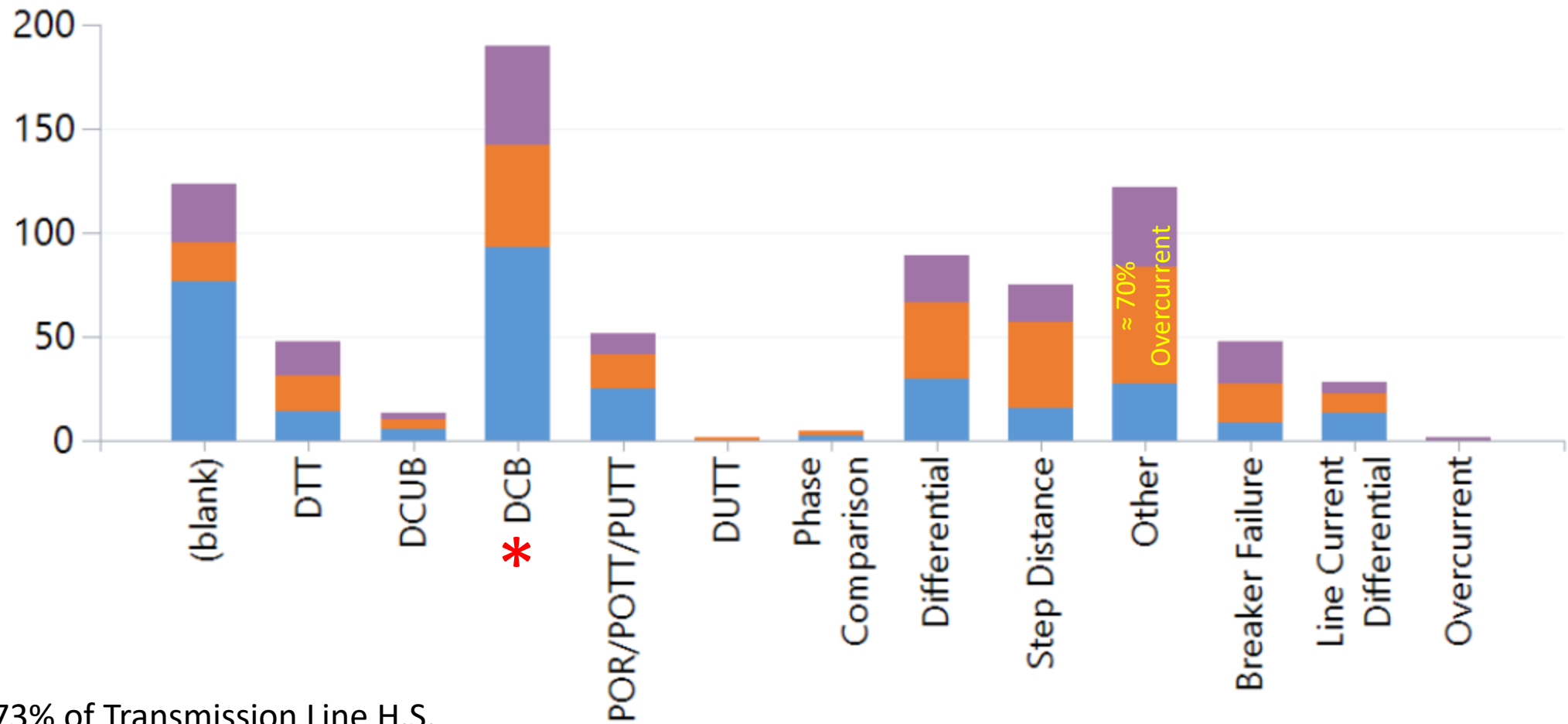


3rd Quarter 2020



* 65% of Transmission Line H.S. Scheme MisOps Reported,
22.5% of H.S. Schemes!

System Schemes



* 73% of Transmission Line H.S. Scheme MisOps Reported, 22.5% of H.S. Schemes!

System Schemes

2020 2019 2018

INTERESTING THINGS REPORTED!

- “The data was analyzed from both ends of this line showed that the active communication scheme was inconsistent between to SEL-421 relays, with one end set to DCB and the other set to POTT.”
- E-mail discussions on a DCB misoperation: “This DCB scheme uses both microprocessor and EM technology. We had already proposed [Entity] enable non-directional carrier starting at their end far faster block signal transmission (3rd recommendation in the lessons learned paper), though they weren’t agreeable due to the upcoming scheme upgrade and lack of historical similar issues on this line. The EM relays on our end aren’t able to be configured with additional delays (1st recommendation from the lessons learned paper), and designing in additional discrete timing relays isn’t an option for us right now. As far as we know, high-speed tripping isn’t required for this line for stability purposes, but is required for coordination with the surrounding stations. ...”
- “A carrier ground relay target was reported and the carrier was found to be on at one terminal and off at the other.”
- “Due to the usually high and varying measured fault impedance, [Station A] relays also don't trip on step distance Z2T element. [Station C] tripped on back up Z4 step distance forward-looking element ahead of a closer-to-fault Z3 step distance forward-looking back up element which tripped at [Station B].”
- “The GE D90P line relaying solid state output was suspected to have had substantial enough leakage to cause a high impedance input to assert.”

