MIDWEST RELIABILITY ORGANIZATION

Meeting Agenda

Protective Relay Subgroup (PRS)

Wednesday, December 6, 2023
9:00 am to 3:00 pm central

MRO Corporate Offices, King Conference Center
St. Paul, MN & Webex

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 (HEROTM) principles.**

7. **Be supportive of proactive initiatives that improve effectiveness and efficiency for MRO and MRO's registered entities.**

MRO PROTECTIVE RELAY SUBGROUP Q4 MEETING AGENDA

Agenda Item

1 Call to Order and Determination of Quorum
Ryan Einer, PRS Chair
a. Determination of Quorum and Introductions
b. Robert's Rules of Order

2 Standards of Conduct and Antitrust Guidelines
Jake Bernhagen, Manager of Reliability Performance, MRO

3 Safety Briefing
Shawn Keller, Outreach Coordinator, MRO

4 Chair's Remarks
Ryan Einer, PRS Chair

5 Consent Agenda
Ryan Einer, PRS Chair
a. Approve September 6, 2023, meeting minutes

6 NERC Activities
Jake Bernhagen, Manager of Reliability Performance, MRO
a. NERC SPCWG Update
Lynn Schroeder, System Protection Engineer, Sunflower Electric Power Corporation
b. SPCWG Position Paper on FERC Order 881
Lynn Schroeder, System Protection Engineer, Sunflower Electric Power Corporation
c. NERC MIDASUG Update
Jake Bernhagen, Manager of Reliability Performance, MRO
d. TADS
John Grimm, Principal Systems Protection Engineer, MRO

7 PRS Business
Jake Bernhagen, Manager of Relliability Performance, MRO
a. Updates
b. Action Item List Review
Ryan Einer, PRS Chair

8 2024 Meeting Dates
Ryan Einer, PRS Chair

Break – 10:00 a.m.

9 Technical Presentation – ATC 2023 Q2 Misoperation Review
Ethan Grindle, Substation Technology Technical and Compliance Engineer, ATC

10 NERC Standards Update
Rich Bauer, Associate Principal Engineer, North American Electric Reliability Corporation (NERC)

11 Misoperations
Jake Bernhagen, Manager of Reliability Performance, MRO
a. Q3 2023 Update, Review and Discussion
b. Review NERC Lessons Learned

Lunch 12:00 p.m.

12 PRS Roundtable Discussion
Ryan Einer, PRS Chair

13 Q3 2023 Misoperations Review

Jake Bernhagen, Manager of Reliability Performance, MRO

a. Breakout Sessions

14 Other Business and Adjourn

Ryan Einer, PRS Chair

AGENDA

Call to Order and Determination of Quorum

a. Determination of Quorum

Ryan Einer, Protective Relay Subgroup Chair

Name	Role	Company	Term
Adam Daters	Member	ITC Holdings	12/31/24
Alex Bosgoed	Member	Saskatchewan Power Corporation	12/31/25
Casey Malskeit	Member	Omaha Public Power District	12/31/25
Cody Remboldt	Member	Montana-Dakota Utilities	12/31/24
David Weir	Member	Western Area Power Administration	12/31/25
David Wheeler	Member	Southwestern Public Services Co.	12/31/23
Dennis Lu	**Vice Chair**	Manitoba Hydro	12/31/23
Derrick Schlangen	Member	Great River Energy	12/31/23
Glenn Bryson	Member	American Electric Power	12/31/24
Greg Hill	Member	Nebraska Public Power District	12/31/25
Greg Sessler	Member	American Transmission Company	12/31/23
Jeff Beasley	Member	Grand River Dam Authority	12/31/25
Josh Erdman	Member	Xcel Energy	12/31/24
Lynn Schroeder	Member	Sunflower Electric Power Corporation	12/31/25
Rochelle Trefry	Member	MidAmerican Energy Company	12/31/25
Ryan Einer	**Chair**	Oklahoma Gas & Electric	12/31/23
Sarah Marshall	Member	Alliant Energy	12/31/24
Scott Paramore	Member	Kansas City Board of Public Utilities	12/31/24
Terry Fett	Member	Central Iowa Power Cooperative	12/31/23

AGENDA

Call to Order and Determination of Quorum

b. Robert's Rules of Order

Ryan Einer, Protective Relay Subgroup 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.

Notes on Motions

Seconds. A Motion must have a second to ensure that at least two members wish to discuss the issue. The "seconder" 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

Standards of Conduct and Antitrust Guidelines
Jake Bernhagen, Manager of Reliability Performance, MRO

Standards of Conduct Reminder:

Standards of Conduct prohibit MRO staff, committee, subcommittee, 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

Safety Briefing
Shawn Keller, Outreach Coordinator, MRO

Action
Information

Report
Shawn Keller will lead this discussion during the meeting.

AGENDA

Chair's Remarks
Ryan Einer, Protective Relay Subgroup Chair

Action
Information

Report
Chair Einer will lead this discussion during the meeting.

AGENDA

Consent Agenda

a. Approve September 6, 2023, meeting minutes
Ryan Einer, Protective Relay Subgroup Chair

Action
Discussion

Report
Chair Einer will lead this discussion during the meeting.

MIDWEST RELIABILITY ORGANIZATION
380 St. Peter St, Suite 800
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651-855-1760

Draft Minutes of the Protective Relay Subgroup Meeting

Hybrid: St. Paul, MN and Webex

Wednesday, September 6, 2023, 9:01 a.m. to 3:12 p.m. Central

Notice for this meeting was electronically posted to the MRO website on August 9, 2023.
A final agenda, including advanced reading materials, was also posted on August 30, 2023.

1. **Call to Order and Determination of Quorum**

   Protective Relay Subgroup (PRS) Vice Chair Dennis Lu called the meeting to order at 9:01 a.m. Lu welcomed everyone, and roundtable introductions were made. Rebecca Schneider, Reliability Analysis Administrator, advised the vice 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, MRO Manager of Reliability Performance, Jake Bernhagen highlighted MRO's Standards of Conduct, Conflict of Interest, and Antitrust Guidelines.

3. **Safety Briefing**

   MRO Outreach Coordinator, Shawn Keller, gave a safety briefing for in-person attendees which included information regarding emergency exits, evacuation procedures, and the location of the automated external defibrillator (AED).

