



MIDWEST
RELIABILITY
ORGANIZATION

MRO 2023 REGIONAL WINTER ASSESSMENT

MRO Reliability Analysis Department
December 12, 2023

10:00 a.m. – 11:00 a.m. Central

Cris Zimmerman, MRO
Salva Andiappan, MRO
David Kuyper, MRO
John Grimm, MRO

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Cris Zimmerman

Manager of Outreach and Stakeholder
Engagement

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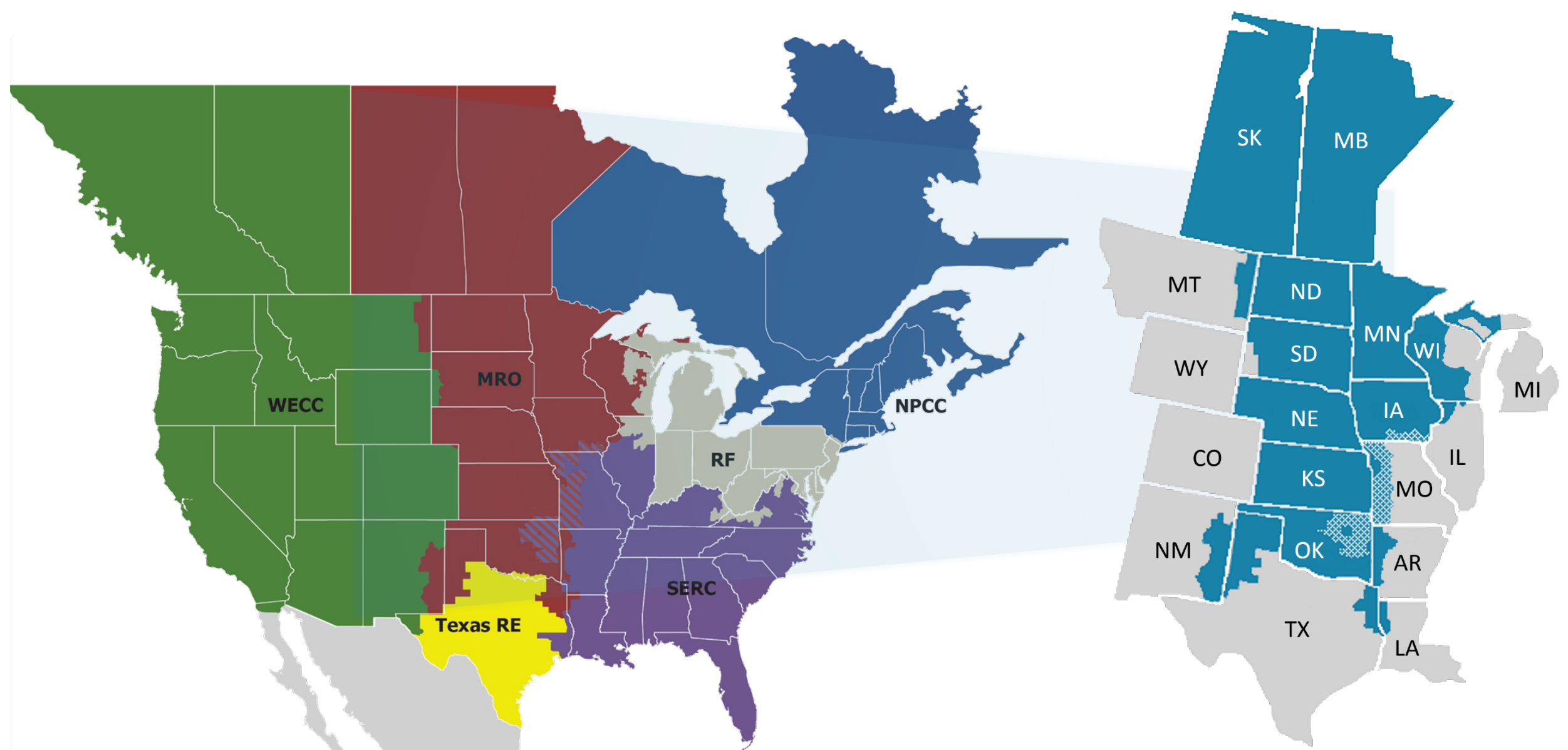
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MRO Upcoming Events

