

Meeting Agenda Reliability Advisory Council (RAC)

November 16, 2022 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 RELIABILITY ADVISORY COUNCIL Q4 MEETING AGENDA

Agenda Item

1 Call to Order and Determination of Quorum Dick Pursley, Reliability Advisory Council Chair a. Determination of Quorum and Introductions b. Robert's Rules of Order 2 Standards of Conduct and Antitrust Guidelines Bryan Clark, Director of Reliability Analysis, MRO 3 Chair's Remarks Dick Pursley, Reliability Advisory Council Chair 4 **Consent Agenda** Dick Pursley, Reliability Advisory Council Chair a. Approve August 17, 2022 meeting minutes b. RAC member recommendations to the OGOC for approval c. PRS member recommendations to the OGOC for approval d. MRO Representatives on NERC IRPS and SPCWG recommendations to the OGOC for approval 5 MRO Board of Directors, OGOC and General Update Bryan Clark, Director of Reliability Analysis, MRO 6 **RSTC Meeting Update** John Stephens, Reliability Advisory Council and RSTC Member 7 **MRO Representatives on NERC Subgroups – Written Reports** Bryan Clark, Director of Reliability Analysis, MRO a. NERC Electric Gas Working Group (EGWG) - Jaimin Patel b. NERC Inverter Based Resource Performance Subcommittee (IRPS) - David Brauch c. NERC System Planning Impacts from DER Working Group (SPIDERWG) – Wayne Guttormson d. NERC System Protection and Control Working Group (SPCWG) - Mark Gutzmann e. NERC Energy Reliability Assessment Task Force (ERATF) – Thomas Whynot Break – 10:00 a.m. 8 2022 Work Plan Update Dick Pursley, Reliability Advisory Council Chair a. Review Action Items b. Reliability Risk Matrix Updates Bryan Clark, Director of Reliability Analysis, MRO c. Cold Weather Preparedness Workshop Debrief Bryn Wilson, Reliability Advisory Council Member d. Draft 2023 Work Plan 9 **Reliability Coordinator Updates** a. MISO - Durgesh Manjure b. SPC - Binod Shrestha c. SPP - CJ Brown

10 Planning Coordinator Updates

- a. MISO Andy Witmeier, MISO and RAC Member
- b. SPP Jason Davis, Southwest Power Pool

Lunch 12:00 p.m.

11 Assessment Review

- a. Review Long-Term Reliability Assessment (LTRA) Salva Andiappan, Principal Reliability Assessment Engineer, MRO
- b. MRO Regional Winter Assessment (RWA) Salva Andiappan, Principal Reliability Assessment Engineer, MRO
- c. MRO Regional Risk Assessment (RRA) Mark Tiemeier, Principal Technical Advisor, MRO
- 12 NERC Standards Review Forum (NSRF) Update Gayle Nansel, Reliability Advisory Council Member
- **13 Protective Relay Subgroup (PRS) Update** Jake Bernhagen, Senior Systems Protection Engineer, MRO
- 14 2023 Meeting Dates Dick Pursley, Reliability Advisory Council Chair
- **15 RAC Member Roundtable** *Reliability Advisory Council Members*
- 16 Other Business and Adjourn Dick Pursley, Reliability Advisory Council Chair

Call to Order and Determination of Quorum

a. Determination of Quorum Dick Pursley, Relibility Advisory Council Chair

Name	Role	Company	Term
Dick Pursley	Chair	Great River Energy	12/31/22
Jason Weiers	Vice Chair	Otter Tail Power Company	12/31/24
Andy Witmeier	Member	MISO	12/31/24
Binod Shrestha	Member	Saskatchewan Power Corporation	12/31/22
CJ Brown	Member	Southwest Power Pool	12/31/24
Dallas Rowley	Member	Oklahoma Gas and Electric	12/31/22
Derek Brown	Member	Evergy	12/31/23
Durgesh Manjure	Member	MISO	12/31/23
Dwayne Stradford	Member	American Electric Power	12/31/24
Gayle Nansel	Member	Western Area Power Administration	12/31/22
Jeremy Severson	Member	Basin Electric Power Cooperative	12/31/24
John Stephens	Member	City Utilities of Springfield Missouri	12/31/23
Nandaka Jayasekara	Member	Manitoba Hydro	12/31/22
Ron Gunderson	Member	Nebraska Public Power District	12/31/23
W. Bryn Wilson	Member	Oklahoma Gas & Electric	12/31/23

Call to Order and Determination of Quorum

b. Robert's Rules of Order Dick Pursley, Reliability Advisory Council 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.

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	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.
	"Yes," "No," or "Present" if abstaining.	

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

Standards of Conduct and Antitrust Guidelines

Bryan Clark, Director of Reliability Analysis, 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.

Chair's Remarks

Dick Pursley, Reliability Advisory Council Chair

Action

Information

Report

Chair Pursley will lead this discussion during the meeting.

Consent Agenda

a. Approve August 17, 2022 meeting minutes

- b. RAC member recommendations to the OGOC for approval
- c. PRS member recommendations to the OGOC for approval

d. MRO Representatives on NERC IRPS and SPCWG recommendations to OGOC for approval

Dick Pursley, Reliability Advisory Council Chair

Action

Discussion

Report

Chair Pursley will lead this discussion during the meeting.



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Draft Minutes of the Reliability Advisory Council Meeting

St. Paul, MN and Webex

August 17, 2022, 9:02 a.m. to 2:55 p.m. Central

Notice for this meeting was electronically posted to the MRO website on July 20, 2022. A final agenda, including advanced reading materials, was also posted on August 10, 2022.

1. Call to Order and Determination of Quorum

The Reliability Advisory Council (RAC) Chair, Dick Pursley, called the meeting to order at 9:02 a.m. Pursley welcomed everyone and roundtable introductions were made. Reliability Analysis Administrator, Rebecca Schneider, advised the chair that a quorum of the RAC was present. A complete list of attendees is included as <u>Exhibit A</u>.

2. Standards of Conduct and Antitrust Guidelines

Pursuant to Policy and Procedure 4, Bryan Clark, MRO Director of Reliability Analysis, highlighted MRO's Standards of Conduct, Conflict of Interest, and Antitrust Guidelines.

3. Chair's Remarks

Chair Pursley congratulated MRO on the remodeled office space. He also noted the nomination periods for the HERO Award and organizational groupss at MRO. Pursley highlighted several NERC activities found on their website as follows: an event analysis of the Panhandle Wind Disturbance by NERC and Texas RE; the Winter Weather Prep webinar scheduled for September 1, 2022; a SPIDERWG white paper on simulation improvements and techniques related to distributed energy resources (DER) planning; and FAC-002-4 R6 proposal for new implementation/compliance guidance around the definition of a qualified change on the transmission system.

4. Diversity Initiative

MRO Assistant Corporate Secretary and Senior Counsel, Julie Peterson, provided an overview of an ongoing initiative of the Organizational Group Oversight Committee (OGOC) to increase diversity on MRO's organizational groups. Peterson highlighted examples of inherent and acquired diversity and the value of diverse teams. Ms. Peterson urged the RAC members to be an MRO diversity ambassador through the upcoming nomination and election process for the MRO organizational groups and board. The timeline for the nomination process at the MRO was also shared.

5. Consent Agenda

The RAC reviewed the consent agenda, which included draft minutes from the May 19, 2022 meeting and an updated charter. The charter was updated to remove language regarding the annual in-person meeting with the OGOC.

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



6. Improving Outreach and Stakeholder Communications

MRO Director of Communications, Jessie Mitchell, provided an overview of the updated MRO website and the newsletter publication process. Mitchell highlighted the features of the new website including the resource library and the enhanced events and news page. Mitchell also discussed future website enhancements and the expected timeline for completion. Discussion ensued.

7. MRO Board of Directors, OGOC and General Update

Clark provided an overview of the Board of Directors and OGOC meetings on June 22-23, 2022. He thanked RAC members, Dick Pursley, John Stephens, CJ Brown, Dwayne Stradford, and Derek Brown for their contributions to the last two newsletters. Clark highlighted two noteworthy approvals from the OGOC meeting in June: RAC charter change and a new joint meeting format. In the new meeting format, one representative from each council will meet with the OGOC quarterly to discuss a risk roundtable topic. The next meeting will take place on September 21, 2022, and the topic is Ambient Adjusted Ratings. Discussion ensued.

