

Meeting Agenda

MRO Protective Relay Subgroup

May 3, 2022 – 8:00 a.m. to 3:00 p.m.

Via Webex



**MIDWEST
RELIABILITY
ORGANIZATION**

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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 Determination of Quorum <i>Greg Sessler, PRS Chair</i> a. Determination of Quorum and Introductions <i>Reliability Analysis Administrator</i> b. Robert's Rules of Order
2	Standards of Conduct and Antitrust Guidelines <i>Jake Bernhagen, Sr. Systems Protection Engineer</i>
3	Consent Agenda <i>Greg Sessler, PRS Chair</i> Approve February 22, 2022 PRS Meeting Minutes (Open and Closed)
4	Chair's Report <i>Greg Sessler, PRS Chair</i>
5	PRS Business <i>Jake Bernhagen, Sr. Systems Protection Engineer</i> a. Updates b. PRS Charter Review c. PRS Number of Members Discussion d. Action Item List Review <i>Greg Sessler, PRS Chair</i>
6	NERC Activities <i>Jake Bernhagen, Sr. Systems Protection Engineer</i> a. Update on NERC SPCWG <i>Mark Gutzmann Director, System Protection & Communication Engineering, Xcel Energy</i> b. NERC MIDASUG Update <i>Jake Bernhagen, Sr. Systems Protection Engineer</i> c. FERC/NERC Protection System Commissioning Program Review Update <i>Max Desruisseaux, Sr. Power Systems Engineer</i> d. TADS <i>John Grimm, Principal Systems Protection Engineer</i>
Break – 10:00 a.m.	
7	Misoperations <i>Jake Bernhagen, Sr. Systems Protection Engineer</i> a. Q4 2021 Results and Review and Discussion b. Project Updates i. Instantaneous Ground Overcurrent <i>Jake Bernhagen, Sr. Systems Protection Engineer</i>

Agenda Item

Lunch – 12:00 p.m.

8	Event Analysis Report <i>Jake Bernhagen, Sr. Systems Protection Engineer</i> a. Review Lessons Learned b. Seek Input for T-Line Icing Lessons Learned
9	Summer 2021 BES Events <i>Max Desruisseaux, Sr. Power Systems Engineer</i>
10	FERC Order 881 – Ambient Adjusted Ratings and FERC NOI – Dynamic Line Ratings <i>John Seidel, Principal Technical Advisor</i>
11	2022 Meeting Dates <i>Greg Sessler, PRS Chair</i>
12	PRS Roundtable Discussion <i>Greg Sessler, PRS Chair</i>
13	Other Business and Adjourn <i>Greg Sessler, PRS Chair</i>

AGENDA 1

Call to Order and Determination of Quorum

a. Determination of Quorum and Introductions

Reliability Analysis Administrator

Name	Locale	Company	Term
Greg Sessler, Chair	Wisconsin	American Transmission Company	12/31/2023
David Wheeler, Vice-Chair	AR/TX/LA/NM	Southwestern Public Services Co.	12/31/2023
Adam Daters	Iowa	ITC Holdings	12/31/2024
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	12/31/2024
David Weir	Dakotas	Western Area Power Administration	12/31/2022
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
Glenn Bryson	AR/TX/LA/NM	American Electric Power	12/31/2024
Greg Hill	Nebraska	Nebraska Public Power District	12/31/2022
Jeff Beasley	Regional	Grand River Dam Authority	12/31/2022
Josh Erdmann	Minnesota	Xcel Energy	12/31/2024
Matt Boersema	Oklahoma	Western Farmers Electric	12/31/2022
Ryan Einer	Oklahoma	Oklahoma Gas & Electric Co.	12/31/2023
Sarah Marshall	Wisconsin	Alliant Energy	12/31/2024
Scott Paramore	Kansas/Missouri	Kansas City Board of Public Utility	12/31/2024
Terry Fett	Iowa	Central Iowa Power Cooperative	12/31/2023

AGENDA 1

Call to Order and Determination of Quorum

b. Robert's Rules of Order

Greg Sessler, 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 or 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.
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.
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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).
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.

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

Standards of Conduct and Antitrust Guidelines

Jake Bernhagen, Sr. Systems Protection Engineer

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.

Antitrust 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 3

Consent Agenda

- a. Approve February 22, 2022 PRS Meeting Minutes

Greg Sessler, PRS Chair

Action

Approve February 22, 2022 PRS meeting minutes.

Report

February 22, 2022 PRS meeting minutes are below.



Draft Minutes of the Protective Relay Subgroup Meeting

Closed Meeting

Webex

February 22, 2022 2:15 p.m. to 2:20 p.m Central

Notice for this meeting was electronically posted to the MRO website [here](#) on January 25, 2022.

A final agenda, including advanced reading materials, was also posted on February 15, 2022.

1. Call to Order and Determination of Quorum

Protective Relay Subgroup (PRS) Chair Greg Sessler called the closed meeting to order at 2:15 p.m. A quorum of the PRS was present.

2. PRS Nominees

The PRS considered nominees for open seats on the PRS.

Upon a motion duly made and seconded, the PRS agreed to recommend approval by the Reliability Advisory Council of David Weir for a seat on the PRS with term ending 12/31/22, and Jeff Beasley for a seat on the PRS with term ending 12/31/22.

Prepared by: Rebecca Schneider, Reliability Analysis Administrator

Reviewed and Submitted by: Jake Bernhagen, Sr. Systems Protection Engineer



Exhibit A – Meeting Attendees

Subgroup Members Present	
Name	Company, Role
Greg Sessler	American Transmission Co., Chair
David Wheeler	Southwestern Public Services Co., Vice-Chair
Adam Daters	ITC
Alex Bosgoed	Saskatchewan Power Company
Casey Malskeit	Omaha Public Power District
Cody Remboldt	Montana-Dakota Utilities
Dennis Lu	Manitoba Hydro
Derek Vonada	Sunflower Electric Power Cooperative
Greg Hill	Nebraska Public Power District
Josh Erdmann	Xcel Energy
Matt Boersema	Western Farmers Electric
Ryan Einer	Oklahoma Gas & Electric
Sarah Marshall	Alliant Energy
Scott Paramore	Kansas City Board of Public Utilities
Terry Fett	Central Iowa Power Cooperative
MRO Staff	
Name	Title
Jake Bernhagen	Senior Protection Systems Engineer
Rebecca Schneider	Temporary Administrator
Lisa Stellmaker	Executive Administrator and Office Manager



Draft Minutes of the Protective Relay Subgroup Meeting

Webex

February 22, 2022, 8:02 a.m. to 2:14 p.m. Central

Notice for this meeting was electronically posted to the MRO website [here](#) on January 25, 2022.

A final agenda, including advanced reading materials, was also posted on February 15, 2022.