4. **Vice Chair's Remarks**

   Vice Chair Lu shared that he would be leading today's meeting as the PRS Chair, Ryan Einer, was unavailable to attend. Lu highlighted the upcoming nomination period at MRO and noted that there are six seats on the PRS with terms expiring at the end of 2023. Lu encouraged anyone interested in serving on the PRS to apply, and he reminded the current members to self-nominate if they are interested in continuing to serve on the PRS.

5. **Consent Agenda**

   The PRS reviewed the consent agenda, which included minutes from the June 27, 2023, meeting.

   Upon a motion duly made and seconded, the PRS approved the consent agenda in its entirety.

6. **NERC Activities**

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

   Lynn Schroeder, MRO representative on the NERC SPCWG, provided an update. She noted that the SPCWG's position on FERC Order 881 (Ambient Adjusted Ratings) related to PRC-023 has not changed. SPCWG recommends the entities review loadability for all protection systems that fall under the order to ensure sufficient margin above normal and emergency AARs. Schroeder also noted a draft PRC-024 IBR White Paper that is complete and currently under review as well as a Standard Authorization Request (SAR) on PRC-006 submitted by the NERC System Planning Impacts from DER Working Group (SPIDERWG). She mentioned the Technical Reference related to maintenance for Ethernet-based P&C. The next meeting is October 24, 2023, in Atlanta. Discussion ensued.

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

Bernhagen provided an update from the August 1, 2023, meeting. The group is considering a Section 1600 reporting change related to the "equipment removed from service" field. This field is currently free form, and the responses have not been particularly useful in terms of event analysis. NERC may replace this field with a distinct count and names of units. A draft proposal is forthcoming. The third quarter meeting will take place in October in Atlanta. Bernhagen noted that annual MIDAS training will be held in November (TBD). Discussion ensued.

Transmission Availability Data System (TADS).

John Grimm, MRO Principal Systems Protection Engineer, provided an update on TADS. Grimm noted that TADS in-person training will take place on October 18-19, 2023, in Atlanta. Additionally, there are training videos located on the NERC website. Grimm mentioned that NERC is missing critical information related to large-scale outages and load loss data, and NERC is looking for volunteers to participate in a task force to assist with this project.

7. PRS Business

Updates.

Bernhagen shared a draft NERC Lessons Learned entitled, "Protective Relay Solid State Output Contact Voltage Leakage." He solicited the PRS members to see if any of the entities has a photo or could take a photo of the resistor installation described in the Lessons Learned. NERC is seeking this photo before publication of the Lessons Learned.

Bernhagen also noted that NERC is still looking for panelists to participate in the Misoperations Workshop in Atlanta on the following topics: Incorrect Settings and Using Contractors for Commission Testing.

Action Item List Review.

Vice Chair Lu reviewed the action item list and updates were made accordingly. An action item was added for a possible joint meeting with another region's relay subgroup within the ERO Enterprise in 2024.

8. 2023 Meeting Dates

Vice Chair Lu reviewed the proposed 2023 meeting dates for the PRS and the other councils and subgroups. Bernhagen proposed Monday, October 23 for the PRS Membership Selection meeting which will take place via Webex. It was noted that a quorum is needed for the voting to take place.

To accommodate schedules, Vice Chair Lu moved the Technical Presentations (Agenda Item 10a and 10b) ahead on the agenda. These minutes reflect the order in which the reports were provided.

9. Technical Presentation

PRC Impacts on Ethernet Based Protection & Control Device Maintenance and Design

Eric Udren, Executive Director, Quanta Technology, LLC gave a presentation on IEC 61850 Substation P&C Architecture and NERC Standards for Definition of Protection System. Udren highlighted the project team and the NERC standards that are impacted or have clarity issues. The purpose of this work is to advise NERC and the industry in 2023 on the impact of emerging P&C technologies on

standards, definitions, and compliance with a focus on Ethernet IEC 61850 substations. Udren outlined the three main goals of the SPCWG Technical Reference team: explain technical issues, give interpretation advice, and recommend standard changes. He noted the draft Technical Reference document is in progress for release in early 2024. Discussion ensued.

WAPA's Geomagnetic Disturbance (GMD) Project Presentation

Chris Colson, Transmission System Planning Manager, Western Area Power Administration, gave a presentation on WAPA's actions for preparation and defense against space weather effects on the transmission system. Colson operates in the Upper Great Plains Region, which is the largest of WAPA's four regions. He discussed why space weather matters in the electronic age, and the occurrence of geomagnetic disturbances (GMD) caused by space weather. Colson also illustrated how geomagnetically-induced current (GIC) can cause significant electric transmission system disruption. Colson concluded that both GIC monitoring and neutral blocking devices (NBD) offer opportunities for improved EOP-010-1 awareness and defensive operations. Discussion ensued.

10. Commissioning Lessons Learned – Montana-Dakota Utilities

Cody Remboldt, System Protection Engineer, MDU and PRS member, gave a presentation on MDU's 5-step management process for relay settings. Remboldt shared that MDU revamped the process in 2021 and moved to a Relay Setting Database instead of managing relay settings in Windows Explorer. He noted that using version fields in the philosophy documentation has been successful in the review process. Remboldt summarized that the adoption of setting versions, instead of dates, and the use of the Relay Setting Database for tracking setting progress has lessened confusion and strengthened confidence that the settings are accurate. Discussion ensued.

11. Misoperations

Q2 2023 Update, Review and Discussion

Bernhagen provided a summary of MRO's second quarter 2023 misoperations data. The overall misoperation rate of 8.5 percent is comparable to previous years. In the second quarter, there were eighty-five misoperations and 950 total operations. Bernhagen reported a high number of misoperations "not during a fault." The leading cause of misoperations was" Relay Failures" followed by "Other/Explainable" and "Incorrect Settings." He also noted that one fifth of the misoperations reported left the scheme field blank. Bernhagen provided instructions for the misoperations review taking place in breakout sessions later in the meeting. Discussion ensued.

Review NERC Lessons Learned

Bernhagen directed the PRS members to visit the NERC website to find the latest Lessons Learned. He noted that at least one new Lessons Learned has been published since the last PRS meeting.