8. Reliability and Security Technical Committee Overview and Highlights

NERC Principal Technical Advisor, Stephen Crutchfield, provided an overview of the Reliability and Security Technical Committee (RSTC) during the meeting. Crutchfield reviewed the timeline for the development of the RSTC as well as the current operating model. The main program areas for the RSTC subgroups are: performance monitoring, reliability and security assessment, and risk mitigation. He shared recent organization changes and the current organizational chart. Highlights from the June 2022 meeting included the endorsement of two Standard Authorization Requests (SARs) submitted by the Energy Reliability Assessment Task Force (ERATF) and the endorsement of a SAR submitted by the Inverter-Based Resource Performance Subcommittee (IRPS).

During the June 2022 meeting, the RSTC also approved two reference documents updated by the Real Time Operating Subcommittee (RTOS), accepted the Generating Availability Data System (GADS) Section 1600 Data Request to post for a 45-day public comment period, and approved two white papers submitted by the System Planning Impacts from Distributed Energy Resources Working Group (SPIDERWG). The RSTC also approved the System Protection and Control Working Group (SPCWG) recommendation to add GADS cause code amplification codes for outages related to frequency deviations identified in the *FERC, NERC and Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States*. In addition, two new Event Analysis Subcommittee (EAS) members were approved during the June meeting: Jake Bernhagen (MRO) and Freddy Garcia (ERCOT).

Crutchfield next provided an overview of actions in progress. The RSTC continues to review and update Reliability and Security Guidelines with metrics to assess the effectiveness of each guideline. The RSTC Executive Committee has developed a draft 2022-2024 Strategic Plan which will be considered by the full RSTC at the December 2022 meeting. The RSTC will also continue to monitor the CIP-002 Transmission Owners Control Centers Field Test. There was also a discussion around industry awareness of the guidelines and reference documents on the NERC website. Discussion ensued.



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9. MRO Representatives on NERC Subgroups

NERC Electric Gas Working Group (EGWG) – Jaimin Patel NERC Inverter Based Resource Performance Subcommittee (IRPS) – David Brauch NERC System Planning Impacts from DER Working Group (SPIDERWG) – Wayne Guttormson NERC System Protection and Control Working Group (SPCWG) – Mark Gutzmann NERC Energy Reliability Assessment Task Force (ERATF) – Tom Whynot

The NERC Representatives from the EGWG, SPIDERWG and SPCWG provided written reports to the RAC. Wayne Guttormson, SaskPower Corp. and Mark Gutzmann, Xcel Energy were present at the meeting and also provided oral reports to the RAC. Discussion ensued.

10. NERC Representative Assignments

Bryan Clark assigned each RAC member to a NERC organizational group to create better alignment and help promote outreach efforts. The groups were instructed to meet before the fourth quarter RAC meeting in November 2022. Assignments are as follows:

- Electric Gas Working Group (EGWG): CJ Brown, Binod Shrestha, Bryn Wilson
- Inverter-Based Resource Performance Subcommittee (IRPS): Derek Brown, Jeremy Severson, Dick Pursley
- Energy Reliability Assessment Task Force (ERATF): John Stephens, Dwayne Stradford, Andy Witmeier
- System Protection Control Working Group (SPCWG): Ron Gunderson, Dallas Rowley, Nandaka Jaysekara
- System Planning Impacts from Distributed Energy Resources Working Group (SPIDERWG): Jason Weiers, Gayle Nansel, Durgesh Manjure

To accommodate scheduling conflicts, Chair Pursley moved the Reliability Coordinator Updates (Agenda Item 12a.-c.) ahead on the agenda. These minutes reflect the order in which the reports were provided.

11. Reliability Coordinator Updates

Midcontinent Independent System Operator (MISO)

Durgesh Manjure, RAC member, provided an oral report. Summer has been relatively quiet with no extreme weather events. Average load is 86 gigawatts. Peak load was set in June at 121 gigawatts. The forecasted peak for August is slightly higher at 122 gigawatts. A new wind peak set in January was 23.6 gigawatts (10 percent of total energy).

A new solar peak set in July was 2.1 gigawatts. MISO's energy transition continues at a slow, steady pace. Since summer 2019, MISO has seen a 2 to 3 percent decrease in energy from coal and gas. Wind contribution has increased as expected. Solar penetration is very small but is expected to grow. The retirement of older assets presents a challenge for MISO as additional megawatts are lost on the system. Long-term projections continue to show an increasing gap between what is needed to meet capacity reserve margins and what is available. MISO has identified some concerns with coal deliveries from their members. Manjure noted that MISO proposed a change to the resource adequacy construct which is pending a decision by FERC. The change proposes moving from an annual capacity

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review to a seasonal review. Manjure highlighted several initiatives for MISO including a workshop on September 21, 2022 to review attributes needed to maintain a reliable system, and modifications to the accreditation for wind/solar hybrid projects and Load Modifying Resources (LMRs). Manjure reported that MISO's fall forecast shows adequate capacity to handle both probable and high load projections. Discussion ensued.

Saskatchewan Power Corporation (SPC)

Binod Shrestha, RAC member, was not present at the meeting and no report was provided.

Southwest Power Pool (SPP)

CJ Brown, RAC member, provided an oral report. SPP set a new peak load in July at 53,337 megawatts (4 percent increase in load). The peak resource mix was gas (43%), coal (38%), wind (13%) and hydro (4%). Brown noted that they were operating in conservative operations for most days in July and were very close to issuing Emergency Energy Alerts (EEAs) for several days in July. He mentioned that SPP has been denying planned maintenance at generation plants and transmission facilities, and he has concerns with planned maintenance being delayed Moving into fall, Brown noted that planned maintenance schedules are continuing to be a challenge and stakeholder discussions are underway about coal supply concerns.

The SPP forecast for the fall season shows sufficient capacity to serve load. Brown shared a slide showing planning reserve margin (PRM) vs. operating capacity margin and noted that SPP has increased their PRM from 12 to 15 percent that will become effective in the summer of 2023. Discussion ensued.

12. 2022 Work Plan Update

Action Item Review

Chair Pursley reviewed the action items in the 2022 work plan. Updates were made accordingly. Discussion ensued.

Reliability Risk Matrix Updates

Mr. Clark reported that the Reliability Risk Matrix is at the RISC for review. In June 2022, the RISC developed a small team to discuss possible ways in which the matrix can be applied to future risk assessments.

RAC Charter Update

The RAC charter was reviewed during the discussion of the 2022 Work Plan. An additional edit to revise language regarding the reporting requirements by the chair and vice chair to the OGOC was proposed.

Upon a motion duly made and seconded, the RAC approved an additional revision to the charter not previously included in the Consent Agenda.

13. Western Area Power Administration – Upper Great Plains Region Oahe Event Review

Bob Soper, Lead Electrical Engineer, WAPA, provided an overview of the Oahe Island event that occurred in 2021. Discussion ensued.

14. 2022 MRO Regional Risk Assessment - Operational and Planning Risks

MRO Regional Risk Assessment (RRA)



Bryan Clark provided an overview of the MRO 2022 Regional Risk Assessment (RRA). The top four operation and planning risks were reviewed. There was a robust discussion about several of the risks identified in the 2022 RRA and if these risks are increasing or decreasing with time. Discussion ensued.

15. NERC Standards Review Forum Update

RAC member, Gayle Nansel, had nothing to report.

16. Protective Relay Subgroup Update

MRO Senior Systems Protection Engineer, Jake Bernhagen, provided an update on the activities of the Protective Relay Subgroup (PRS). The PRS held its third quarter meeting on August 16, 2022. The highlights included a technical presentation by Kevin W. Jones from Xcel Energy. He presented a study regarding concerns around traditional load shedding programs as more renewable resources are interconnected to the grid. The RAC members requested this information be presented to them at a future meeting. There was also a recap of the Protection System Commissioning webinar from July 2022. Bernhagen noted that the PRS is considering a recurring agenda item for future PRS meetings that covers the topic of best practices to be used while commissioning. The PRS also discussed the retirement of analog communication circuits and the decreasing security risks as more utilities are now installing their own fiber circuits. Discussion ensued.