1. Call to Order and Determination of Quorum

Protective Relay Subgroup (PRS) Chair Greg Sessler called the meeting to order at 8:02 a.m. Sessler welcomed everyone and brief introductions were made by those on the call. Rebecca Schneider, Reliability Analysis Administrator, advised the chair that a quorum of the PRS was present. A complete list of attendees is included as [Exhibit A](#).

2. Standards of Conduct and Antitrust Guidelines

Pursuant to Policy and Procedure 4, Senior Systems Protection Engineer, Jake Bernhagen highlighted MRO's Standards of Conduct, Conflict of Interest, and Antitrust Guidelines

3. Consent Agenda

The PRS reviewed the consent agenda, which included draft minutes from the November 16, 2021 meeting.

Upon a motion duly made and seconded, the Protective Relay Subgroup approved the consent agenda, which included minutes from the November 16, 2021 PRS meeting as written.

4. Chair's Report

Chair Sessler had nothing to report since the last meeting.

5. New Members' Welcome Presentation

Bernhagen presented an overview to new members including the MRO organizational structure and ongoing initiative of the Organizational Group Oversight Committee (OGOC) to increase diversity on MRO's organizational groups. It was noted that the welcome presentation given during the meeting did not match the presentation provided in the agenda packet. Schneider updated the agenda packet during the meeting to include the correct welcome presentation.

6. PRS Business

PRS Charter Update Discussion.

Bernhagen led a discussion reminding the PRS members that a decision was approved in the fourth quarter to remove the locale requirement from the charter to help alleviate recruitment challenges. The proposed revisions to the charter will go to the Reliability Advisory Council for recommendation and approval by the OGOC. Discussion ensued.

Number of Members Discussion.

Bernhagen reminded the PRS of a discussion from the PRS' fourth quarter meeting regarding pending changes to Policy and Procedure 3 which would raise the number of possible organizational group



members per group from 19 to 21. Bernhagen noted that this topic has yet to be discussed and decided upon internally and that an update would be provided at the next PRS meeting.

PRS Nominations

The two nominees were given time to represent their nominations to the PRS.

Action Item List Review.

Chair Sessler reviewed the action item list and updates were made accordingly.

7. NERC Activities

Update on NERC System Protection and Control Working Group (SPCWG).

Mark Gutzmann, MRO representative on the NERC SPCWG, provided an overview on the recent work of the group. Gutzmann noted a reliability guideline called “Transmission System Phase Backup Protection”. Gutzmann also referenced FERC Order No. 881 that addresses ambient adjusted ratings. Greg Sessler noted that a presentation on FERC Order No. 881 may be a worthwhile pursuit for a future PRS meeting. Discussion ensued.

NERC Misoperation Information Data Analysis System User Group (MIDASUG) Update.

Bernhagen noted that there are no updates as the MIDASUG has not met since November 2021, and the next meeting is March 1, 2022.

FERC/NERC Protection System Commissioning Program Review.

Bernhagen solicited volunteers from the PRS to organize a second quarter webinar regarding FERC/NERC Protection System Commissioning Program Review. Sarah Marshall, Ryan Einer, and Cody Remboldt volunteered to assist Max Desruisseaux with this action item.

TADS.

MRO Principal Systems Protection Engineer, John Grimm, provided an update regarding TADS. Currently, TADS data reporting for MRO is 80 percent. There is an effort in 2022 to achieve 90 percent. Grimm addressed the need for data to be correct and submitted on time. The group was asked for ideas on how to increase participation.

8. Misoperations

To accommodate scheduling conflicts, Chair Sessler moved the Failure Modes and Mechanisms Task Force report (Agenda Item 8b.i.) ahead on the agenda. These minutes reflect the order in which the reports were provided.

Technical Presentations

Failure Modes and Mechanisms Task Force

Richard Hackman, Sr. Event Analysis Advisor, NERC, gave a presentation on examining cold weather generation failures using a failure modes and mechanisms approach. Hackman also asked for task force volunteers, especially in the area of electromagnetic and static relays.

Third Quarter 2021 Results and Review and Discussion.

MIDAS and Misoperations Q3 Update.

Bernhagen provided an overview of third quarter misops data. He will review in more depth when the fourth quarter data is available. A member asked the group if any of their companies were using multiprotocol label switching (MPLS) or other routable protocols for their communication-assisted transmission line protection schemes and if any misoperations have occurred on these schemes. Discussion ensued.



Technical Presentations

Out of Step Tripping

Kevin Jones, Consulting Engineer, Xcel Energy, gave a presentation on power swing blocking and out of step tripping. Discussion ensued.

Project Updates

Instantaneous Ground Overcurrent.

Bernhagen noted that there were no updates for this ongoing project. More information will be provided next quarter. An action item was captured to ask for volunteers for this project.

9. MRO 2022 Reliability Risk Assessment

John Seidel, Principal Technical Advisor, provided an overview of the MRO Regional Risk Assessment (RRA) highlighting the top reliability and security risks within the region. He also summarized the ERO-Wide Generation Resource Capacity by Fuel Type Table, noting the wind capacity numbers. The severe winter weather events in the South-Central United States were highlighted. Seidel also provided an overview of Demand Side Management (DSM). The top risks were reviewed and the rankings on the heat chart were explained. An attendee commented that workforce should be ranked as a higher risk because college graduates are not choosing careers in the power industry. Discussion ensued.

10. Event Analysis Report

Bernhagen, Sr. Systems Protection Engineer, provided an overview of the event analysis report. MRO is working on a key performance indicator (KPI). MRO will start tracking event analysis by the number of days it takes to process the event analysis report. The proposed goal is +/- 20 percent of 180 days (144-216). The Event Analysis group is also looking at major weather events such as hurricanes, etc.

11. 2022 Dates

Chair Sessler reviewed the 2022 meeting dates for the PRS and the other councils and subgroups.

12. PRS Roundtable Discussion

The PRS members next participated in a roundtable discussion. The following items were highlighted:

- PRC-004-6 requirements – Discussion regarding how to track the R5 date with the new standard. Does MRO need a new guidance document?
- MIDAS Misops – Bernhagen solicited volunteers to review quarterly misops and provide feedback. Several PRS members volunteered.

13. Other Business and Adjourn

Having no further business to discuss, the meeting was adjourned at 2:14 p.m.