- **Long-Term Reliability Assessment Webinar** January 25th, 10:00am – 12:00pm
- **2024 Conferences**
 - March 20th RAM Virtual Conference
 - May 15th Reliability Hybrid Conference, MRO Offices St. Paul, MN
 - July 24th CMEP Hybrid Conference, Westin Hotel in Kansas City, MO
 - Oct 1st & 2nd Security Hybrid Conference, MRO Offices St. Paul, MN





The ERO Enterprise and MRO

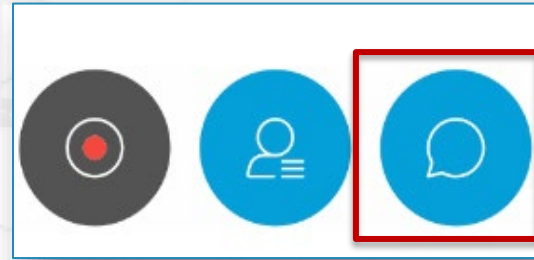
MRO's Mission Supports the Vision

*To identify, prioritize and assure effective and efficient mitigation of risks to the reliability and security of the North American bulk power system by promoting **Highly Effective Reliability Organizations™ (HEROs)**.*



WebEx Chat Feature

Open the Chat Feature:



The chat feature will appear to the right of the WebEx window.

Attendees should chat their questions to: “All Panelists”.

Select All Panelists by using the drop-down arrow in the “To” field.

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Salva Andiappan

Principal Reliability Assessment Engineer

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MRO 2023 Regional Winter Assessment

- Winter Seasonal Forecast and Recommendations
- Generator Availability Data System (GADS)
- Transmission Availability Data System (TADS)
- Misoperations Information Data Analysis System (MIDAS)

2023 Winter Seasonal Forecast

- **Data is collected and analyzed based on each PCs footprint.**
- **Assessment period from Dec. 2023 through Feb. 2024.**
- **Reserve Margin % used as an indication of adequacy.**
- **Analysis looks at 3 different load and outage conditions:**
 1. Normal peak load forecast with typical outages
 2. Extreme peak load forecast with typical outages
 3. Extreme peak load forecast with typical outages + extreme derates

Normal Peak Demand with Typical Outages

Assessment Area	Anticipated Resources	Typical Maintenance and Forced Outages	Anticipated Resources with Typical Outages	Normal Peak Load	Anticipated Reserve Margin with Typical Outages	Likelihood to issue EEAs
MH	5,332	100	5,232	4,623	13.2%	Low
MISO	147,097	27,676	119,421	94,394	26.5%	Low
SPC	4,570	519	4,051	3,789	6.9%	High
SPP	60,676	10,600	50,076	43,718	14.5%	Low

Anticipated Reserve Margin for Normal Load Forecast with Typical Outages (in MWs)

- SPC is projecting insufficient firm generation available to meet forecasted winter peak load with typical maintenance and generator forced outages.
- MH, MISO, and SPP have sufficient operating reserve to meet normal forecasted peak load with typical outages.

Extreme Peak Demand with Typical Outages

Assessment Area	Anticipated Resources with Typical Outages	Extreme Peak Load	Reserve Margin Under Extreme Peak Load	Likelihood to issue EEAs
MH	5,232	4,909	6.6%	Low
MISO	119,421	110,278	8.3%	Medium
SPC	4,051	3,952	2.5%	High
SPP	50,076	46,718	7.2%	Medium

Extreme Peak Demand with Typical Outages (in MWs)

- SPC is at high risk of operating below the required operating reserve requirement.
- MISO and SPP are at elevated risk for potential insufficient operating reserves in above-normal peak load conditions.