17. 2022 Meeting Dates

Chair Pursley reviewed the remaining 2022 meeting dates for the RAC, as well as the other councils and subgroups. Pursley noted the upcoming Security Conference in October 2022 and asked the RAC members to help promote the event within their organizations. Clark noted that the timing for the 2023 Reliability Conference will likely be May. Clark also mentioned that MRO may schedule the RAC, SAC and CMEPAC meetings back-to-back for at least one quarter in 2023.

18. RAC Member Roundtable

Chair Pursley invited member participants to share other relevant industry observations. Topics discussed included:

- Reliability Issues Steering Committee (RISC) Summit in January 2023, Washington, D.C.
- The Q4 RAC meeting will include Planning Coordinator updates from the MRO region.

19. Other Business and Adjourn

Having no further business to discuss, the meeting was adjourned at 2:55 p.m.

Prepared by: Rebecca Schneider, Reliability Analysis Administrator **Reviewed and Submitted by:** Bryan Clark, Director of Reliability Analysis



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Exhibit A – Meeting Attendees

Reliability Advisory Council Members Present			
Name	Organization		
Dick Pursley, Chair	Great River Energy		
Jason Weiers, Vice Chair	Otter Tail Power Company		
Andy Witmeier	MISO		
C.J. Brown	Southwest Power Pool, Inc.		
Durgesh Manjure	MISO		
Dwayne Stradford	American Electric Power		
Gayle Nansel	Western Area Power Administration		
Jeremy Severson	Basin Electric Power Cooperative		
John Stephens	City Utilities of Springfield Missouri		
Nandaka Jayasekara	Manitoba Hydro		
Ron Gunderson	Nebraska Public Power District		
W. Bryn Wilson	Oklahoma Gas & Electric		
	MRO Staff Present		
Name	Title		
Bryan Clark	Director of Reliability Analysis		
Rebecca Schneider	Reliability Analysis Administrator		
Michelle Olson	Compliance Monitoring Administrator		
Salva Andiappan	Principal Reliability Assessment Engineer		
Jake Bernhagen	Senior Systems Protection Engineer		
Max Desruisseaux	Senior Power Systems Engineer		
Dianlong Wang	Senior Power Systems Engineer		
Jessie Mitchell	Director of Communications		
Julie Peterson	Assistant Corporate Secretary and Senior Counsel		

Oversight & Risk Management



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Cris Zimmerman	Manager of Outreach & Stakeholder Engagement	
Joshua Hebert	Senior Compliance Engineer/Auditor, O&P	
Guests		
Name	Organization	
Mark Gutzmann	Xcel Energy	
Stephen Crutchfield	NERC	
Wayne Guttormson	Saskatchewan Power Corporation	
Tom Whynot	Manitoba Hydro	
Mary Agnes Nimis	FERC	
Boris Voynik	FERC	
Norris Henderson	FERC	
John Roemen	Western Area Power Administration	
Chris Colson	Western Area Power Administration	
Robert Soper	Western Area Power Administration	
Mark Buccholz	Western Area Power Administration	
Daniel Moore	WFEC	
Jeremy Harris	Evergy	
Kyle Wright	Evergy	
Terry Harbour	MidAmerican Energy	
Larry Brusseau	Corn Belt Power Cooperative	

MRO Board of Directors, OGOC and General Update Bryan Clark, Director of Reliability Analysis, MRO

Action

Information

Report

Bryan Clark will lead this discussion during the meeting.



OGOC and BOD Update

Bryan Clark, P.E. Director of Reliability Analysis November 16, 2022

CLARITY ASSURANCE RESULTS

Joint Council Meeting

- Q3 OGOC Meeting Risk Roundtable
 - Variable Transmission Line Ratings



Future Meeting Dates

- OGOC Annual Risk Meeting
 - November 30th
- BOD Meeting
 - December 1st
- Q1 OGOC Meeting
 - April 12, 2023





Questions

Reliability and Security Technical Committee (RSTC) Update John Stephens, Reliability Advisory Council and RSTC Member

Action

Information

Report

- RSTC met September 13-14 at the MRO office
- Inverter Based and Distributed Resources continue to dominate the agenda
 - Approved a White Paper reviewing existing Standards for modifications necessary to accommodate DERs
 - Approved White Paper examining DER Impacts to Under Voltage Load Shedding Program Design
 - o Developing White Paper for Cybersecurity for DERs and Aggregators
 - Approved GADS Section 1600 change to require enhanced outage reporting from Wind and Solar resources to be more consistent with requirements for conventional resources
- Previewed Winter Assessment and LTRA 2022
 - WRA approved and posted
 - LTRA is pending approval
- Sector elections for RSTC are currently proceeding

MRO Representatives on NERC Subgroups – Written Reports

a. NERC Electric Gas Working Group (EGWG) Jaimin Patel, SPC and RAC Member

Action

Information

Report

NERC EGWG has not met since last RAC meeting/report. EGWG sent out the Fuel Assurance and Fuel-Related Reliability Risk Analysis for the Bulk Power System Reliability Guidelines <u>Effectiveness</u> <u>Survey</u> on September 27, 2022 and was shared with MRO RAC.

As per last RAC meeting, I met with assigned RAC members on October 24, 2022 to discuss EGWG activities.

MRO Representatives on NERC Subgroups – Written Reports

b. NERC Inverter-Based Resource Performance Subcommittee (IRPS) David Brauch, MISO and RAC Member

Action

Information

Report

Areas of Focus

1. EOP-004 Standard Authorization Request:

IRPS has endorsed a SAR that seeks to enhance generation loss criteria, so it is applicable to inverter-based resources as well as synchronous generation. Currently, the generation loss criteria thresholds are not suited for more widespread inverter-based resources loss events. This recommendation was identified in the San Fernando disturbance report. The EOP-004 final SAR will be presented to the RSTC in December.

2. IRPS Guideline Revisions:

IRPS is revising previously published reliability guidelines to incorporation IEEE 2800 adoption as well as consolidating the Inverter-based Resource performance and Interconnection Guidelines into a single reliability guideline.

Accomplishments

- 1. IRPS held several technical presentations regarding Grid Forming control schemes and their uses on October 20.
- The Standard Development Team nomination window closed on September 13, 2022 for the active SAR to modify NERC standards FAC-002, MOD-032, and TPL-001 to incorporate EMT modeling and studies.

Challenges

 The Grid Forming control scheme is thought of the next major evolution in transitioning the Grid towards inverter-based generation resource penetration. As shown in the technical presentations, Grid Forming inverters can provide blackstart capability, improved stability performance, and can be stable in zero-inertia cases. The amount of Grid Forming inverters to maintain stability does not depend on IBR penetration but the number of synchronous machines online. The exact percentage is still not exactly know as more comprehensive study is required.

MRO Representatives on NERC Subgroups – Written Reports

c. NERC System Planning Impacts from DER Working Group (SPIDERWG) *Wayne Guttormson, SPC and RAC Member*

Action

Information

Report

Last SPIDERWG meeting was held on October 31 and November 1. The meeting covered the following coordination and analysis activities of the working group. Agenda package posted on SPIDERWG site. Draft minutes to be posted.

General Activities:

- DER Workshop Planning (Date planned for December 14)
- Work Plan Review

Coordination Activities:

- Standards Committee Engagement
 - Engagement with ongoing Standards Projects from SARs that originated from SPIDERWG work (e.g., Project 2022-02 for TPL-001 and MOD-032 SARs)
- White Paper Update: Security Risks Posed by DER and DER Aggregator
 - joint work with SITES
- Proposed SAR's:
 - Higher Priority:
 - FAC-001 & FAC-002 (Final review)
 - MOD-031
- Proposed SARs Update:
 - Will need to collaborate with other NERC groups
 - Medium Priority
 - EOP-004 Reporting of aggregate DER loss during events
 - EOP-005 Telemetry requirements for DERs and/or DPs
 - Lower Priority
 - BAL-003 Ensure accounting of DER in balancing equations and functions.
 - PRC-006 Clarify "load" in imbalance equation
 - TOP-001, -002, -003, and -010 Revise OPA and RTA to explicitly enumerate aggregate DER
- White Paper Update: Variability, Uncertainty, and Data Collection for the BPS with DER Aggregators

Analysis Activities:

- White Paper Final Review: Distributed Battery Energy Storage White Paper
- Guideline Final Review: Modeling Merge (Tranche 2) Parameterization of the DER_A Model for Aggregate DER
- Guideline Update: Modeling Merge (Tranche 3) DER Modeling and Model Verification

- Guideline Update: BPS Planning under Increasing DER
- White Paper Update: DER Aggregators and DERMS Functional Modeling

Next meeting is scheduled for February 1 & 2. Meeting will be virtual. Additional meeting dates scheduled for 2023 are May 2 & 3, August 1 & 2 and October 24 & 25.