Prepared by: Rebecca Schneider, Reliability Analysis Administrator

Reviewed and Submitted by: Jake Bernhagen, Sr. Systems Protection Engineer



Exhibit A – Meeting Attendees

PRS Members Present	
Name	Company, Role
Greg Sessler	American Transmission Co., Chair
David Wheeler	Southwestern Public Services Co., Vice Chair
Adam Daters	ITC
Alex Bosgoed	Saskatchewan Power Company
Casey Malskeit	Omaha Public Power District
Cody Remboldt	Montana-Dakota Utilities
Dennis Lu	Manitoba Hydro
Derek Vonada	Sunflower Electric Power Cooperative
Greg Hill	Nebraska Public Power District
Josh Erdmann	Xcel Energy
Matt Boersema	Western Farmers Electric
Ryan Einer	Oklahoma Gas & Electric
Sarah Marshall	Alliant Energy
Scott Paramore	Kansas City Board of Public Utilities
Terry Fett	Central Iowa Power Cooperative
MRO Staff	
Name	Title
Jake Bernhagen	Senior Protection Systems Engineer
John Grimm	Principal Systems Protection Engineer
John Seidel	Principal Technical Advisor
Rebecca Schneider	Temporary Administrator
Lisa Stellmaker	Executive Administrator and Office Manager
Dianlong Wang	Sr. Power Systems Engineer



Guests	
Name	Company
Richard Hackman	NERC
Kevin Jones	Xcel Energy
Mark Gutzmann	Xcel Energy
David Weir	Western Area Power Administration
Jeff Beasley	Grand River Dam Authority

AGENDA 4

Chair's Report

Greg Sessler, PRS Chair

Action

Discussion

Report

Chair Sessler will provide an oral report during the meeting.

AGENDA 5

PRS Business

a. Updates

Jake Bernhagen, Sr. Systems Protection Engineer

Action

Information

Report

Jake Bernhagen will lead the discussion during the meeting.

AGENDA 5

PRS Business

b. PRS Charter Review

Jake Bernhagen, Sr. Systems Protection Engineer

Action

Information

Report

Jake Bernhagen will lead the discussion during the meeting.



MRO PROTECTIVE RELAY SUBGROUP CHARTER

January 1, 2022

I. Purpose

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).

II. Membership

Pursuant to [Policy and Procedure 3: Establishment, Responsibilities, and Procedures of Organizational Groups and MRO Sponsored Representatives on NERC Organizational Groups](#) (PP3), 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. The PRS is comprised of industry experts in the areas of system protection and control. The specific experience and expertise needs of the PRS are determined by the PRS. The subgroup shall be comprised of no more than 19 members, with not more than one member from the same company.

The PRS will annually elect its chair and vice chair pursuant to the process and terms outlined in Policy and Procedure 3.

III. Key Objectives

- Develop, maintain, and implement regional procedures as needed that address the requirements of NERC PRC standards.
- Annually review the summary of Misoperations (prepared by MRO staff) for the purpose of identifying Lessons Learned and communicating 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.
- Interface with the NERC groups related to protection and control.

IV. Meetings

The PRS will meet quarterly, or as necessary, in person, via conference call, or web meeting. Meetings of the PRS are open to public attendance; however, an executive session may be called 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, Organizational Groups.



V. Costs

Meeting costs incurred by PRS members are reimbursable by MRO according to MRO Policy and Procedure 2, Expense Reimbursement.

VI. Reporting Requirements

The chair of the PRS, or delegate, will provide a written or oral report describing the activities and actions of the group quarterly to the RAC. The PRS will perform an annual review of this charter and the group's overall purpose and key objectives to ensure that the group is efficient and effective in its operations and according to its purpose. The chair will provide an annual summary report, including a statement of its conclusions, to the RAC.

AGENDA 5

PRS Business

c. PRS Number of Members Discussion

Jake Bernhagen, Sr. Systems Protection Engineer

Action

Information

Report

Jake Bernhagen will lead the discussion during the meeting.

AGENDA 5

PRS Business

d. Action Item List Review

Greg Sessler, PRS Chair

Action

Information

Report

Chair Sessler will lead the discussion during the meeting.

AGENDA 6

NERC Activities

- a. Update on NERC SPCWG

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

Action

Information

Report

Mark Gutzmann will provide an oral report during the meeting.

AGENDA 6

NERC Activities

b. NERC MIDASUG Update

Jake Bernhagen, Sr. Systems Protection Engineer

Action

Discussion

Report

Jake Bernhagen will provide an oral report during the meeting.

AGENDA 6

NERC Activities

- c. FERC/NERC Protection System Commissioning Program Review Update

Max Desruisseaux, Senior Power Systems Engineer

Action

Information

Report

Max Desruisseaux will provide an oral report during the meeting.

AGENDA 6

NERC Activities

- d. Transmission Availability Data System (TADS)

John Grimm, Principal Systems Protection Engineer

Action

Discussion

Report

John Grimm will provide an oral report during the meeting.

AGENDA 7

Misoperations

- a. Q4 2021 Results and Review Discussion

Jake Bernhagen, Sr. Systems Protection Engineer

Action

Information

Report

Jake Bernhagen will provide an overview during the meeting.



MIDWEST
RELIABILITY
ORGANIZATION

MIDAS & Misoperations Q2 2022 PRS Update

By Jake Bernhagen

Q4 2021 Misop Rates

Quarter 4, 2021

Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate
<100kV (BES)	1	20	5.00%	2.78%
100kV	0	0	0.00%	7.58%
115kV	6	96	6.25%	4.40%
138kV	14	155	9.03%	6.91%
161kV	3	103	2.91%	6.02%
230kV	2	50	4.00%	10.28%
345kV	4	95	4.21%	7.63%
500kV	0	2	0.00%	7.87%
HVdc	0	15	0.00%	0.00%
TOTAL	30	536	5.60%	6.54%



2021 Misop Rates

Quarter 1 2021

Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate
<100kV (BES)	0	17	0.00%	3.49%
100kV	0	0	0.00%	0.00%
115kV	18	135	13.33%	5.52%
138kV	6	153	3.92%	6.72%
161kV	9	45	20.00%	14.49%
230kV	6	99	6.06%	8.81%
345kV	12	97	12.37%	7.66%
500kV	1	4	25.00%	17.39%
HVdc	0	1	0.00%	0.00%
TOTAL	52	551	9.44%	7.17%

Quarter 2, 2021

Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate
<100kV (BES)	3	18	16.67%	5.19%
100kV	0	0	0.00%	0.00%
115kV	16	186	8.60%	6.66%
138kV	21	269	7.81%	6.90%
161kV	14	103	13.59%	11.04%
230kV	15	99	15.15%	9.37%
345kV	5	87	5.75%	6.74%
500kV	0	6	0.00%	12.62%
HVdc	0	4	0.00%	0.00%
TOTAL	74	772	9.59%	7.50%