Extreme Peak Demand with Typical Outages + Extreme Derates

Assessment Area	Anticipated Resources with Typical Outages + Operational Mitigations	Extreme Resource Derates	Extreme Low Generation	Extreme Peak Load	Reserve Margin Under Extreme Resource Derates and Extreme Peak Load	Likelihood to issue EEAs
MH	5,232	0	5,232	4,909	6.6%	Low
MISO	119,421	18,067	101,354	110,278	-8.1%	High
SPC	4,051	275	3,776	3,952	-4.5%	High
SPP	50,076	11,940	38,136	46,718	-18.4%	High

Extreme Peak Demand with Typical Outages + Extreme Derates

- MISO, SPC and SPP would likely need to issue EEAs to access demand response, non-firm imports or short-term load interruption.

Recommendations

- Maintain situational awareness of fuel risk, unplanned generation outages, abnormal and extreme weather conditions, and low wind forecast period.
- Have safeguard protocols in place to ensure adequate generation resources are available prior to the winter season high demand period.
- Assist grid operators prior to and during the winter season by supporting requested environmental and transportation waivers as well as public appeals for electric load and natural gas conservation.
- Review NERC alerts related to cold weather preparedness and participate in MRO's voluntary Generator Winterization Program.
- Develop new and improved methods to assess and evaluate supply adequacy.



For more information, please contact:

Salva Andiappan
Principal Reliability Assessment Engineer
Salva.Andiappan@mro.net

Questions



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David Kuyper

Power Systems Engineer II

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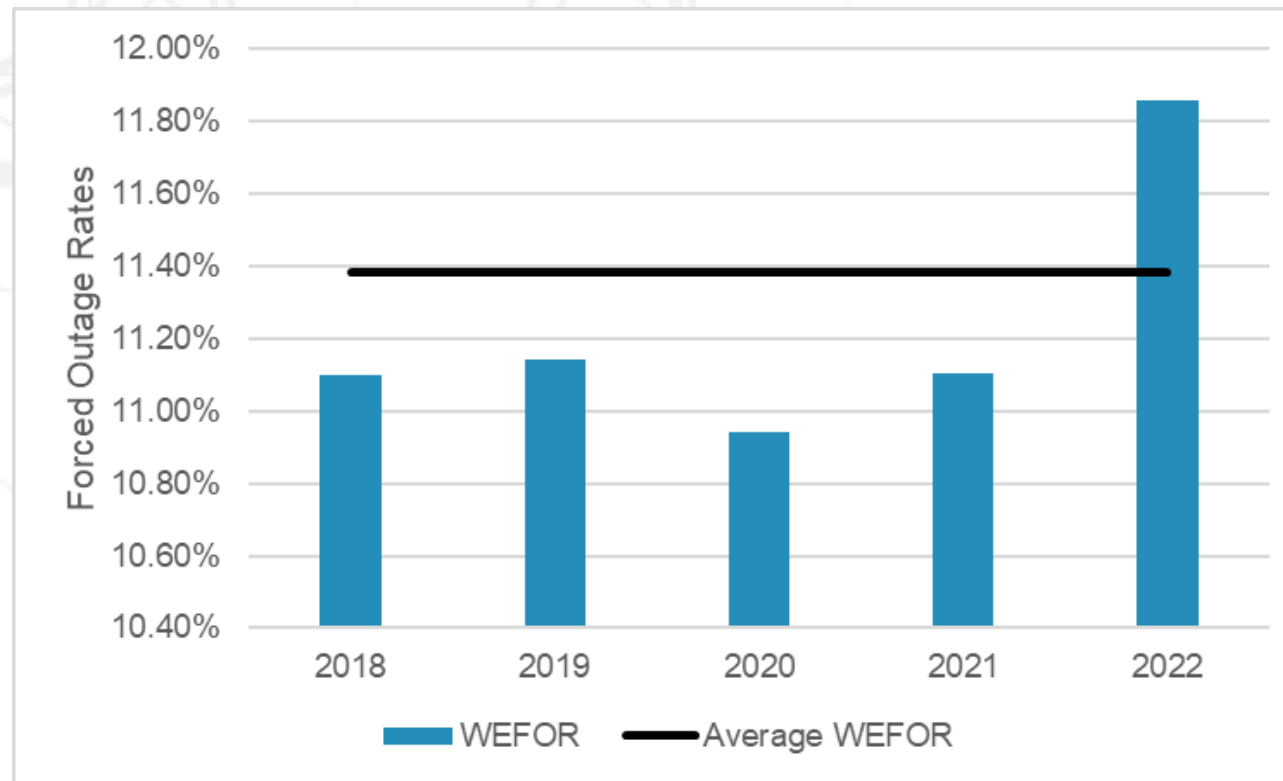
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Generator Availability Data System (GADS)