2023 ERO Misoperation Workshop Update

Bernhagen polled the group to see if anyone was planning to attend the NERC ERO Misoperation Workshop on October 25-26, 2023, in Atlanta, GA. He also reminded members that NERC is looking for panelists.

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12. PRS Roundtable Discussion

Vice Chair Lu invited member participants to share other relevant industry observations. Topics discussed included applying split phase type protection to a multi-leg oil filled reactor.

13. Q2 2023 Misoperations Review

Breakout Sessions
The PRS members reviewed the second quarter 2023 misoperations in breakout sessions both in-person and via Webex. Discussion ensued.

14. Other Business and Adjourn

Having no further business to discuss, the meeting was adjourned at 3:12 p.m.

Prepared by: Rebecca Schneider, Reliability Analysis Administrator
Reviewed and submitted by: Jake Bernhagen, Manager of Reliability Performance

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Exhibit A – Meeting Attendees

PRS Members Present	
Name	**Company**
Dennis Lu, Vice Chair	Manitoba Hydro
Adam Daters	ITC Holdings
Alex Bosgoed	Saskatchewan Power Corporation
Casey Malskeit	Omaha Public Power District
Cody Remboldt	Montana-Dakota Utilities
David Weir	Western Area Power Administration
David Wheeler	Southwestern Public Services Co.
Glenn Bryson	American Electric Power
Greg Hill	Nebraska Public Power District
Greg Sessler	American Transmission Company
Jeff Beasley	Grand River Dam Authority
Josh Erdman	Xcel Energy
Lynn Schroeder	Sunflower Electric Power Corporation
Rochelle Trefry	MidAmerican Energy Company
Sarah Marshall	Alliant Energy
Scott Paramore	Kansas City Board of Public Utilities
Terry Fett	Central Iowa Power Cooperative
MRO Staff Present	
Name	**Title**
Jake Bernhagen	Manager of Reliability Performance
Rebecca Schneider	Reliability Analysis Administrator
Shawn Keller	Outreach Coordinator
John Grimm	Principal Systems Protection Engineer

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Eric Graftaas	Principal Power Systems Engineer
Max Desruisseaux	Senior Power Systems Engineer
Joshua Hebert	Senior Compliance Engineer, O&P
Other Attendees	
Name	**Company**
David Oswald	Liberty Utilities
Chris Colson	Western Area Power Administration
Ed Ruck	NERC
Eric Udren	Quanta Technology, LLC
Dylan Underwood	Southwestern Power Administration
Gayan Wijeweera	Manitoba Hydro
Kevin Ostash	Manitoba Hydro
Mark Gutzmann	Xcel Energy
Matthew Wyatt	Liberty Utilities
Terry Volkmann	Glencoe Light and Power
Tyler Baxter	Corn Belt Power Cooperative
Tyler Porter	Great River Energy

AGENDA

NERC Activities

a. NERC SPCWG Update

Lynn Schroeder, Sunflower Electric Power Corporation and PRS Member

Action

Information

Report

Lynn Schroeder will provide an oral report during the meeting.

AGENDA

NERC Activities

b. SPCWG Position Paper on FERC Order 881

Lynn Schroeder, Sunflower Electric Power Corporation and PRS Member

Action

Information

Report

Lynn Schroeder will provide an oral report during the meeting.

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

SPCWP Position on FERC 881/881a

Lynn Schroeder and Manish Patel
21 June 2023

RELIABILITY | RESILIENCE | SECURITY




Background

- Order 881 requires transmission providers to:
  - Use at least four seasonal line ratings when evaluating longer-term point-to-point transmission service ending more than 10 days in the future.
  - It also requires that AARs be determined for at least every hour for near-term (10 days into the future) requests for point-to-point and network service.
  - Those AARs must be calculated for both day and night with the knowledge that there is no solar heating during the nighttime calculation.

Background Cont.

- Order 881 states that:
  - The commission believes that settings changes will not be required to "thousands" of relays (P99) to comply with PRC-023
    - Because "PRC-023-4 related relay settings are currently calculated based on practical limitations which in the majority of cases should ~~not~~ exceed AAR values." (P99) (Order 881-A stated that this is an error by the Commission and should be "…should exceed AAR values").
- FERC 881A clarifies "We clarify two aspects of the AAR requirements related transmission protection relay settings.
  - First, if a transmission provider establishes higher transmission line ratings, it will have to evaluate or reevaluate its applicable protection systems for that facility.
  - Second, we clarify that in a majority of situations the relay setting should exceed AAR values."

Background Cont.

- Paragraph 26 states that:
  - "a transmission provider must evaluate its applicable protection systems for that facility in order to comply with PRC-023-4 and prevent protection systems from limiting transmission loadability" as a result of favorable ambient conditions.
  - However - P26 does not claim that the PRC-023 needs to change to address AAR values and can be interpreted to mean that the transmission line rating increases must refer to newly required seasonal ratings since those are the pertinent ratings in PRC-023.

Examples

- **Utility A**
  - Utility A currently has four seasonal ratings and uses 41° F to calculate seasonal ratings used to evaluate loadability as required by PRC-023. The utility's initial assessment of historical temperatures shows that it may need to calculate AAR for temperatures as low as 15° F. The utility found that this change would increase transmission line ratings less than 10%.
- **Utility B**
  - Utility B currently bases its seasonal winter rating on a temperature of 50° F. The utility calculated ratings for three of its 345 kV lines using a historical low temperature of -20° F and found that ratings increased by 13–20%.

Examples

- **Utility C**
  - Utility C currently has only one seasonal rating and its compliance with PRC-023 is based on that seasonal rating. Utility C has drafted proposed seasonal ratings in accordance with order 881, and the winter rating will increase nearly all ratings with some as high as 70%. Re-evaluation of its protection system loadability with PRC-023 applicability will be required under the current version of the standard.
- **Utility D**
  - Utility D currently calculates winter ratings based on a temperature of 32° F with some wind. These ratings are used for PRC-023 compliance. New ratings calculated at -30° F with wind are 5–18% higher than the current ratings.