Quarter 3, 2021

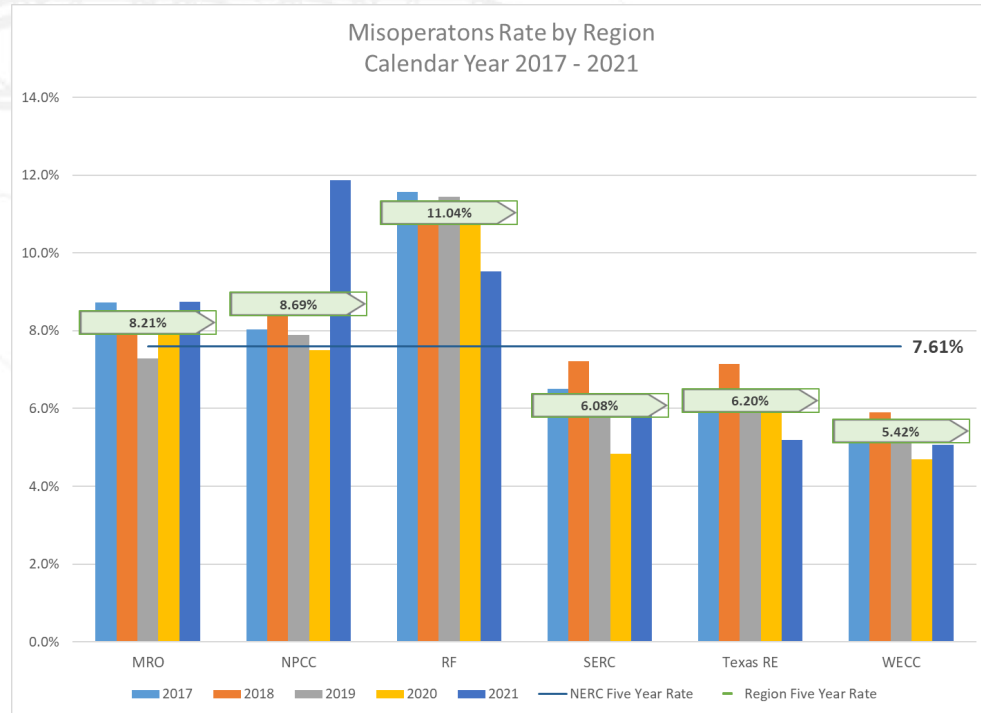
Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate
<100kV (BES)	2	22	9.09%	4.23%
100kV	0	0	0.00%	0.00%
115kV	16	189	8.47%	4.37%
138kV	27	227	11.89%	6.53%
161kV	12	111	10.81%	7.45%
230kV	12	85	14.12%	8.81%
345kV	5	100	5.00%	5.46%
500kV	0	6	0.00%	7.50%
HVdc	0	28	0.00%	0.00%
TOTAL	74	768	9.64%	6.23%

Quarter 4, 2021

Voltage Class	MisOps Count	Ops Count	Rate	NERC Rate
<100kV (BES)	1	20	5.00%	2.78%
100kV	0	0	0.00%	7.58%
115kV	6	96	6.25%	4.40%
138kV	14	155	9.03%	6.91%
161kV	3	103	2.91%	6.02%
230kV	2	50	4.00%	10.28%
345kV	4	95	4.21%	7.63%
500kV	0	2	0.00%	7.87%
HVdc	0	15	0.00%	0.00%
TOTAL	30	536	5.60%	6.54%



ERO Misop Rates



Operations Comparison

2021

Voltage Class	Ops Count
<100kV (BES)	77
100kV	0
115kV	606
138kV	804
161kV	362
230kV	333
345kV	379
500kV	18
HVdc	48
TOTAL	2627

2017 – 2020

Voltage Class	2020	2019	2018	2017	Avg
<100kV (BES)	52	85	93	105	84
100kV	5	0	0	0	1
115kV	756	944	1009	879	897
138kV	954	1111	1133	1197	1099
161kV	381	436	419	495	433
230kV	366	437	516	387	427
345kV	472	665	530	516	546
500kV	11	6	3	15	9
HVdc	57	46	36	43	46
TOTAL	3054	3730	3739	3643	3542



Misoperations Comparison

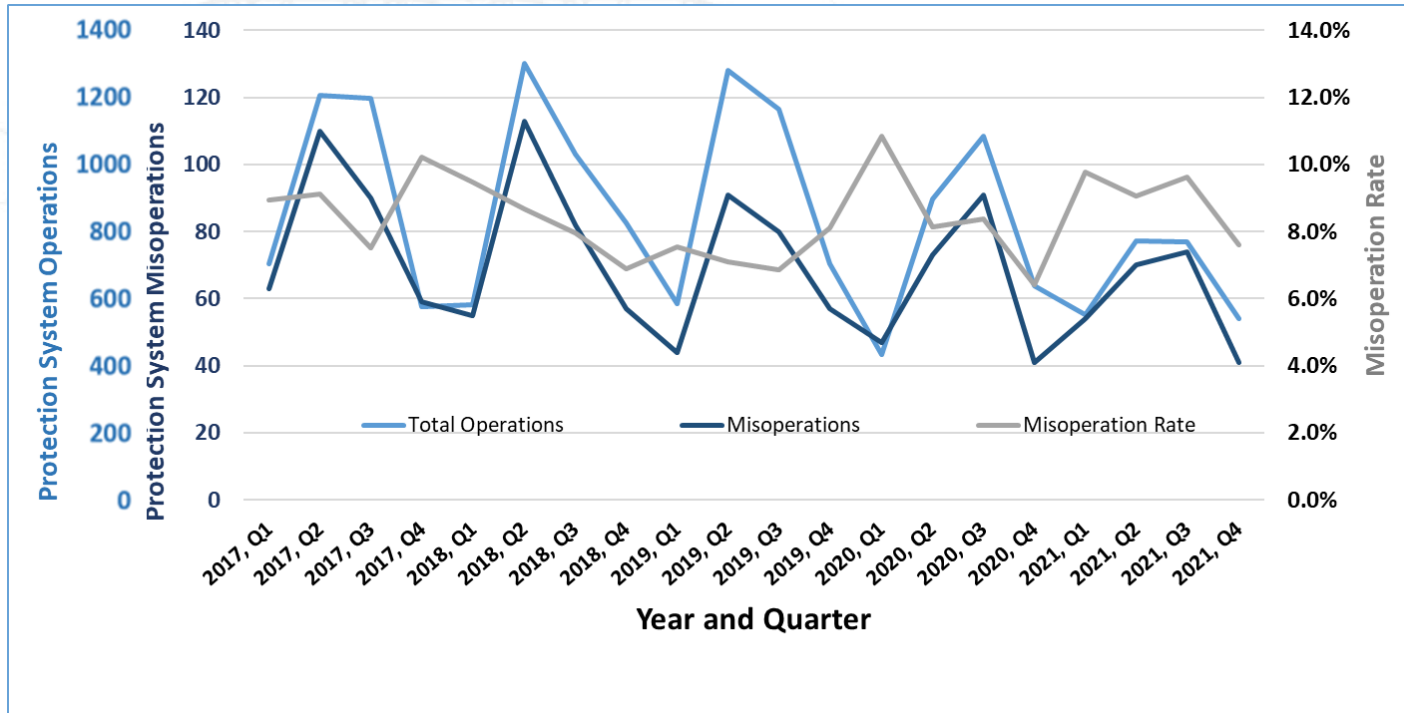
2021

Voltage Class	MisOps Count
<100kV (BES)	6
100kV	0
115kV	56
138kV	68
161kV	38
230kV	35
345kV	26
500kV	1
HVdc	0
TOTAL	230