Areas of Focus

Following work plan deliverables are being submitted for RSTC action at the December 2022 meeting.

- SAR's: FAC-001 & FAC-002 for Endorsement
- Reliability Guideline: Parameterization of the DER_A Model for Aggregate DER for Approval
- White Paper: Distributed Battery Energy Storage and Multiple Types of DER Modeling for Approval

Accomplishments

- White Paper: NERC Reliability Standards Review and DERs Approved by RSTC
- White Paper: DER Impacts to UVLS Programs **Approved** by RSTC
- Technical Report: Beyond Positive Sequence RMS Simulations for High Penetration Conditions – Approved by RSTC

Challenges

• NERC has published a DER strategy document outlining its approach to proactively identifying and addressing BPS reliability impacts with increasing DER levels.

MRO Representatives on NERC Subgroups – Written Reports

d. NERC System Protection and Control Working Group (SPCWG) Mark Gutzmann, Xcel Energy

Action

Information

Report

The NERC SPCWG conducted one in-person meeting on October 26-27th, 2022. This was the first in-person meeting since 2019. The SPCWG discussions were associated with FERC Order 881a, TPL-001-5.1 Footnote 13d, and IEC-61850 associated with testing compliance (PRC-005).

Areas of Focus

1. FERC Order 881a

The SPCWG continued discussion on the impacts of Order 881a with-respect-to relay loadability (PRC-023-4). The working group's position is that the Order doesn't impact PRC-023-4 as long as the margin associated with ambient and solar adjusted ratings doesn't encroach on the required margins within the standard. It is noted that while PRC-023-4 only applies to BES systems above 200kV and Planning Coordinator designated systems, Order 881a applies to all transmission facilities. This will impact entities through needed efforts to ensure protection system loadability on systems not applicable to PRC-023-4. The SPCWG is developing a position paper on the topic.

2. TPL-001-5.1 Footnote 13

PG&E raised a question on Table 1, Footnote 13 of NERC Standard TPL-001-5.1 which provides guidance on protection system redundancy requirements for the four applicable protection system components (instrument transformers, CT/PT, do not require redundancy). Footnote 13d requires redundancy to control circuitry including circuit breaker trip coils. There is an exception caveat that allows singular trip coils if they are monitored however there is no monitoring exception for control circuitry. Since there is a one-to-one relationship to control circuitry and trip coils, this appears to be a standard inconsistency causing confusion. PG&E is considering drafting Standards Authorization Request (SAR) on the topic.

3. IEC-61850 and NERC Standard PRC-005-6 Testing Requirements

Eric Udren presented on the continued development and application of IEC-61850 which is an international standard on digitized substation protection and control. This standard has pervasive use of networking components as well as the elimination of considerable control and instrumentation wiring. Eric and SPCWG members provided their perspective on the applicability of various system components of a fully digitized system.

Accomplishments

1. Inter-Entity Short Circuit Model white paper

<u>Challenges</u>

None noted.

MRO Representatives on NERC Subgroups – Written Reports

e. NERC Energy Reliability Assessment Task Force (ERATF) Tom Whynot, Manitoba Hydro and RAC Member

Action

Information

Report

2022 Work Plan Update

a. Review Action Items Dick Pursley, Reliability Advisory Council Chair

Action

Discussion

Report

Chair Pursley will lead this discussion during the meeting.

2022 Work Plan Update

b. Reliability Risk Matrix Updates Bryan Clark, Director of Reliability Analysis, MRO

Action

Discussion

Report

Bryan Clark will lead this discussion during the meeting.

2022 Work Plan Update

c. Cold Weather Preparedness Workshop Debrief Bryn Wilson, Reliability Advisory Council Member

Action

Discussion

Report

Bryn Wilson will lead this discussion during the meeting.

2022 Work Plan Update

d. Draft 2023 Work Plan Dick Pursley, Reliability Advisory Council Chair

Action

Discussion

Report

Chair Pursley will lead this discussion during the meeting.
Reliability Coordinator Updates

a. Midcontinent Independent System Operator (MISO) Durgesh Manjure, MISO and RAC Member

Action

Information

Report

Durgesh Manjure will provide an oral report during the meeting.

Reliability Coordinator Updates

b. Saskatchewan Power Corporation (SPC) *Binod Shrestha, SaskPower and RAC Member*

Action

Information

Report

Binod Shrestha will provide an oral report during the meeting.

Reliability Coordinator Updates

c. Southwest Power Pool (SPP) *CJ Brown, SPP and RAC Member*

Action

Information

Report

CJ Brown will provide an oral report during the meeting.

Planning Coordinator Updates a. Midcontinent Independent System Operator (MISO) Andy Witmeier, MISO and RAC Member

Action

Information

Report

Andy Witmeier will provide an oral report during the meeting.

MISO Update on Long Range Transmission Planning and Planning Coordinator Activities

MRO Reliability Advisory Council (RAC)

November 16, 2022

Long Range Transmission Planning



MISO's Reliability Imperative works to define the MISO changes that are necessary to reliably manage the changing resource portfolio



Transforms MISO's legacy platform into a flexible, upgradeable, and secure system that can evolve for years to come; will also integrate advanced technologies to process increasingly complex information

Focuses on the skills, processes, and technologies needed to ensure MISO Operations can effectively manage the grid into the future under increased complexity

Long-Range Transmission



MISO plans transmission, not generation, but minimizing total costs requires balancing both generation and transmission investment



MISO's long range transmission planning process is focused on minimizing the total cost of delivered power to consumers – of energy, capacity and transmission – to meet a given objective



Future scenarios incorporate and build upon member plans to inform the resource transition and changing demand patterns



Generation Energy Mix

■ Nuclear ■ Coal ■ Gas ■ Wind ■ Solar ■ Battery ■ Other

By 2039	Future 1	Future 2	Future 3
1 [™] Additions	121	170	306
	_{GW}	_{GW}	_{GW}
a Retirements	77	80	112
	_{GW}	_{GW}	_{GW}
晶 Peak Load	136	148	164
	_{GW}	_{GW}	_{GW}
🛴 Emissions*	↓ 63%	↓ 65%	↓ 81%

^{*} Resulting CO₂ emission reductions relative to 2005 levels

See: MISO Futures Report for details.