Key Points

- Protection systems required to comply with PRC-023 are a subset of protections systems to which Orders 881 and 881-A apply.
  - It is unknown how many additional systems will need to be reviewed to ensure that the protection systems meet those orders. A survey of some entities suggested that the relays covered by PRC-023-04 are only 20–60% of the relays that will now need to be evaluated to meet the new loadability requirement in the orders.

Key Points

- The SPCWG acknowledges that:
  - relays should allow some margin above the maximum loadability required by new AARs to ensure that the relays won't trip under load.
- Based on the examples:
  - Entities that have historically calculated winter season ratings for transmission lines subject to PRC-023 will likely have at least 20% margin above the AAR loadability requirements,

881 and PRC-023

- Based on these findings, the SPCWG believes that no changes to PRC-023 are necessary, and protection systems that are presently applicable and compliant with PRC-023 based on winter seasonal ratings do not need to be revised to meet the margin required in PRC-023 for the AAR that are determined by the entities

Conclusion

- Review loadabilities for all protection systems that fall under the order to ensure sufficient margin above normal and emergency AARs.
  - SPCWG believes that reaching margins specified in PRC-023 (e.g., Criteria 1's 150%) above AARs is not necessary and would increase the amount of setting modifications entities would be required to implement.
- 881 and 881-A will require most entities to expend significant resources to ensure that protection system loadabilities will accommodate newly required seasonal ratings and AAR.
  - Up to 70% of existing transmission line protection systems may be impacted
  - Work associated with this review and possible settings changes is likely to exceed the implementation time frame allowed in 881 and 881-A.

Questions and Answers

AGENDA

NERC Activities

c. NERC MIDASUG Update

Jake Bernhagen, Manager of Reliability Performance, MRO

Action

Information

Report

Jake Bernhagen will provide an oral report during the meeting.

AGENDA

NERC Activities

d. Transmission Availability Data System (TADS)

John Grimm, Principal Systems Protection Engineer, MRO

Action

Information

Report

John Grimm will provide an oral report during the meeting.

AGENDA

PRS Business

a. Updates

Jake Bernhagen, Manager of Reliability Performance, MRO

Action

Information

Report

Jake Bernhagen will provide an oral report during the meeting.

AGENDA

PRS Business

b. Action Item List Review

Ryan Einer, Protective Relay Subgroup Chair

Action

Discussion

Report

Chair Einer will lead this discussion during the meeting.

AGENDA

2024 Meeting Dates

Ryan Einer, Protective Relay Subgroup Chair

Action

Information

Report

Chair Einer will provide an overview during the meeting.

	Q1 2024	Q2 2024	Q3 2024	Q4 2024
RAC	2/22	5/16	8/8	10/3
SAC	2/21	5/14	8/6	10/3
CMEPAC	2/20	5/7	7/23	10/3
PRS	3/12	6/11	9/10	12/10
OGOC	3/6 Virtual	5/22	8/20	11/6
BOD	2/8 Virtual	5/23	8/22	11/7

***Joint council meeting 10/2/24 (half day)**

***Networking Event 10/2/24 (evening)**

MRO CONFERENCE DATES 2024	
Q1	**RAM Conference: March 19-20, 2024 networking reception and conference (hybrid)**
Q2	**Reliability Conference: May 14-15, 2024 networking reception and conference (hybrid)**
Q3	**CMEP Conference: July 23-24, 2024 networking reception and conference (hybrid); Kansas City, MO**
Q4	**Security Conference: October 1-2, 2024 networking reception, training and conference (hybrid)**

AGENDA

Technical Presentation – ATC 2023 Q2 Misoperation Review

Ethan Grindle, Substation Technology Technical and Compliance Engineer, ATC

Action

Information

Report

Ethan Grindle will provide an oral report during the meeting.

AGENDA

NERC Standards Update

Rich Bauer, Associate Principal Engineer, NERC

Action

Information

Report

Rich Bauer will provide an oral report during the meeting.

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Protection Related Standards Projects

Rich Bauer
MRO PRS Quarterly Meeting
December 6, 2023

RELIABILITY | ACCOUNTABILITY




New Developments

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Standards Development Strategy to Address FERC Order 901

November 2023

RELIABILITY | RESILIENCE | SECURITY




New Developments

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Overall Approach

- Key Factors to Include in Strategy
  - Prioritization of NERC Standards Projects
  - Continual coordination between NERC Engineering, Legal, and Standards
  - Ongoing communication to industry
  - Balance with other high priority work

New Developments

Home > Program Areas & Departments > Standards > Reliability Standards Under Development

Reliability Standards Under Development

The RSUD page provides access to all projects including: Reliability Standards, Standard Authorization Requests, Periodic Reviews, and Interpretations.

NERC Standards Projects have been increasing in quantity; coinciding with the increasing pace of technology changes in our industry and the issuance of FERC directives. The high priority projects listed below will be completed in 2024. The medium and low priority projects will have completion dates of 2025 beyond.

Prioritization Slide Deck

Once standard(s) are adopted by the NERC Board of Trustees, the project is moved to the **Archived Reliability Standards Under Development** page and the standard(s) are added to the appropriate family of standards on the **Reliability Standards** page.

Click **here** to participate in NERC's Quality Review (QR) program.

*Denotes Inverter-based resources and distributed energy resource projects

Reliability Standards Under Development
High Priority - Completed by 2024
2016-02 Modifications to CIP Standards - CIP-002, CIP-003, CIP-004, CIP-005, CIP-006, CIP-007, CIP-008, CIP-009, CIP-010, CIP-011, CIP-012-1
2020-02 Modifications to PRC-024 (Generator Ride-through)*
2021-03 CIP-002
2021-04 Modifications to PRC-002-2*
2021-07 Extreme Cold Weather Grid Operations, Preparedness, and Coordination
2022-03 Energy Assurance with Energy-Constrained Resources
2023-02 Performance of IBRs*
2023-03 Internal Network Security Monitoring (INSM)
2023-04 Modifications to CIP-003
2023-06 CIP-014 Risk Assessment Refinement
2023-07 Transmission System Planning Performance Requirements for Extreme Weather