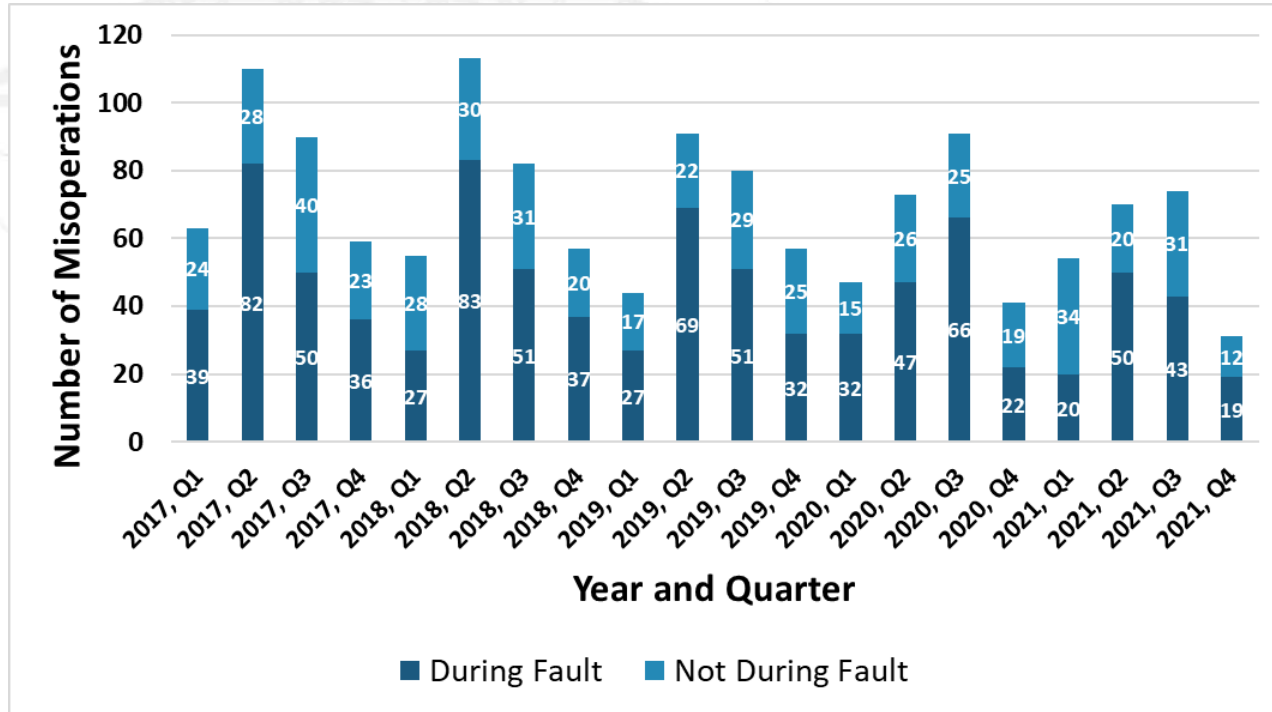
2017 – 2020

Voltage Class	2020	2019	2018	2017	Avg
<100kV (BES)	1	5	5	8	5
100kV	0	0	0	0	0
115kV	62	75	76	78	73
138kV	74	68	102	86	83
161kV	50	37	47	60	49
230kV	28	33	37	35	33
345kV	35	53	36	48	43
500kV	3	1	1	1	2
HVdc	1	1	2	3	2
TOTAL	254	273	306	319	288

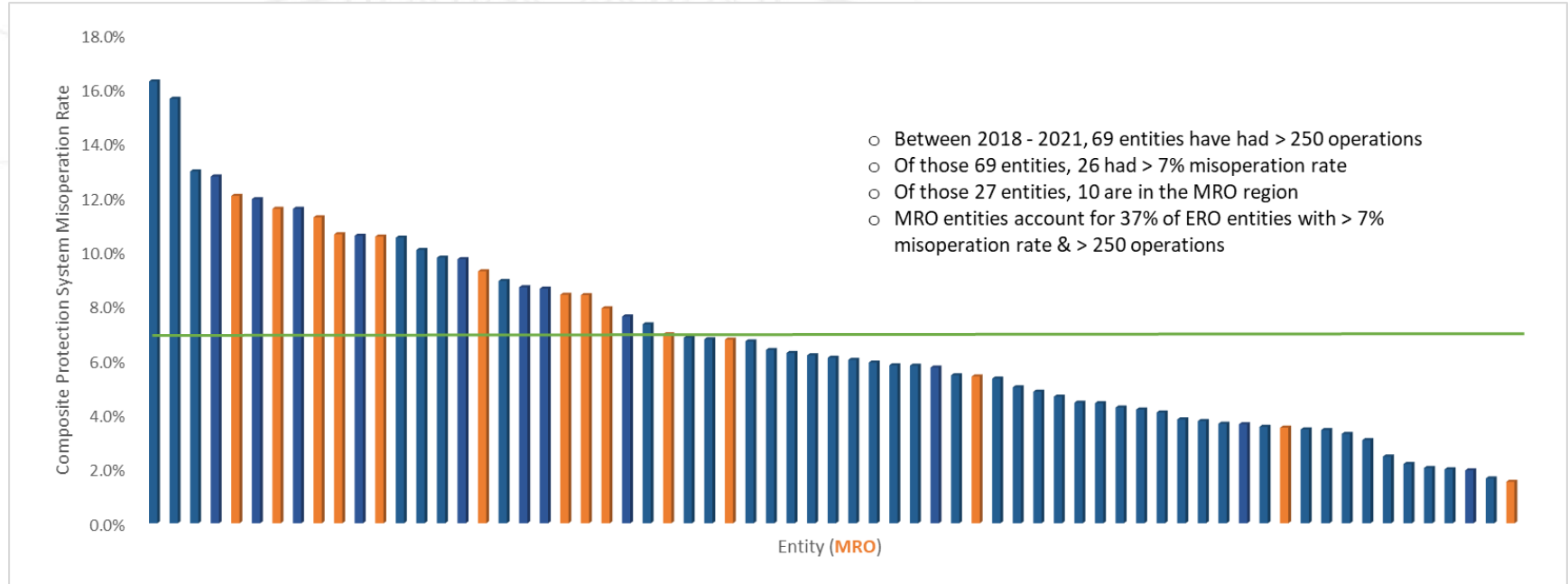
Protection System Operations & Misoperations Rate