Tranche 1 represents the first iteration and includes 18 projects across the MISO Midwest subregion estimated at \$10.3 billion



Assumption on a	ll in-service	dates is b	by 2030
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ID	Project Description	Est. Cost (2022 \$)
1	Jamestown – Ellendale	\$439M
2	Big Stone South – Alexandria – Cassie's Crossing	\$574M
3	Iron Range – Benton County – Cassie's Crossing	\$970M
4	Wilmarth – North Rochester – Tremval	\$689M
5	Tremval – Eau Clair – Jump River	\$505M
6	Tremval – Rocky Run – Columbia	\$1,050M
7	Webster – Franklin – Marshalltown – Morgan Valley	\$755M
8	Beverly – Sub 92	\$231M
9	Orient – Denny-Fairport	\$390M
10	Denny – Zachary – Thomas Hill – Maywood	\$769M
11	Maywood – Meredosia	\$301M
12	Madison – Ottumwa – Skunk River	\$673M
13	Skunk River – Ipava	\$594M
14	Ipava – Maple Ridge – Tazewell – Brokaw – Paxton East	\$572M
15	Sidney – Paxson East – Gilman South – Morrison Ditch	\$454M
16	Morrison Ditch – Reynolds – Burr Oak – Leesburg – Hiple	\$261M
17	Hiple – Duck Lake	\$696M
18	Oneida - Nelson Rd.	\$403M
	Total Project Portfolio Cost	\$10.3B



Benefits will be broadly distributed across the Midwest subregion and deliver a benefit to cost ratio of at least 2.2 for all zones

Range of Benefit/Cost Ratio by Cost Allocation Zone (20-year present value, 6.9% Discount Rate) 3 **Midwest Cost** Allocation Zones 4.4 4.2 4.0 4.0 Benefit/Cost Ratio 3.9 3.8 3.5 3.4 3.2 3.0 2.8 2.8 2.7 2.6 2.3 2.2 Zone 1 Zone 7 Zone 2 Zone 3 Zone 4 Zone 5 Zone 6 Total Lower-end Higher-end



Significant investments facilitated by the LRTP work will enable greater sharing of resources and attributes across the region



Represents earliest potential Board approvals; timelines for Tranches 2 & 3, and may exceed durations shown

For Tranche 2, MISO will keep the Futures as broadly defined, but will refresh the data inputs such as members' plans, etc...

- New Futures will be developed for analysis occurring after the LRTP is completed.
- Futures Data refresh will require new EGEAS resource expansion runs & siting.
- Future 2 will be prioritized first, followed by Futures 1 & 3.
- Load shapes & forecast will remain the same other than being extended to match the 20-year study period.

Data that will be updated in Futures refresh

- State & member plans
 - Announced additions
 - Announced retirements
 - Announced carbon goals
 - Announced renewable targets
 - Integrated Resource Plans
- Capital, operating, & fuel costs
- Planning Reserve Auction data
- Additions & retirements from the GI queue & Attachment Y process



MISO MISO

2022 MISO Transmission Expansion Plan (MTEP22) and 2022 Generator Interconnection Requests

MTEP22 is focused on reliability drivers



Project information as of September 15, 2022

*Other = Projects based on local needs including reliability, equipment age and condition, etc.

**Breakdown categories are informational only and do not indicate new project types for cost allocation

373 new projects totaling \$4.1 billion will be recommended in MTEP22 for approval in December



*Other = Projects based on local needs including reliability, economics, equipment age and condition, environmental, etc. Numbers provided are as approved by the Board of Directors (2022 pending approval) **MISO**

Historical View of Interconnection Applications by Generation Type (GW)



https://cdn.misoenergy.org/2022%20GIQ%20Submission%20Statistics626443.pdf https://cdn.misoenergy.org/GIQ%20Web%20Overview272899.pdf



MISO-SPP Joint Targeted Interconnection Queue (JTIQ) Study



JTIQ Need – Why now?

The SPP-MISO JTIQ Study focuses on optimizing transmission needed for interconnection across the seams for the evolving resource mix



- SPP and MISO are experiencing similar resource mix shifts
- The transmission system is at capacity along the SPP-MISO seam
- Upgrades are too costly for small groups of interconnection customers, contributing to churn in the queue
- The study accomplishes what FERC Affected System Studies were meant to achieve



JTIQ Portfolio now includes a five-project portfolio with an estimated cost of \$1.06B

JTIQ P	ortfolio	Location by RTO	Cost E&C (\$M)	Bison
Bison-Hankinson-Bi៖	stone South 345 kV	MISO	476	Hankinson
Brookings Co – Laket	field 345 kV	MISO	331	Big Stone South S
Raun – S3452 345 k\	/	MISO-SPP	144.4	THE ANT
Auburn – Hoyt 345 kV		SPP	90.5	Brookings County
Sibley 345 Bus Reconfiguration		SPP	18.8	Lakerield
Total Cost of Portfolio of Projects		MISO-SPP	1,060.7	Raun
MISO Benefits (B/C)	SPP Benefits (B/C)	Overall Benefits (B/C)		\$3459
\$55.7 (0.052)	\$132.9 (0.113)	\$188.6 (0.16 ¹)		Auburn
¹ : This B/C ratio = (10-year PV APC The ATRR rough estimate is not tie	8 Benefits) / (10-year PV Est. ATRR). d to specific TOs' formula rates.	MISO JTIQ Por 345 Exis	•SPP Southwest Power Pool tfolio Map kV ting Transmission SO Region	Hoyt Sibley



JTIQ Roadmap to FERC Filing Q1 2023

- Next JTIQ Stakeholder meeting November/December 2022
 - Continued discussion at MISO PAC and RECB in October and November
- Draft updates to MISO/SPP Joint Operating Agreement (JOA)
- MISO presented JTIQ concept/JOA changes at stakeholder forums
 - IPWG and PAC –feedback received
 - RECB Seek feedback
- SPP present JTIQ concept/JOA changes at stakeholder forums
 - GIUF/SAG & CAWG/RSC/MOPC Seek feedback
 - Board of Directors
- Additional Joint Stakeholder meeting(s) Present final plan
- FERC Filing Q1 2023



Stakeholder Cost Allocation discussions Summary

- JTIQ replacing Affected System study process between MISO and SPP
 - Post ongoing JTIQ Affected System transmission needs will be identified through a periodic future JTIQ(s).
- Forward looking Periodic JTIQ(s) will pre-determine transmission needs and affected system costs of future DPP & DISIS interconnection requests
 - Will consider interconnection queue trends in DPP and DISIS
 - Mitigate existing and future AFS constraints utilizing futures generation input
 - Proposed to occur at least every two years
- Assigns a predetermined \$ per MW of capacity charge to applicable interconnection requests in JTIQ AFS Zone
 - Zonal charge will be adjusted accordingly based on future JTIQ studies
- Takes advantage of cost sharing opportunities between GI customers and load



Planning Coordinator Updates b. Southwest Power Pool (SPP) Jason Davis, Southwest Power Pool

Action

Information

Report

Jason Davis will provide an oral report during the meeting.

Assessment Review

a. Review Long-Term Reliability Assessment (LTRA)
b. MRO Regional Winter Assessment (RWA)
Salva Andiappan, Principal Reliability Assessment Engineer, MRO

Action

Information

Report

Salva Andiappan will provide an update during the meeting.



MRO Assessment Areas 2022 LTRA Report

Presented by: Salva Andiappan RA Department

CLARITY ASSURANCE RESULTS



Risk Area Summary 2023 - 2027



- Assessment Period 2023 through 2032
- 5-Year Projected Reserve Margins

Planning Reserve Margins (2023-2027)									
Assessment Area	Reserve Margins (%)	2023	2024	2025	2026	2027			
	Anticipated Reserve Margin	16.3%	13.2%	10.5%	8.9%	6.5%			
MISO	Prospective Reserve Margin	18.2%	38.9%	40.0%	72.6%	71.3%			
	Reference Margin Level	17.4%	17.0%	16.5%	16.8%	17.0%			
	Anticipated Reserve Margin	16.0%	15.8%	16.0%	16.4%	12.9%			
МН	Prospective Reserve Margin	16.7%	16.5%	16.7%	17.1%	13.5%			
	Reference Margin Level	12.0%	12.0%	12.0%	12.0%	12.0%			
SPC	Anticipated Reserve Margin	26.9%	37.2%	28.4%	30.9%	27.2%			
	Prospective Reserve Margin	26.9%	37.2%	28.4%	30.9%	34.9%			
	Reference Margin Level	15.0%	15.0%	15.0%	15.0%	15.0%			
SPP	Anticipated Reserve Margin	46.0%	49.9%	55.4%	54.3%	53.7%			
	Prospective Reserve Margin	43.8%	48.2%	53.2%	51.9%	49.7%			
	Reference Margin Level	16.0%	16.0%	16.0%	16.0%	16.0%			



MISO



Anticipated Reserve Margin (%) Prospective Reserve Margin (%) Reference Margin Level (%)