- Data is collected and analyzed based on MRO regional footprint.
- Review historical performance on conventional generators 20 MW and larger, and wind turbine 75 MW or greater.
- Collected per [Section 1600](#) data request.
- Wind turbine component outage information not included in this assessment until mandatory and representative data sets are available.

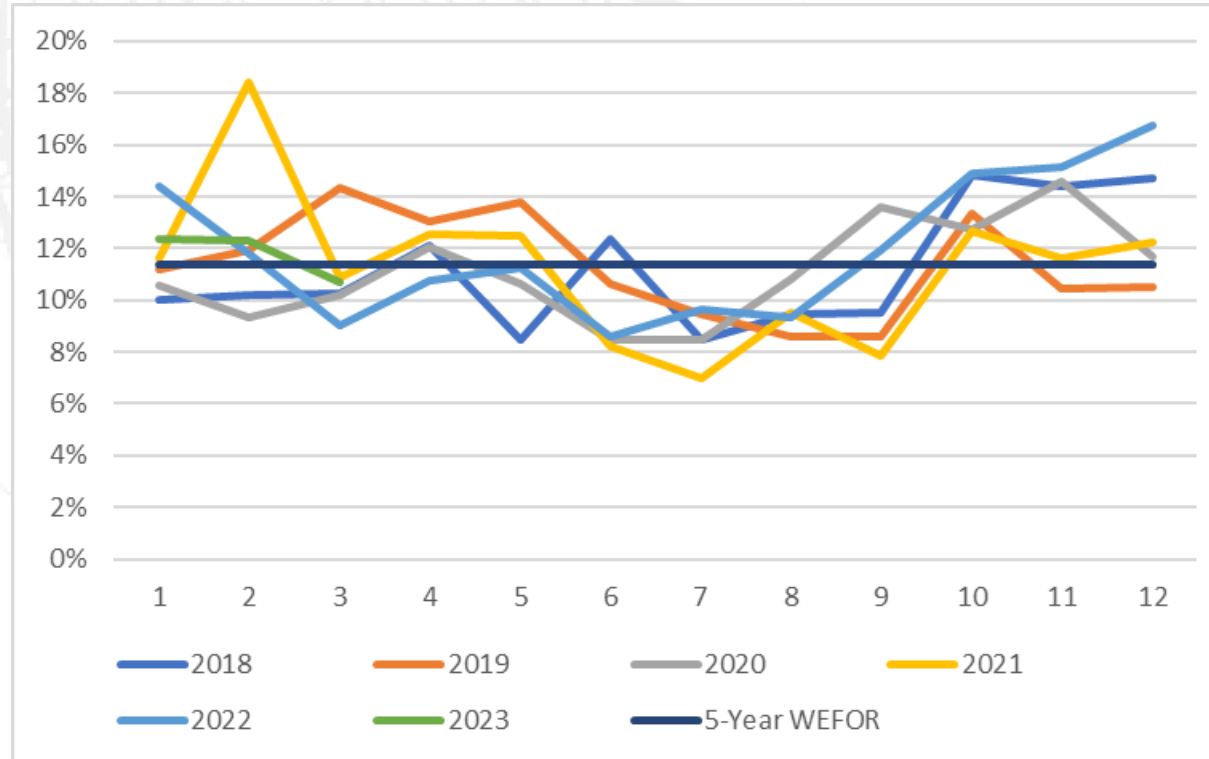
Generator Availability Data System (GADS)