FIELD COMMISSIONING RELATED?

- “A 4:5 Aux CT was necessary to adjust 2000:5 back to 1600:5 to match other bus differential CTs as all the CT ratios into a CA-16 bus relay need to match, but a 5:4 ratio was incorrectly prescribed by SPE. Two days after installation, once load current became sufficiently high the imbalance of CT ratios caused a false differential current to trip the bus protection.”
- “Incorrect wiring of the capacitor bank protection PTs resulted in a swap of B and C phase connections to the capacitor bank SEL-487V voltage differential relay.”

BE AWARE!?

- “SEL changed the Mho Phase Distance Relay Word Bits in the SEL-421-5, the setting was ZnP and the new setting is ZnMP. The SEL AcSELerator software did not correctly convert the settings leading to the number of Mho elements being reduced from 4 to 3 and the Mho settings being set to default.”
- “We are working with CAPE to update our IOC macro to correctly account for mutual-coupling. Until the macro correctly sets the IOC element, we have added documentation to our relay settings checklist to work with ... when mutual coupling is involved. CAPE will have an updated IOC macro that accounts for mutual-coupling in Q4 of 2020. It has been determined that other IOC settings could be set too sensitive due to the mutual coupling ...”
- Regarding forward biasing of the Negative-Sequence Voltage-Polarized Directional element: “SEL has created a modified setting guideline and recommends instituting it only when new settings are issued or when reviewing existing settings.”

AGENDA 8

Misoperations

b. Technical Discussions

i. ITC Midwest Derecho Event Relay Operations

Sammani Ahmed and Wayne Miller, ITC Midwest

Action

Information

Report

Sammani Ahmed and Wayne Miller will provide an oral report during the meeting.

AGENDA 8

Misoperations

- c. Project Updates
- i. Static Output Driving High Impedance Inputs

Mike Bocovich, PRS Technical Liaison

Action

Discussion

Report

Mike Bocovich will lead this discussion during the meeting.



MIDWEST
RELIABILITY
ORGANIZATION

Static Output Driving High Impedance Inputs

Lessons Learned

CLARITY

ASSURANCE

RESULTS

Another Possible Instance

- Had a conversation with an engineer regarding this topic August 25.
- Breaker Failure Initiate
- Referred the person to two documents:
 - [NERC lessons learned 20130703](#) and
 - [PRS Phase II Misoperations White Paper](#)



NERC Lessons Learned 20130703

- **RAS Operation**
- **One Problem**
- **One Solution**



PRS Phase II

Misoperations White Paper

- **In the Breaker Failure section**
- **Multiple Solutions**



Volunteers:

Ryan Einer

Dennis Lu



CLARITY

ASSURANCE

RESULTS

AGENDA 8

Misoperations

- c. Project Updates
- ii. Instantaneous Ground Overcurrent

Mike Bocovich, PRS Technical Liaison

Action

Discussion

Report

Mike Bocovich will lead this discussion during the meeting.



MIDWEST
RELIABILITY
ORGANIZATION

Instantaneous Ground Overcurrent

White Paper

CLARITY

ASSURANCE

RESULTS

Overcurrent Misoperations

A quick scan:

- About 56/80, 70% of the misoperations listed in the “Other” Relay Schemes are associated with overcurrent. 2019 – June 2020
- About 39/56, $\approx 70\%$ of those were assigned a cause of “Incorrect Settings”.
- $39/39 = 100\%$ were microprocessor based relays.



Documents

- **PRS Protection System Misoperations**
white paper, Pages 6 - 13
- **NERC Misoperations Report**, April 2013,
Pages 27 & 28
- **Lessons Learned (?)**:
 - [LL20130702](#)
 - [LL20150202](#)
 - [LL20181201](#)



Volunteers:

Gary Stoedter

Wayne Miller

Jeff Beasley

John Grimm

Greg Hill



CLARITY

ASSURANCE

RESULTS

AGENDA 9

Event Analysis Report

Jake Bernhagen, MRO Sr. Systems Protection Engineer and

David Kuyper, MRO Power System Engineer

Action

Information

Report

Jake Bernhagen and David Kuyper will provide an oral report during the meeting regarding any Transmission Events that have occurred since the last PRS meeting.

AGENDA 10

Update on SPS Review Team Activities

David Kuyper, MRO Power System Engineer

Action

Information

Report

David Kuyper will provide an oral report at the meeting.

AGENDA 11

PRS Roundtable Discussions

John Grimm, PRS Chair

Action

Discussion

Report

Chair Grimm will lead this discussion during the meeting.

AGENDA 12

Upcoming PRS Meeting Dates

Mike Bocovich, PRS Liaison, MRO

Action

Discussion

Report

Mike Bocovich will lead this discussion during the meeting.

AGENDA 13

Other Business and Adjourn

John Grimm, PRS Chair