MISO 5-year Projected Reserves



Solar and Wind Nameplate Capacity, Existing and Planned Additions through 2032

Assessment Area	Solar Nameplate (MW)				Wind Nameplate (MW)					
	Existing	Tier 1	Tier 2	Tier 3	Total	Existing	Tier 1	Tier 2	Tier 3	Total
MISO	1769	9544	86407	10481	108,201	26068	2840	17346	5406	51,660
МН	0	0	0	0	0	259	0	0	0	259
SPC	26	20	0	122	168	627	200	0	0	827
SPP	394	2300	0	25500	28,194	30264	8200	1175	11500	51,139
Total	2,189	11,864	86,407	36,103	136,563	57,218	11,240	18,521	16906	103,885



MRO Transmission Development Trends by 2032



Future Transmission Circuit Miles >100 kV by Project Status



Future Transmission Circuit Miles by Primary Driver



QUESTIONS



MRO RAC Action Item:

Motion to accept the LTRA report prepared by each of the MRO Planning Coordinators – MH, MISO, SPC and SPP





MRO Reliability Advisory Council (RAC) Webinar

2022 Long-Term Reliability Assessment Overview

RAC Liaison/Emcee - TBD Kelly Hunter, Manitoba Hydro Chris Haley, Southwest Power Pool Suman Thapa, Saskatchewan Power Corporation Nick Przybilla, Midcontinent Independent System Operator January XX, 2023



OVERVIEW OF MRO 2022 REGIONAL WINTER ASSESSMENT

Presented by: Salva Andiappan RA Department

CLARITY ASSURANCE RESULTS

What's New

- 2022 Winter Seasonal Review
 - GADS Weighted Equivalent Forced Outage Rate (WEFOR)
 - TADS Total Transmission Outages per 100 Circuit Miles



Key Findings

- Extreme winter peak load coupled with unplanned generation outages could result in energy shortfalls across the MISO and SPC.
- MH and SPP anticipate resources are sufficient to meet reserve margin requirements under normal and extreme demand for the 2022 winter season.
- Coal delivery issues in MISO and SPP could be an emerging reliability concern.
- Long term trends indicate increasing generation forced outage rates.


2022-23 Winter Seasonal Forecast

Assessment Area	Anticipated Resources	Typical Maintenance and Forced Outages	Anticipated Resources with Typical Outages	Net Internal Demand	Anticipated Reserve Margin with Typical Outages	Reserve Margin Requirements
МН	5,418	85	5,333	4,588	16.2%	12.0%
MISO	141,565	28,818	112,747	98,939	14.0%	17.9%
SPC	4,779	249	4,530	3,714	22.6%	15.0%
SPP	70,772	10,600	60,172	41,637	44.5%	16.0%

Anticipated Reserve Margin with Typical Outages and Normal Forecast

- MISO is at increased risk to implement operating mitigations such as load modifying resources.
- MH, SPC and SPP anticipate resources are sufficient to meet reserve margin requirements under normal with typical outages.



Reserve Margin Percentage under Extreme Conditions

Assessment Area	Anticipated Resources with Typical Outages	Extreme Derates	Extreme Low Generation	Operational Mitigations	Extreme Low Generation + Operational Mitigations	Extreme Peak Load	Reserve Margin Under Extreme Conditions	Likelihood to issue EEAs
мн	5,333	0	5,333	80	5,413	4,882	+10.9%	Low
MISO	112,747	17,624	95,123	2,400	97,523	105,513	-7.6%	High
SPC	4,530	123	4,407	60	4,467	3,914	+14.1%	Low
SPP	60,172	11,940	48,232	2,000	50,232	44,137	+13.8%	Low

Extreme Winter Resource and Peak Demand Scenario/Risk Hour (in MWs)

 Under extreme peak demand and outage scenario studied, MISO would likely need to issue EEAs.



MRO Event Severity Index as of September 2022



Total 4 transmission events occurred in 2021-22 winter.



MRO Resource Mix





MRO 4-Year Generator MW-Weighted EFOR



Long term trends continue to indicate increasing EFOR rates.



Annual Winter Total Outages Per 100 Circuit Miles



Increase in outages for 2021-22 winter in the 100-199kV and 300-399kV voltages due to the derecho that swept through the MRO region December 15th and 16th 2021.



MRO Misoperation Rates by Year



- Misoperation rate trending downward until 2020.
- 2,628 operations and 231 misoperations reported in 2021.
- Total protection system operations were down but total misoperations did not proportionaly decrease resulting in higher misoperation rate in 2021.

Misoperation Rate = (No. of Misoperations / No. of Total Operations) X 100%



Winter 2021 Misoperations by Cause



- Total 46 misoperations between December 1, 2021 and February 28, 2022.
- Nearly half were attributable to Human Errors.





MISO Assessment

Planning Reserve Margins

MISO is projecting a decrease from last year's reserve margins, with planned reserves falling below reference margin levels beginning in 2023. The reserve decline is driven mainly by lower capacity contribution from weather dependent new generation additions that are replacing retiring units with higher contributions. Increasing demand projections also contribute to lower reserve margins. Increased coordination and continued action with MISO members will be critical to ensuring resource adequacy into the future. In most of the MISO region, load-serving entities with oversight by the applicable state or local regulators are responsible for resource adequacy.

Probabilistic Assessment

Base Case Summary of Results					
2024* 2024 2026					
EUE (MWh)	14.3	193.6	68.8		
EUE (ppm)	0.02	0.304	0.108		
LOLH (Hours per Year)	0.085	0.808	0.393		
Operable On-peak Margin	13.7%	8.1%	13.9%		

Demand

The peak demand forecast increased from last year by approximately 1.1 GW, largely due to a rebound from COVID-related decline. The five-year regional demand growth remained stable at a relatively flat 0.2%. It is unclear yet how electrification of transportation and other sectors will drive future growth, but anticipated electrification will be examined fully in the MISO Transmission Expansion Plan or MTEP process.

Demand Side Management

DR programs continue to play an important role in providing capacity. While DR projections are shown to be decreasing over the assessment period, this trend may change following the 2022 resource auction, OMS-Survey, and in the transition to seasonal capacity auctions.

Distributed Energy Resources

MISO estimates that there is a total of 860 MW of installed solar PV distribution resource capacity. While DER are anticipated to play a larger role into the future, MISO is still working with stakeholders on adequate methods for aggregating, reporting, and allowing DER participation in MISO markets.

Generation

Since the 2021 LTRA, MISO has retired 5,000 MW of generation (breakdown by type) and added 1,700 MW of new generation (breakdown by type) for a net change of 3,300 MW.

The MISO generator interconnection queue continues to show a steadily increasing levels of variable energy resources including battery storage and hybrid resources in the future generation fleet mix. Currently 300 MW of grid-connected batteries are installed, with another 15 GW in the interconnection planning queue and 16 GW of hybrid battery-renewable generation in queue. This transition of the generation fleet, along with the observed extreme weather events of Hurricane Laura in 2020 and Winter Storm Uri in February 2021 continue to stress the importance of the MISO Resource Adequacy construct. Appropriate planning and operating signals must be sent to prompt investment (or system enhancements) when needed to ensure that the BPS continues to perform reliably.

Capacity Transfers

Net firm transfers with neighboring regions declined from the prior LTRA and continue to decline as reported in this year's LTRA: for summer 2023, firm transfer commitments have fallen by nearly 25%. Non-firm transfers have played a critical role in maintaining reliability during extreme weather events. Growing reliance on non-firm imports increases the risk of energy emergencies when external assistance is not available.

Transmission

Approved transmission projects increased since the 2021 LTRA. In the latest MTEP (MTEP21), 33% of projects are classified as "reliability" projects needed to maintain system reliability in accordance with NERC Reliability Standards. Another 47% are for replacing aging equipment, and the remaining 20% are for the integration of new resources, and to accommodate load growth. In addition, MISO's Long Range Transmission Plan introduced a \$10.3 billion transmission project portfolio in the upper Midwest appended to MTEP21 transmission projects in Summer 2022. These lines are expected to support 53GW of renewable energy and provide \$23-52 billion in benefits to MISO utilities.

Reliability Issues

MISO's planning, markets and operations continue to evolve in response to the changing resource fleet and the increased frequency of extreme weather events. Managing the increasing uncertainty is a key component of the market redefinition effort and includes transitioning to a seasonal resource adequacy construct, reforming accreditation, and enhancing scarcity pricing to better align system

needs and capabilities during tight operating conditions. The seasonal resource adequacy construct has been filed at FERC and will be effective in September 2022 ahead of the 2023-24 Planning resource auction. MISO is awaiting FERC approval of the updated tariff provisions.