MRO Annual Generator MW-Weighted EFOR

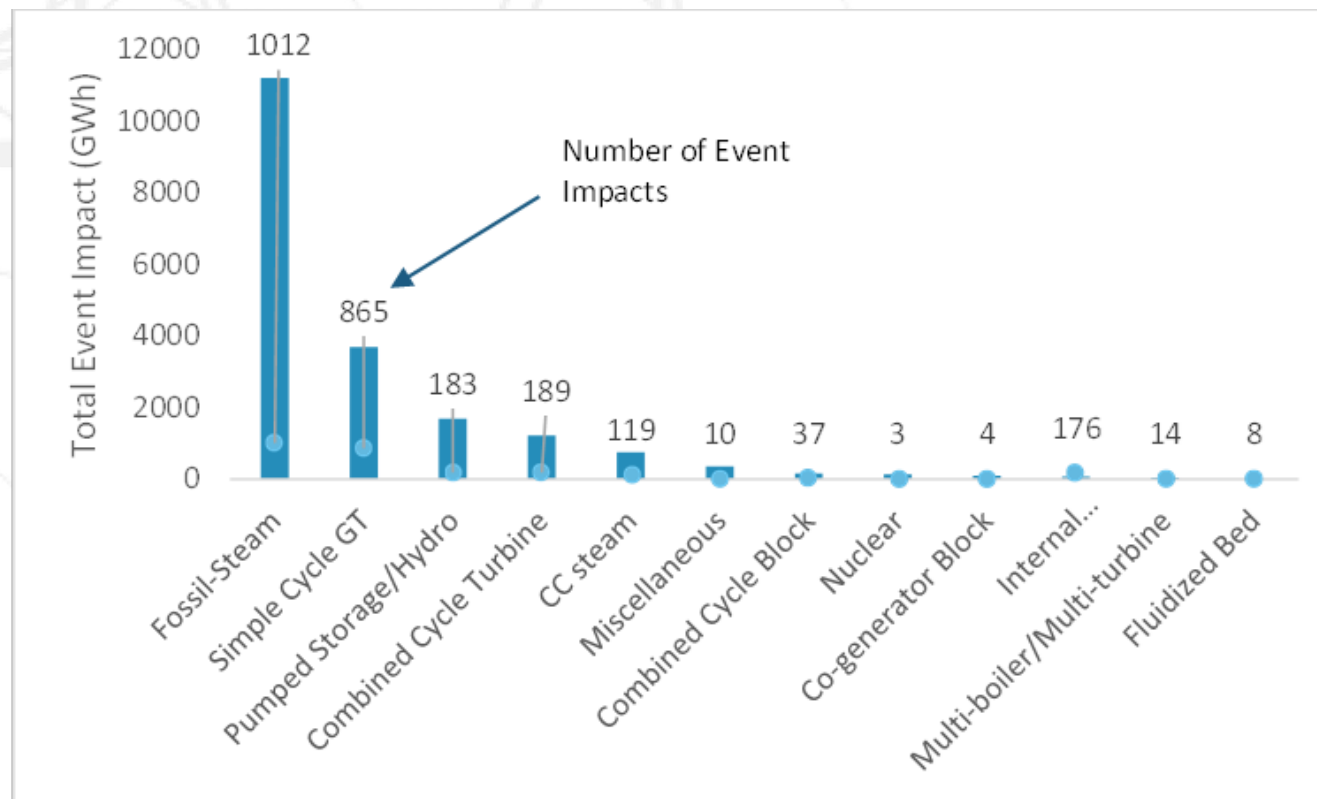
- Long term trends continue to indicate increasing EFOR rates.