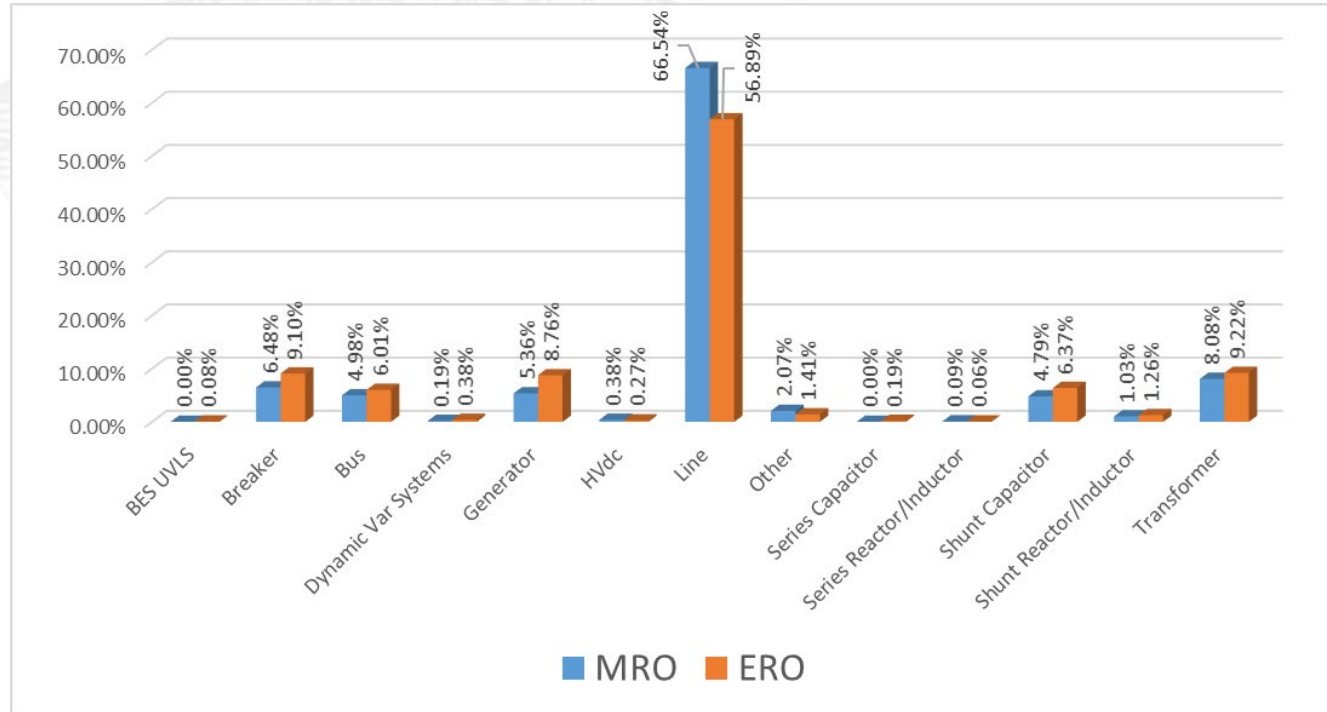
Fault Associated & Non-Fault Associated Misoperations



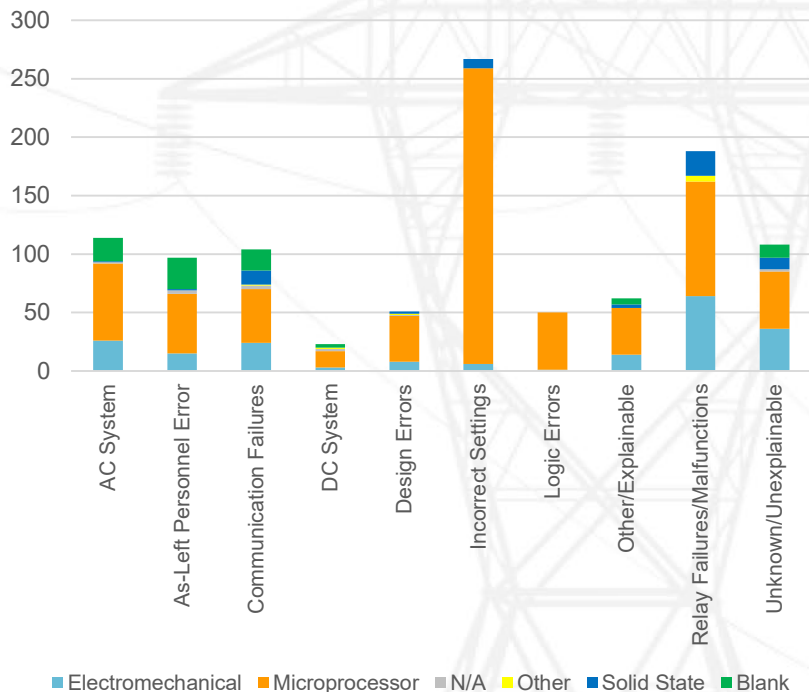
2018 - 2021 ERO Misoperation Rate



MRO Misoperation Rate By Equipment Type (2018 – 2021)



MRO Misoperations by Cause Subdivided by Relay Type (2018 – 2021)