MRO-Manitoba Hydro Assessment

Planning Reserve Margins

The ARM does not fall below the RML of 12% during the first five years of the assessment period. Lower reserve margins in the second half of the assessment period compared to the 2021 LTRA are due to demand growth. No Tier 2 resources have been assumed to come into service during the assessment period. No resource adequacy issues are anticipated during the first five years of the assessment period.

Energy Assessments

As the operator of a predominately hydro system, on an at least weekly basis Manitoba Hydro performs an all-hours season ahead energy adequacy analysis as required to manage near term to seasonal ahead reservoir energy storage while meeting system demands. Additionally, Manitoba Hydro conducts specific analyses to determine short term storage and minimum flow requirements that would be required to maintain Manitoba and extra-provincial resource adequacy obligations. As there are modest levels of wind and solar on the Manitoba Hydro system, the resource adequacy risk on the Manitoba Hydro system over the next five years and under normal water conditions is expected to fall at or very near the peak demand hours.

Probabilistic Assessments

Every two years Manitoba Hydro prepares a probabilistic assessment for the Manitoba system, most recently in 2022. The probabilistic assessment was supportive of a 12% RML for the Manitoba system being sufficient to provide a loss of load expectation of less than 0.1 days per year under the study assumptions.

Probabilistic Assessment

Base Case Summary of Results					
<u>2024*</u> 2024 2026					
EUE (MWh)	3.383	28.64	7.23		
EUE (ppm)	0.133	1.141	0.287		
LOLH (Hours per Year)	0.004	0.036	0.007		
Operable On-peak Margin	N/A	13.5%	13.5%		

Demand

Manitoba Hydro is projecting modest electric load growth over the next five years. Factors considered in load growth projections include economic activity, electric vehicle adoption, and demand side management programs in Manitoba operated by Efficiency Manitoba. The electric vehicle load forecast in Manitoba now assumes Canadian federal targets of zero emission vehicles (ZEVs) reaching 10% of light-duty passenger vehicles sales by 2025, 30% by 2030 and 100% by 2040. Over the assessment period, Manitoba Hydro projects the total internal demand growth to increase at a compound annual growth rate (CAGR) of 0.56% for summer and 1.06% for winter.

Demand-Side Management

Manitoba Hydro does not have any demand side management (DSM) resources which are considered as Controllable and Dispatchable Demand Response. There have been no modifications to the methods for Controllable and Dispatchable Demand Response programs since the 2021 LTRA.

Distributed Energy Resources

There is a potential for increased solar DER resources in the latter half of the assessment period and plans are being developed to study the impacts on the Manitoba Hydro system.

Generation

All seven units at the Keeyask hydro station (630 MW net addition) are anticipated to be in commercial operation for Winter 2022-23. The completion of all seven units at the Keeyask hydro station will improve resource adequacy for the remainder of the assessment period. Manitoba is not currently experiencing large additions of wind and solar resources being seen in other regions - and hence, emerging reliability issues arising from such large wind and solar resource additions are not anticipated in the next five years.

Energy Storage

Additions of energy storage resources in the next 10 years are not anticipated at this time.

Capacity Transfers

A capacity transfer of 190/215 MW from Manitoba to Saskatchewan beginning June 1, 2022 will tend to increase east to west flow on the Manitoba – Saskatchewan interface. The 230 kV/ 390 MVA Birtle to Tantallon line, which will help facilitate this and other capacity transfers to Saskatchewan, was placed in service in March 2021.

Transmission

The Manitoba to Minnesota Transmission Project (MMTP), a major new 500 kV interconnection, was placed into service on June 1, 2020 and provides for alternative supply from the MISO market during drought conditions and improves the resilience of Manitoba Hydro's system to extreme events including drought. Manitoba Hydro currently has 86 miles of transmission under construction and 58 miles of planned transmission during the 10 year assessment period.

MRO-SaskPower Assessment

Saskatchewan uses a criterion of 15% as the Reference Reserve Margin and has assessed its planning reserve margin for the upcoming 10 years considering the summer and winter peak hour loads, available existing and anticipated generating resources, firm capacity transfers, and available Demand Response for each year. Saskatchewan's anticipated reserve margin ranges from approximately 20% to 37% and does not fall below the RML

Probabilistic Assessment

Base Case Summary of Results					
2024 [*] 2024 2026					
EUE (MWh)	26.5	169.5	117.0		
EUE (ppm)	1.1	6.5	4.4		
LOLH (Hours per Year)	0.3	1.4	0.9		
Operable On-peak Margin	22.8%	23.1%	24.6%		

Saskatchewan's system peak forecast is contributed by econometric variables, weather normalization, and individual level forecasts for large industrial customers. Average annual summer and winter peak demand growth is expected to be approximately 1.0% with a range from 0.5% to 2.3% throughout the assessment period.

Saskatchewan is adding approximately 761 MW of generation under Tier 1 category within the next five years which includes a 200 MW wind generation facility, two utility-scale solar project (10 MW each) and the expansion of two existing natural gas facilities as well as two new natural gas facilities totaling 687 MW. The remaining capacity (74 MW) is projected to be Carbon Neutral and Waste Heat Recovery projects.

Under Tier 2, over 1462 MWs of new generation is projected in the assessment period. This includes six natural gas facilities. The natural gas generation is a proxy holder for any new generation needed beyond the medium-term (>5 years), but a portion of this capacity is anticipated to be covered through deploying renewables, carbon neutral and low emission generation projects.

A total of approximately 343 MW is confirmed for retirements. This includes 139 MW of coal generation, 41 MW of natural gas, 21 MW of Heat Recovery facility, 22MW of Wind facilities and 25

MW of hydro import contract. Unconfirmed retirements of approximately over 1400 MW is also expected in the assessment period. This includes approximately 1200 MW of coal generation that will be phased out by the end of 2029. Generating resources being planned as Tier 2 and Tier 3 will replace the retired units before retirements and therefore Saskatchewan is not expecting any long-term reliability impacts due to generation retirements.

Saskatchewan's energy efficiency and energy conservation programs include incentive-based and education programs focusing on installed measures and products that provide verifiable, measurable and permanent reductions in electrical energy, and demand reductions during peak hours. Energy provided from EE and DSM programs are modeled as load modifiers and are netted from both the peak load and energy forecasts. Saskatchewan's DR program has contracts in place with industrial customers for interruptible load based on defined DR programs. The first of these programs provides a curtailable load, currently up to 67 MW, with a 12-minute event response time. Other programs are in place providing access to additional curtailable load requiring up to two hours notification time.

Saskatchewan has interconnection agreements with Manitoba Hydro, Southwest Power Pool, and Alberta Electric System Operator. Saskatchewan currently has contracts in place for firm capacity transfers for up to 290 MW from Manitoba Hydro within the assessment period.

Approximately 80 km of 230 kV transmission line is under construction phase and several other transmission projects (approximately 650 circuit km) are under the planning and conceptual phase in the 5 to 10 year planning horizon. These projects are driven by load growth, new generation additions and reliability needs. Saskatchewan also has its first Battery Energy Storage System a 20 MW/20MWh facility under-construction.

SaskPower performs transmission planning studies including the annual TPL assessment and other applicable periodic studies to meet NERC requirements, system Impact Studies for new load/generation interconnections, generation retirements, transmission service request (TSR) studies, area adequacy studies and other special studies as required to identify potential system issues. Mitigations are identified as part of these studies and included in the system development plan to ensure system performance requirements are met.