Generator Availability Data System (GADS)



MW-Weighted EFOR By Month

Generator Availability Data System (GADS)



Total Event Impact (GWh) and Number of Event Impact for Winter 2022

Generator Availability Data System (GADS)

- **Increase in 2022 WEFOR was driven in part by extreme outage events during winter storm Elliott**
- **2022 winter season saw sizable decrease in event impact from the 2021 winter season**
- **Fossil Steam and Simple Cycle GT contributed to higher event impacts and increased WEFOR percentages**



For more information, please contact:

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Questions



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John Grimm

Principal Systems Protection Engineer

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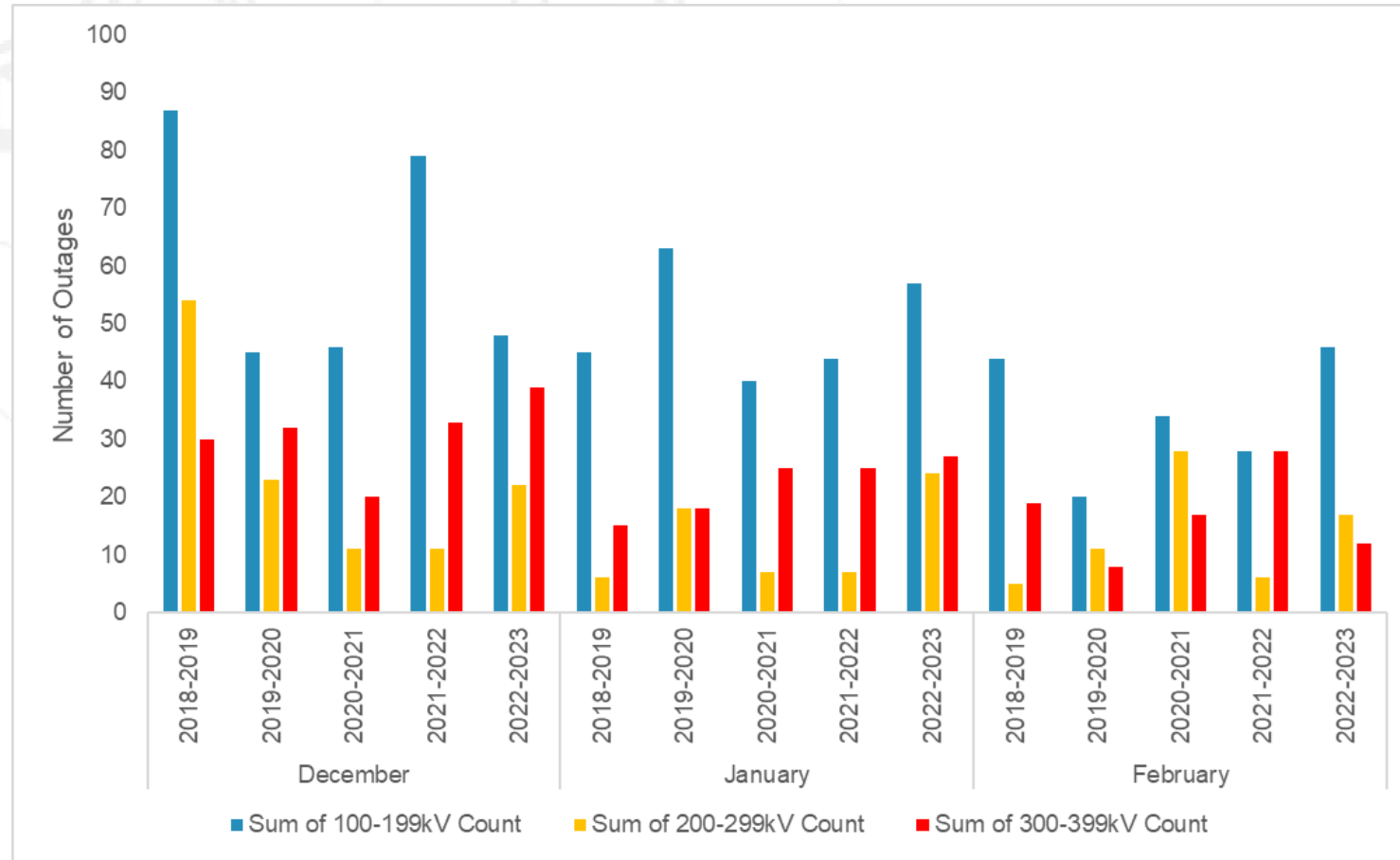
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Transmission Availability Data System (TADS)