New Developments

Medium Priority - Completed By 2025 and Beyond
2020-04 Modifications to CIP-012
2020-06 Verifications of Models and Data for Generators*
2021-01 Modifications to MOD-025 and PRC-019*
2023-01 EOP-004 IBR Event Reporting*
Low Priority
2017-01 Modifications to BAL-003 Phase II
2019-04 Modifications to PRC-005-6
2021-02 Modifications to VAR-002-4.1*
2021-08 Modifications to FAC-008
2022-01 Reporting ACE Definition and Associated Terms
2022-02 Modifications to TPL-001-5.1 and MOD-032-1*
2022-04 EMT Modeling*
2022-05 Modifications to CIP-008 Reporting Threshold
2023-05 Modifications to FAC-001 and FAC-002 *
2023-08 Modifications of MOD-031 Demand and Energy Data

PRC-005-7

- **Standards Project 2019-04**
- **Draft 1 PRC-005-7 - Posted in July**
- **Existing definition**
  - **Protection System –**
    - **Protective relays which respond to electrical quantities,**
- **Proposed definition**
  - **Protection System – One or more of the following components:**
    - **Protective relays and components of control systems which respond to secondary measured electrical quantities and provide protective functions;**

- **PRC-005-7 proposed maintenance table changes**

PRC-005-7 – Protection System, Automatic Reclosing, and Sudden Pressure Relaying Maintenance

Table 1-1 Component Type - Protective relays and Components of control systems which respond to measured electrical quantities and provide protective functions Excluding distributed UFLS and distributed UVLS (see Table 3)		
Component Attributes	**Maximum Maintenance Interval[3]**	**Maintenance Activities**
Any unmonitored protective relay/Component not having all the monitoring attributes of a category below.	6 Calendar Years	For all unmonitored relays/Components: • Verify that protective function settings are as specified For non-microprocessor relays/Components: • Test and, if necessary calibrate For microprocessor relays/Components: • Verify operation of the relay/Component inputs and outputs that are essential to proper functioning of the Protection System. • Verify acceptable measurement of power system input values that are essential to proper functioning of the Protection System.
Monitored microprocessor protective relay/Component with the following: • Internal self-diagnosis and alarming (see Table 2). • Voltage and/or current waveform sampling three or more times per power cycle, and conversion of samples to numeric values for measurement calculations by microprocessor electronics. • Alarming for power supply failure (see Table 2).	12 Calendar Years	Verify: • Protective function settings are as specified. • Operation of the relay/Component inputs and outputs that are essential to proper functioning of the Protection System. • Acceptable measurement of power system input values that are essential to proper functioning of the Protection System.

- **Draft 1 PRC-005-7 – Poll Results**

	Ballot	Non-binding Poll
	Quorum / Approval	Quorum / Supportive Opinions
PRC-005-7	90.17% / 35.33%	88.13% / 23.37%
Implementation Plan	90.78% / 41.53%	N/A

Project 2019-04 - Modifications to PRC-005-6

Low Priority (2025 and Beyond)

PRC-002

- Standards Project 2021-04
- Modifications to PRC-002
- 2 SARS
  - Glencoe Light SAR (Phase 1)
  - IBR SAR (Phase 2)

PRC-002

- PRC-002-4 Approved by FERC April 14, 2023
- PRC-002-4 addresses the Glencoe Light SAR only
- Glencoe SAR – clarify connected versus directly connected

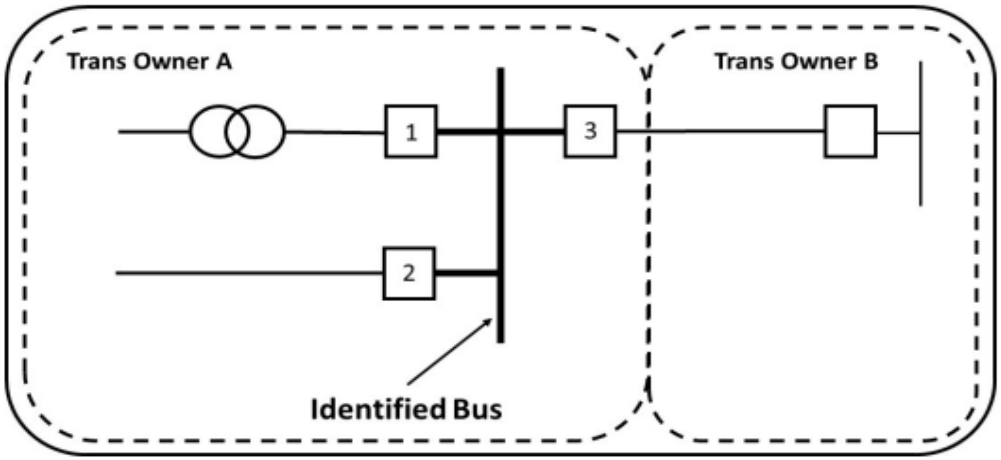


Figure 3

PRC-002

- Phase 2 addresses IBR SAR
- Draft 1 Posted for comment September 2023
- Remove IBR facilities from PRC-002
- Create new IBR Monitoring Standard – PRC-028

PRC-028-1 – Disturbance Monitoring and Reporting Requirements for Inverter-Based Resources

A. Introduction

1. **Title:** Disturbance Monitoring and Reporting Requirements for Inverter-Based Resources
2. **Number:** PRC-028-1
3. **Purpose:** To have adequate data available from inverter-based resources (IBR) to facilitate analysis of Bulk Electric System (BES) Disturbances.
4. **Applicability:**
   - **4.1. Functional Entities:**
     - **4.1.1.** Transmission Owner that owns equipment as identified in section 4.2
     - **4.1.2.** Generator Owner that owns equipment as identified in section 4.2
   - **4.2. Facilities:** The following Elements associated with BES generating plants (inverter-based portion of generating plant/Facility meeting the criteria set by Inclusion I2, Part (b) or Inclusion I4 of the BES definition):
     - **4.2.1** Circuit breaker(s).
     - **4.2.2** Main power transformer(s)[1].
     - **4.2.3** Collector bus.
     - **4.2.4** Shunt static or dynamic reactive device(s).
     - **4.2.5** At least one IBR unit[2] connected to last 10% of each collector feeder length (i.e., furthest from the collector bus).