SPP Assessment

Planning Reserve Margins

ARMs do not fall below the RML of 16% (SPP coincident) for the entire 10-year assessment period. The RML is determined by a probabilistic LOLE study. While the SPP PRM shows a robust amount of excess capacity, these margins do not account for generator planned, forced or maintenance outages. Instead, they reflect the full availability of accredited capacity. Additionally, Anticipated Resources do not reflect de-rates based on real time operational impacts. There is potential to still experience times of capacity shortfall based on performance impacts during high load periods despite the current projected LTRA PRM capacity and. The 2022 Summer Reliability Assessment provides an illustration of an extreme demand and low resource risk period in the SPP Seasonal Risk Scenario.¹⁷

Non-Peak Hour Risk, Energy Assurance, Probabilistic Based Assessments

SPP performs a biennial LOLE study to establish PRMs. SPP, with input from the stakeholders, develops the inputs and assumptions used for the LOLE Study to analyze the ability to reliably serve the SPP BAA's 50/50 forecasted Peak Demand utilizing a Security Constrained Economic Dispatch. SPP will study the PRM such that the LOLE for the applicable planning year (2 and 5 year study) does not exceed 1 day in 10 years, or 0.1 day per year. At a minimum, the PRM will be determined using probabilistic methods by altering capacity through the application of generator forced outages and forecasted demand through the application of load uncertainty to ensure the LOLE does not exceed 0.1 day per year. In the 2021 LOLE study, other than the application of projected resource retirements, a future resource mix was not applied when analyzing year five (2026) to establish the minimum PRM to maintain an LOLE of 0.1 day per year. SPP performed a future generation sensitivity based on a future resource mix from the 2022 Integrated Transmission Planning (ITP) process

The assumptions applied for planning year 2026 are shown below.

- 38,000 MW Nameplate Wind (additional 7,444 MW from the base case)
- 9,000 MW Nameplate Solar (additional 8,762 MW from the base case)
 - 125% Overbuild (10,952 MW nameplate with overbuild)
- 3,700 MW 4-hour duration Battery

To effectively model the generation portfolio for analysis, existing wind facility capabilities were increased by 24% to simulate 38,000 MWs of nameplate wind, while honoring the historical wind profiles for each weather year. Since the SPP system currently has less than 300 MWs of nameplate

solar resources, a different methodology was used to reflect the future growth of solar installations. Locations that were developed in the 2022 ITP Future 2, Year 5 scenario were used for the analysis, resulting in 55 new solar locations.

Probabilistic Assessment

Base Case Summary of Results				
2024* 2024 2026				
EUE (MWh)	0.00	0.27	0.84	
EUE (ppm)	0.00	0.00	0.00	
LOLH (Hours per Year)	0.00	0.00	0.00	
Operable On-peak Margin	13.3%	19.7%	19.6%	

Demand

SPP load peaks during the summer season; the 2022 load forecast is projected to peak at 51,058 MW, which is lower than the previous year's LTRA forecast for the 2022 summer season. A diversity factor is used to convert the non-coincident peak demand forecast to an SPP coincident peak demand forecast. SPP forecasts the coincident annual peak growth based on member submitted data over the 10-year assessment timeframe. Over the assessment period, SPP projects the total internal demand growth to increase at a CAGR of 0.77% for summer and 0.91% for winter.

SPP's energy efficiency and conservation programs are incorporated into the reporting entities' demand forecasts. There are no known impacts to the SPP assessment area's long-term reliability related to the forecasted increase in EE and DR across the assessment area.

Demand Side Management

As an additional sensitivity to the 2021 LOLE study, SPP modeled high level constraints applied to the current demand response programs to understand the possible reliability impacts when constraining the programs to a certain limited number of calls per year and limited number of hours per day. The parameters were applied to each demand response program, which resulted in a PRM increase of approximately 0.5%. With the footprint's projected demand response growth over the next few years, it will be important to model these programs accurately to better depict the reliability implications to

the SPP system. The potential growth expansion in the demand response and electrification will introduce a new level of uncertainty and reliability risk.

Distributed Energy Resources

The SPP Assessment Area has less than 50 MW of installed BTM solar currently, but is forecasting between 700 – 750MWs of DER in the 5-10 year planning horizon. SPP Model Development, Economic Studies, and the Supply Adequacy working groups develop policies and procedures around DERs.

Generation

Since the 2021 LTRA, SPP members have reported approximately 300 MWs of conventional resources being retired. Reliability impacts of generator retirements are assessed throughout the planning process, and no impacts from these confirmed retirements are anticipated. Additionally, impact of confirmed retirements on resource adequacy was analyzed in the 2021 LOLE study, and impacts that retired generation have on the transmission system are analyzed in the annual Integrated Transmission Plan.

Energy Storage

There are approximately 17,000MWs of energy storage and hybrid resources in generator interconnection queue, with 500MWs of that generation under contract by members across the SPP Assessment Area. These resources are being modeled as generation in the planning assumptions both near and long term.

Starting with the 2023 summer season, the ELCC methodology will be implemented for standalone energy storage resources. This will be the first set of policies for accreditation implemented by SPP for energy storage resources. By applying ELCC methodology, energy storage resources will be more properly accredited, which becomes critical as more conventional generators near retirement causing SPP historical planning reserve margin levels to decline.

Capacity Transfers (Reliance on Assistance)

Planning entities in the SPP Assessment Area coordinate with neighboring areas to ensure that adequate transfer capabilities will be available for capacity transfers. On an annual basis during the model build season, SPP staff coordinates the modeling of transfers between Planning Coordinator footprints. The modeled transactions are fed into the models created for the SPP planning process.

In April 2019, SPP and ERCOT executed a Coordination Plan that superseded the prior coordination agreement. The Coordination Plan addresses operational issues for coordination of the DC ties between the Texas Interconnection and Eastern Interconnection, Block Load Transfers (BLTs), and Switchable Generation Resources (SWGRs). Under the terms of the Coordination Plan, SPP has priority to recall the capacity of any SWGRs that have been committed to satisfy the resource adequacy requirements contained in Attachment AA of the SPP Open Access Transmission Tariff.

Transmission

The SPP 2021 Integrated Transmission Plan Assessment and the 2022 SPP Transmission Expansion Plan Reports are posted on the SPP website. Both reports provide details for proposed transmission projects needed to maintain reliability while also providing economic benefit to the end users. SPP currently has no transmission under construction and 58 miles of planned transmission during the 10 year assessment period.

Reliability Issues

There are concerns of drought conditions impacting the Missouri River and other water sources for generation resources that rely on once-through cooling processes. Low water can impact the generation's capacity output and reduce its ability to support congestion management and serve load. An additional concern could be the impact to coal availability, which could cause units to run at a derated level to conserve supplies. These extreme conditions are studied in SPP's Seasonal Assessment process to identify mitigations prior to peak conditions. Additional analysis is performed with updated information as part of operations planning.

Assessment Review

c. MRO Regional Risk Assessment (RRA) Mark Tiemeier, Principal Technical Advisor, MRO

Action

Information

Report

Mark Tiemeier will provide an update during the meeting.

NERC Standards Review Forum (NSRF) Update Gayle Nansel, Reliability Advisory Council Member

Action

Information

Report

Gayle Nansel will provide an update during the meeting.

Protective Relay Subgroup (PRS) Update Jake Bernhagen, Senior Systems Protection Engineer, MRO

Action

Information

Report

Jake Bernhagen will provide an update during the meeting.

2023 Meeting Dates Dick Pursley, Reliability Advisory Council Chair

Action

Information

Report

Chair Pursley will provide an overview during the meeting.

	Q1 2023	Q2 2023	Q3 2023	Q4 2023
RAC	3/1	5/18	8/10	11/8
SAC	2/22	5/24	8/8	10/12
CMEPAC	2/21	5/3	8/9	10/11
SACTF	2/15	5/17	8/2	10/4
PRS	3/14	6/6	9/6	12/5
OGOC	4/12	6/14	9/13	11/15
BOD	4/13	6/15	9/14	11/16

MRO CONFERENCE DATES 2023

Q1	RAM Conference: March 21-22, 2023 networking reception and conference (hybrid)
Q2	Reliability Conference: May 16-17, 2023 networking reception and conference (hybrid)
Q3	CMEP Conference: July 25-26, 2023 networking reception and conference (hybrid)
Q4	Security Conference: September 26-28, 2023 networking reception, training and
	conference (hybrid); Oklahoma City, OK

RAC Member Roundtable Reliability Advisory Council Members

Action

Discussion

Report

Chair Pursley will lead this discussion during the meeting.

Other Business and Adjourn Dick Pursley, Reliability Advisory Council Chair

Action

Discussion

Report

Chair Pursley will lead this discussion during the meeting.