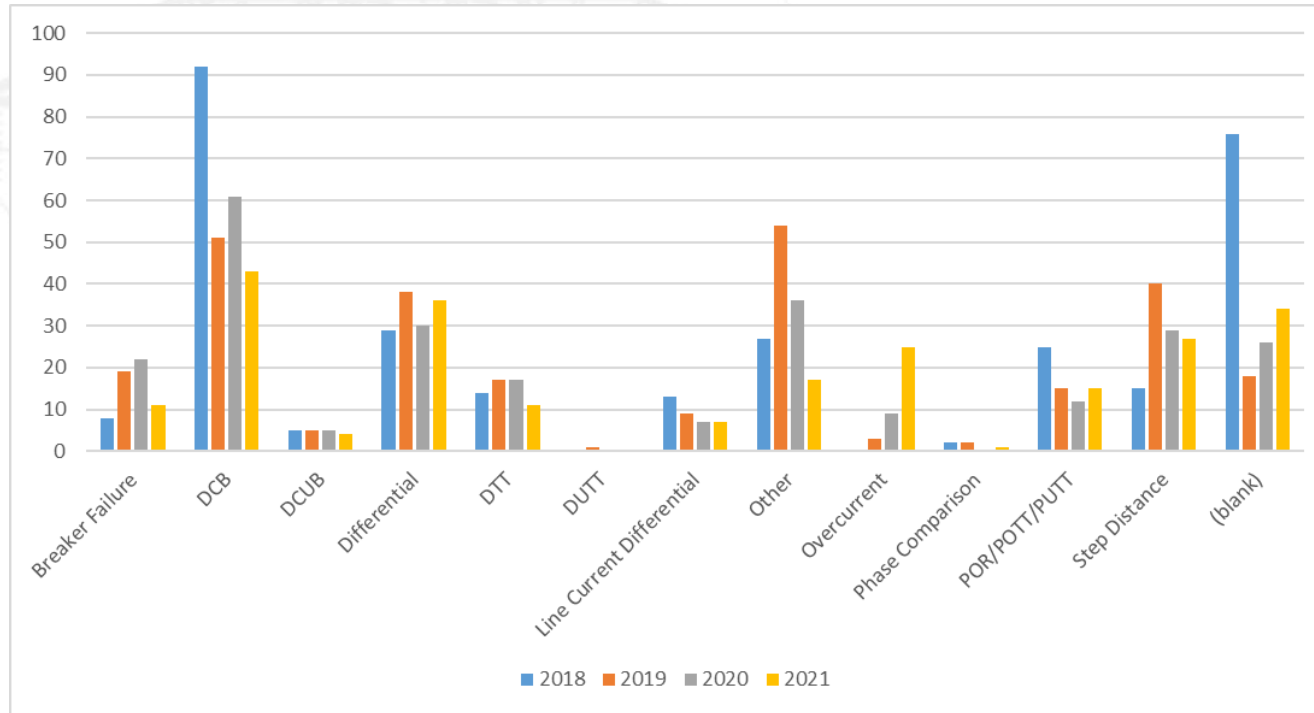
- **43.7% Human Error Related (As-Left Personnel Error, Design Errors, Incorrect Settings, Logic Errors)**
 - 84.3% of HE are associated with microprocessor relays
- **40.3% Equipment Failure Related (AC System, Communication Failures, DC System, Relay Failures/Malfunctions)**
- **66.3% Microprocessor relays**
- **18.5% Electromechanical relays**

2018 – 2021 Misoperation Rate In MRO by Voltage Class

Voltage Class	Operations (Includes Misoperations)	Misoperations	Misoperation Rate
100kV-199kV	9234	771	8.35%
200kV-299kV	1651	133	8.06%
300kV-399kV	2046	150	7.33%
400kV-599kV	38	6	15.8%
HVDC	187	4	2.14%



MRO Misoperations by Scheme



Questions?



CLARITY

ASSURANCE

RESULTS

AGENDA 7

Misoperations

- b. Project Updates
- i. Instantaneous Ground Overcurrent

Jake Bernhagen, Sr. Systems Protection Engineer

Action

Information

Report

Jake Bernhagen will provide an overview during the meeting.

AGENDA 8

Event Analysis Report

- a. Review Lessons Learned

Jake Bernhagen, Sr. Systems Protection Engineer

Action

Information

Report

Jake Bernhagen will provide an overview during the meeting.

Lessons Learned Posted

April 13, 2022

Six new lessons learned have been posted on the NERC website on the [Lessons Learned](#) page.

The new lessons address the following topics:

- [DER Performance During a Disturbance](#)
- [Islanding and Insufficient Primary Frequency Response Resulted in Unintended UFLS](#)
- [Model Data Error Impacts SE and RTCA](#)
- [Substation Flooding Events Highlight Potential Design Deficiencies](#)
- [Unintended Consequences of Altering Protection System Wiring to Accommodate Failing Equipment](#)
- [Intermittent Network Connection Causes EMS Disruption](#)

For more information or assistance, please contact [Sandy Shiflett](#) (via email).

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RELIABILITY | RESILIENCE | SECURITY

AGENDA 8

Event Analysis Report

- b. Seek Input for T-Line Icing Lessons Learned

Jake Bernhagen, Sr. Systems Protection Engineer

Action

Information

Report

Jake Bernhagen will provide an overview during the meeting.

AGENDA 9

Summer 2021 BES Events

Max Desruisseaux, Sr. Power Systems Engineer

Action

Information

Report

Max Desruisseaux will provide an overview during the meeting.



MIDWEST
RELIABILITY
ORGANIZATION

Summer 2021 BES Events

By Max Desruisseaux

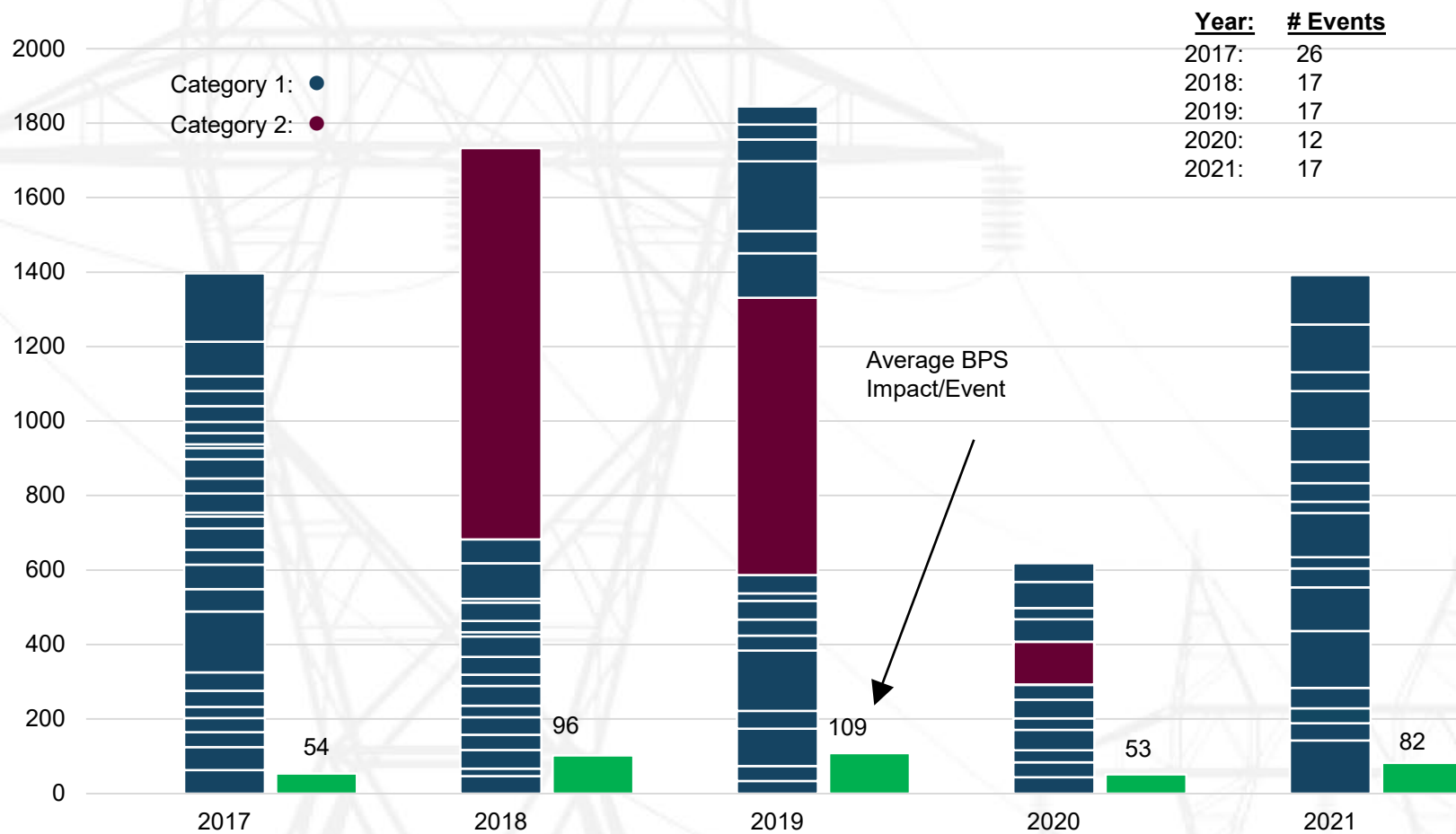
BES Event Analysis (EA)