- **Modifications to PRC-002 Phase 2 Ballot Results**

	Ballot	Non-binding Poll
Standard	Quorum / Approval	Quorum / Supportive Opinions
PRC-002-5	87.96% / 61.44%	86.09% / 54.45%
PRC-028-1	87.41% / 43.33%	85.44% / 28.07%
Implementation Plan	87.23 / 42.96%	N/A

Project 2021-04 - Modifications to PRC-002

High Priority (2024)

- **Standards Project 2021-01**
- **PRC-019-3 – Draft 2 posted for comment – June 2023**

~~Standard PRC-019-2~~ PRC-019-3 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

1.2. For IBR generating Facilities, assuming the voltage control mode is enabled in the power plant controller and/or IBR unit(s)[6] and steady-state system operating conditions, verify the following coordination items:

1.2.1. The in-service control functions of the power plant controller are set to operate before the protective functions of the applicable Facilities in order to avoid disconnecting any of the Facilities listed under Section 4.2.4 unnecessarily.

1.2.2. The in-service control functions of IBR unit(s) are set to operate before protective functions of the applicable Facilities in order to avoid disconnecting any of Facilities listed under Section 4.2.4 unnecessarily.

1.2.3. The applicable in-service protective functions are set to operate to isolate or de-energize equipment in order to limit the extent of damage when operating conditions exceed equipment capabilities.

M1. Each Generator Owner and Transmission Owner with applicable Facilities will have evidence such as a graphical representation(s) of coordination including a P-Q Diagram, R-X Diagram, Inverse Time Diagram, equivalent tables, steady-state calculations, dynamic simulation studies, or other evidence that it performed a coordination study as specified in Requirement R1. This evidence should include dated documentation that demonstrates the coordination was performed.

- **Draft 2 PRC-019-3 – Poll Results**

	Ballot	Implementation Plan	Non-binding Poll
	Quorum / Approval	Quorum / Approval	Quorum / Supportive Opinions
MOD-025-3	87.04% / 36.05%	86.62% / 46.46%	85.88% / 34.88%
PRC-019-3	86.99% / 46.73%	86.67% / 54.39%	85.94% / 44.07%

Project 2021-01 - Modifications to MOD-025 and PRC-019

Medium Priority (2025 and Beyond)

TPL-001 Footnote 13 d

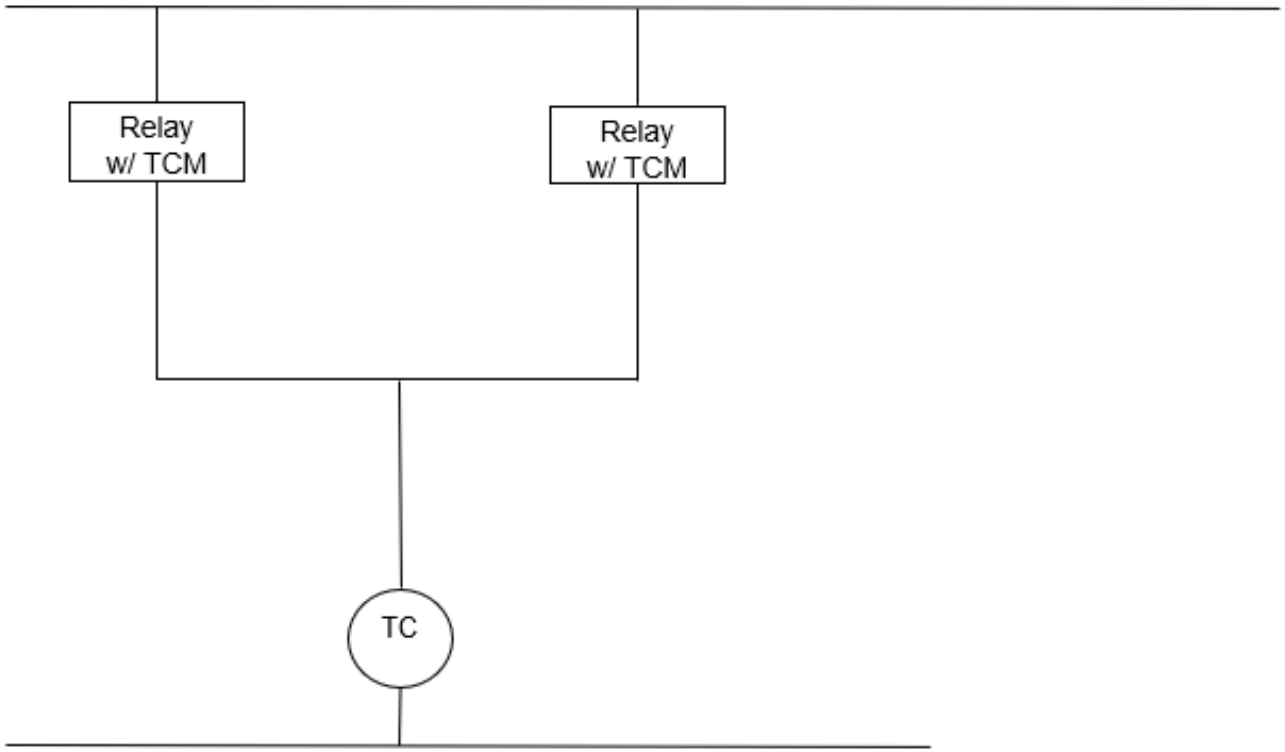
- **Standard Project 2022-02**
- **TPL-001-5 Footnote 13**
- **Single Point of Failure**

Category	Initial Condition	Event [1]	Fault Type [2]	BES Level [3]	Interruption of Firm Transmission Service Allowed [4]	Non-Consequential Load Loss Allowed
P5 Multiple Contingency *(Fault plus non-redundant component of a Protection System failure to operate)*	Normal System	Delayed Fault Clearing due to the failure of a non-redundant component of a Protection System[13] protecting the Faulted element to operate as designed, for one of the following: 1. Generator 2. Transmission Circuit 3. Transformer[5] 4. Shunt Device[6] 5. Bus Section	SLG	EHV	No[9]	No
				HV	Yes	Yes

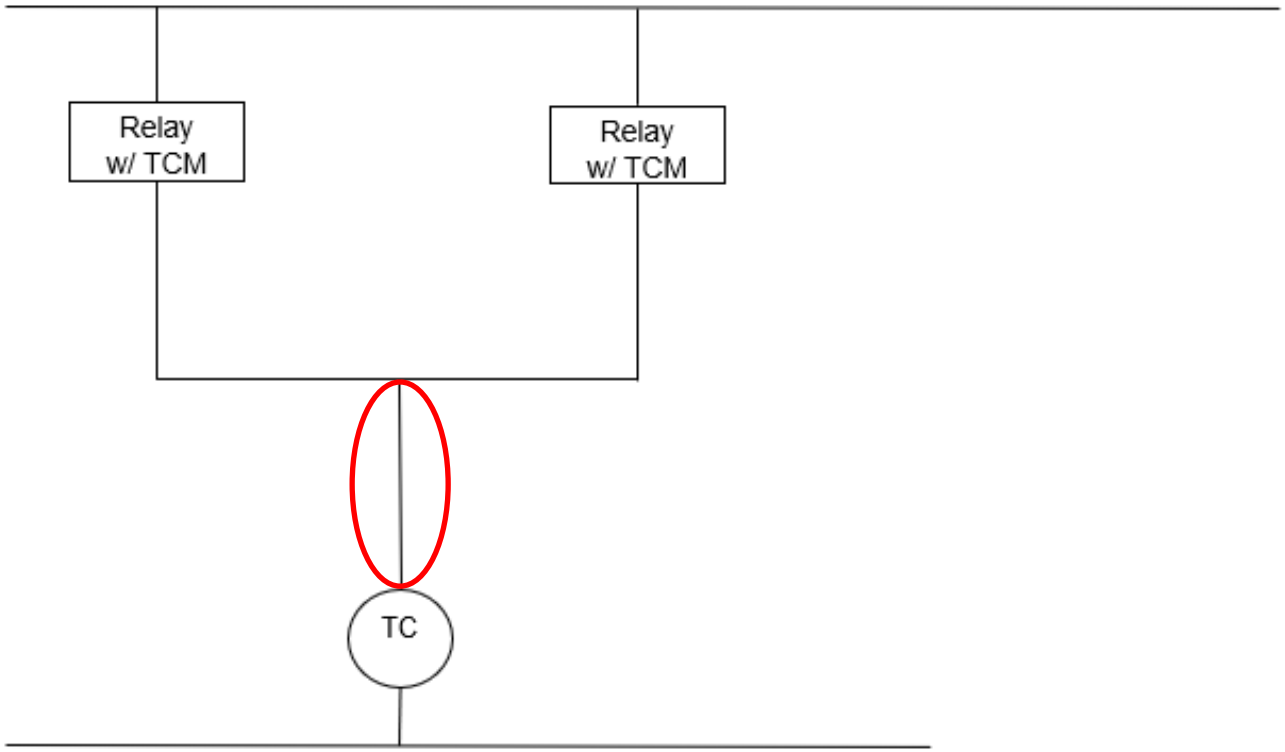
TPL-001 Footnote 13 d

- **Footnote 13**
  - **13. For purposes of this standard, non-redundant components of a Protection System to consider are as follows:**
  - **d. A single control circuitry (including auxiliary relays and lockout relays) associated with protective functions, from the dc supply through and including the trip coil(s) of the circuit breakers or other interrupting devices, required for Normal Clearing (the trip coil may be excluded if it is both monitored and reported at a Control Center).**

TPL-001 Footnote 13 d



TPL-001 Footnote 13 d



Project 2022-02 - Modifications to TPL-001-5.1

Low Priority (2025 and Beyond)

PRC-023

- PRC-023-6
- Filed with FERC March 2
- Remove R2
- Remove Attachment - 2.3

PRC-023-6 – Transmission Relay Loadability

Requirement R1, criterion 12 in the Facility Rating determination for the circuit.

13. Where other situations present practical limitations on circuit capability, set the phase protection relays so they do not operate at or below 115% of such limitations.

M1. Each Transmission Owner, Generator Owner, and Distribution Provider shall have evidence such as spreadsheets or summaries of calculations to show that each of its transmission relays is set according to one of the criteria in Requirement R1, criterion 1 through 13 and shall have evidence such as coordination curves or summaries of calculations that show that relays set per criterion 10 do not expose the transformer to fault levels and durations beyond those indicated in the standard. (R1)

R2. ~~Each Transmission Owner, Generator Owner, and Distribution Provider shall set its out-of-step blocking elements to allow tripping of phase protective relays for faults that occur during the loading conditions used to verify transmission line relay loadability per Requirement R1. *[Violation Risk Factor: High] [Time Horizon: Long Term Planning]*~~ Reserved.

M2. ~~Each Transmission Owner, Generator Owner, and Distribution Provider shall have evidence such as spreadsheets or summaries of calculations to show that each of its out-of-step blocking elements is set to allow tripping of phase protective relays for faults that occur during the loading conditions used to verify transmission line relay loadability per Requirement R1. (R2)~~ Reserved.

- **10/10/23 FERC requested additional information**

Be advised that we seek additional information to process the filing. Please provide complete responses to the information requested below.
1. Explain how Requirement R2 is redundant to Requirement R1, i.e., the fault condition addressed by Requirement R2 is addressed by Requirement R1. In the explanation, identify the language in Requirement R1 that encompasses the Requirement R2 obligation to "set out-of-step-blocking elements to allow tripping of phase protective relays for faults that occur during loading conditions used to verify transmission line relay loadability."
2. Confirm whether, if Requirement R2 were to be retired, the existing obligations in Requirement R2 would be enforced and audited under Requirement R1.

PRC-004

- **Project 2023-02 Performance of IBRs - PRC-004**
  - **Clarify requirements for IBR analysis (interrupting device)**
- **Drafting Team solicited March 2023**
- **No activity as of yet…**

Project 2023-02 – Performance of IBRs

High Priority (2024)

PRC-024

- **Project 2020-02 Modifications to PRC-024**
  - **Make it a ride through Standard rather than a relay setting Standard**
- **SDT is contemplating a new ride-through Standard for IBRs and maintaining the current PRC-024 for synchronous generators**

Project 2020-02 – Modifications to PRC-024

High Priority (2024)

NERC Glossary

- **Project 2020-06 Verifications of Models and Data for Generators**
- **2nd Draft currently posted for comment (1st draft in October)**

New or Modified Term(s) Used in NERC Reliability Standards

Background:
This section includes all new or modified terms used in the proposed standard that will be included in the *Glossary of Terms Used in NERC Reliability Standards* upon applicable regulatory approval. The terms proposed below are intended to be used in MOD-026-2 and other inverter-based resource related standards.