- Follows the [ERO Event Analysis Process](#).
- Registered Entity develops a brief report.
- Perform root cause analysis.
- Provide recommendations and lessons learned.



BES Event Analysis (EA)

MRO Event Severity Index Chart



Year:	# Events
2017:	26
2018:	17
2019:	17
2020:	12
2021:	17



BES Event Analysis (EA)

- **Total of 17 events in 2021.**
- **6 of 17 events occurred in summer of 2021.**
- **All 6 of these events involved protection system misoperations.**

June 7, 2021 Transmission Event

- **Event Category: 1.a**
- **# of BES facilities Interrupted: 4**
- **MW of Generation Lost: 0 MW**
- **MW of Load Lost: 23 MW**

A115 kV non-BES transmission line tripped and did not attempt to reclose while serving 23 MW of customer load.

Severe thunderstorms had been reported in the area.

Two transmission line and Two transformer outages.

The system configuration at the time created a radial connection, resulting in a 23 MW load shed. Seven damaged structures were identified on the system.



June 10, 2021 Transmission Event 1

- **Event Category: 1.a**
- **# of BES facilities Interrupted: 4**
- **MW of Generation Lost: 0 MW**
- **MW of Load Lost: 0 MW**

A failing B phase CCVT on a 161kV line was being replaced when it experienced a catastrophic failure. During the removal of the failing CCVT a B-phase voltage was jumpered to the line relaying from an adjacent line.

The jumpered B phase voltage cause multiple erroneous recloses on the 161kV line which led to unnecessary operations elsewhere.

There were three misoperations during this event.



June 10, 2021 Transmission Event 2

- **Event Category: 1.a**
- **# of BES facilities Interrupted: 6**
- **MW of Generation Lost: 235 MW**
- **MW of Load Lost: 90 MW**

3-phase fault occurred at a neighboring substation (see previous Event 1).

A 161 kV circuit breaker failed to trip to isolate the fault because it did not receive a trip signal from the line protection relays.

The breaker failure relaying also did not receive an initiate signal to start the breaker failure timer. The cause of this is later determined to be an as-left personnel error.

An incorrect transformer protection relay setting caused unnecessary trips for this fault. The resulting outages were five 161 kV lines, one 161/69 kV transformer, a 235 MW generator and 90 MW of load.

Relay settings were corrected as a result of this event.



June 11, 2021 Transmission Event

- **Event Category: 2.d**
- **# of BES facilities Interrupted: 3**
- **MW of Generation Lost: 0 MW**
- **MW of Load Lost: 0 MW**

115 kV line relay operated and reclosed automatically.

At approximately the same time, an adjacent line breaker tripped and a remote breaker on another adjacent line tripped open ending the adjacent lines.

A relay coordination issue was identified as the cause of the over trip.

Severe thunderstorms had been reported in the area.



July 8, 2021 Transmission Event

- **Event Category: 1.a**
- **# of BES facilities Interrupted: 4**
- **MW of Generation Lost: 0 MW**
- **MW of Load Lost: 23 MW**

A 230 kV transmission line and one terminal of an adjacent 230 kV transmission line tripped and reclosed automatically.

These operations briefly open-ended a 230 kV transmission line and two 230/115 kV transformers.

This event also caused a Special Protection System (SPS) to operate.

**At the time of the event, radar indicated severe thunderstorms in the area.
The total outage time was less than 1 minute.**



July 23, 2021 Transmission Event

- **Event Category: 1.a**
- **# of BES facilities Interrupted: 5**
- **MW of Generation Lost: 0 MW**
- **MW of Load Lost: 15 MW**

The failure of an A phase lightning arrester on a 115 kV transmission line caused the line to trip high speed to clear the fault.

The line attempted a high speed reclose but failed.

During the reclose attempt, A 345/115 kV transformer at one of the line terminals tripped on sudden pressure triggering a transfer trip signal to be sent to trip a 345 kV line.

Also, during the high speed reclose attempt on the 115kV line; the remote terminal line relay tripped and initiated BFI. The resulting lock-out-relay (LOR) operation caused an entire substation outage including 13.8 kV distribution buses for at least 20 min.



AGENDA 10

FERC Order 881 – Ambient Adjusted Ratings and FERC NOI – Dynamic Line Ratings *John Seidel, Principal Technical Advisor*

Action

Information

Report

John Seidel will provide an overview during the meeting.

AGENDA 11

2022 Meeting Dates

Greg Sessler, PRS Chair

Action

Information

Report

Chair Sessler will provide an overview during the meeting.

	Q1 2022	Q2 2022	Q3 2022	Q4 2022
RAC	4/6*	5/19	8/17	11/16
PRS	2/22	5/3	8/16	11/15
SAC	2/16	6/22*	10/5-10/6	11/9
SACTF	2/9	6/15	10/6	11/2
CMEPAC	2/15	6/7	9/21*	11/10
OGOC	4/6	6/22	9/21	11/30
BOD	4/7	6/23	9/22	12/1

*Joint with OGOC

MRO CONFERENCE DATES 2022	
Q1	RAM/CIP Conference: March 23, 2022 *virtual
Q2	Reliability Conference: May 17-18, 2022 networking reception and conference Kansas City
Q3	CMEP: July 25-26, 2022 networking reception and conference
Q4	Security Conference: October 4-6, 2022 SAC meeting, training, networking and conference

AGENDA 12

PRS Roundtable Discussion

Greg Sessler, PRS Chair

Action

Discussion

Report

Chair Sessler will lead this discussion during the meeting.

AGENDA 13

Other Business and Adjourn

Greg Sessler, PRS Chair

Action

Discussion

Report

Chair Sessler will lead the discussion during the meeting.