Term(s):
Inverter-Based Resource (IBR): A source (or sink in the case of a charging battery energy storage system (BESS)) of electric power that is connected to the electric power system (transmission, sub-transmission, or distribution system), and that consists of one or more IBR Unit(s) operated as a single resource at a common point of interconnection. IBRs include solar photovoltaic (PV), Type 3 and Type 4 wind, BESS, and fuel cell.

IBR Unit: An individual device, or a grouping of multiple devices, that uses a power electronic interface(s), such as an inverter or converter, capable of exporting Real Power from a primary energy source or energy storage system, and that connect together at a single point on the collector system.

Project 2020-06 – Verification of Models

Medium Priority (2025 and Beyond)

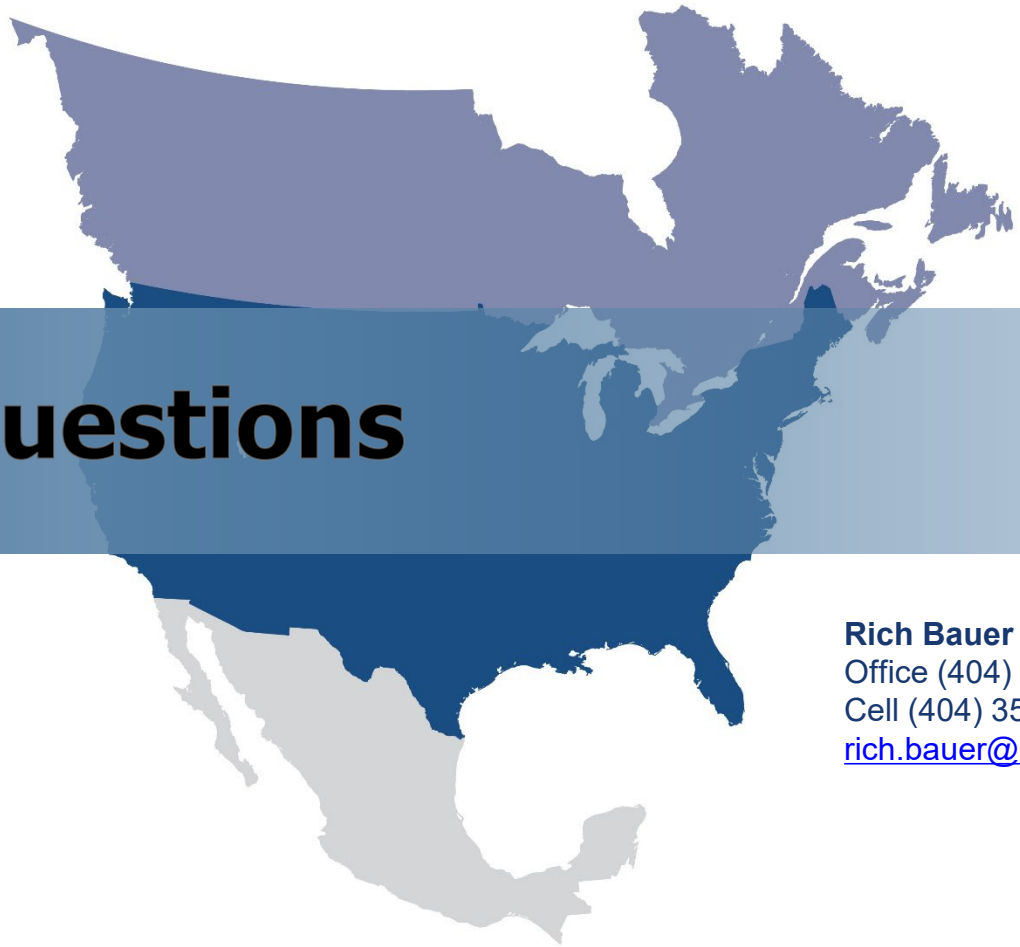
MOD-026-2 – Verification of Dynamic Models and Data for BES Connected Facilities

New or Modified Term(s) Used in NERC Reliability Standards

Background:
This section includes all new or modified terms used in the proposed standard that will be included in the *Glossary of Terms Used in NERC Reliability Standards* upon applicable regulatory approval. The terms proposed below are intended to be used in MOD-026-2 and other inverter-based resource related standards.

Term(s):
Power Electronic Device (PED): Any device connected to the ac power system through a power electronic interface that generates or transmits active power or reactive power, or absorbs active power for the purposes of re-injecting it at a later time. This term excludes any load.

Inverter-Based Resource (IBR): Any source of electric power consisting of one or more Power Electronic Devices (PEDs), that operates as a single resource, supplies primarily active power, and connects to the Bulk Power System. An IBR plant/facility includes the Power Electronic Devices, and the equipment designed primarily for delivering the power to a common point of connection (e.g. step-up transformers, collector system(s), main power transformer(s), and power plant controller(s)).



Questions

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AGENDA

Misoperations

a. Q3 2023 Update, Review and Discussion

Jake Bernhagen, Manager of Reliability Performance, MRO

Action

Information

Report

Jake Bernhagen will provide an oral report during the meeting.

AGENDA

Misoperations

b. Review NERC Lessons Learned

Jake Bernhagen, Manager of Reliability Performance, MRO

Action

Discussion

Report

Jake Bernhagen will lead this discussion during the meeting.

AGENDA

PRS Roundtable Discussion

Ryan Einer, Protective Relay Subgroup Chair

Action

Discussion

Report

Chair Einer will lead this discussion during the meeting.

AGENDA

Q2 2023 Misoperations Review

a. Breakout Sessions

Jake Bernhagen, Manager of Reliability Performance, MRO

Action

Discussion

Report

Jake Bernhagen will lead this discussion during the meeting.

AGENDA

Other Business and Adjourn

Ryan Einer, Protective Relay Subgroup Chair

Action

Discussion

Report

Chair Einer will lead this discussion during the meeting.