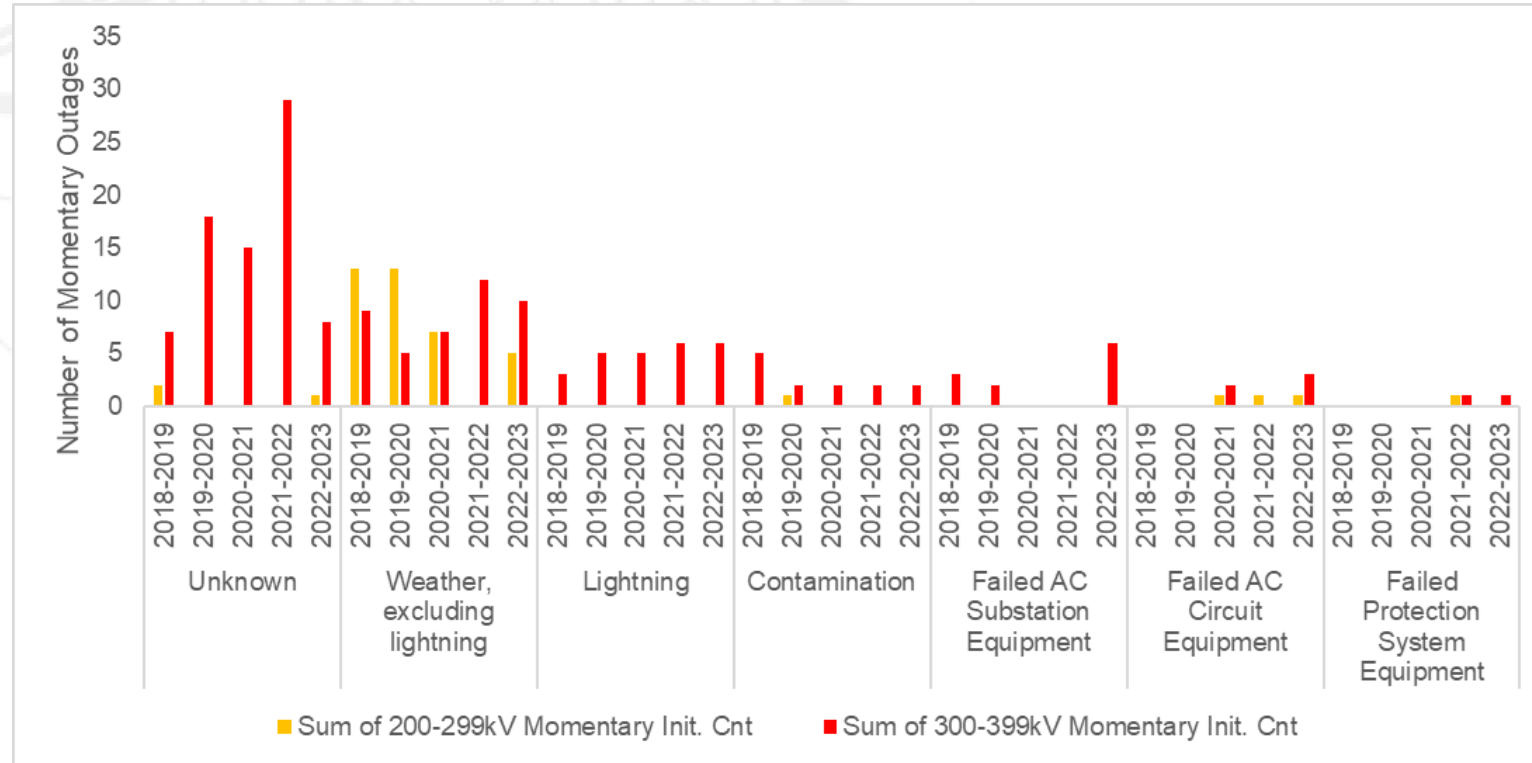
- **Data is collected and analyzed based on MRO regional footprint.**
- **Review historical performance on transmission lines and transformers 100-kV and above.**
- **Collected per Section 1600 data request.**

Transmission Availability Data System (TADS)



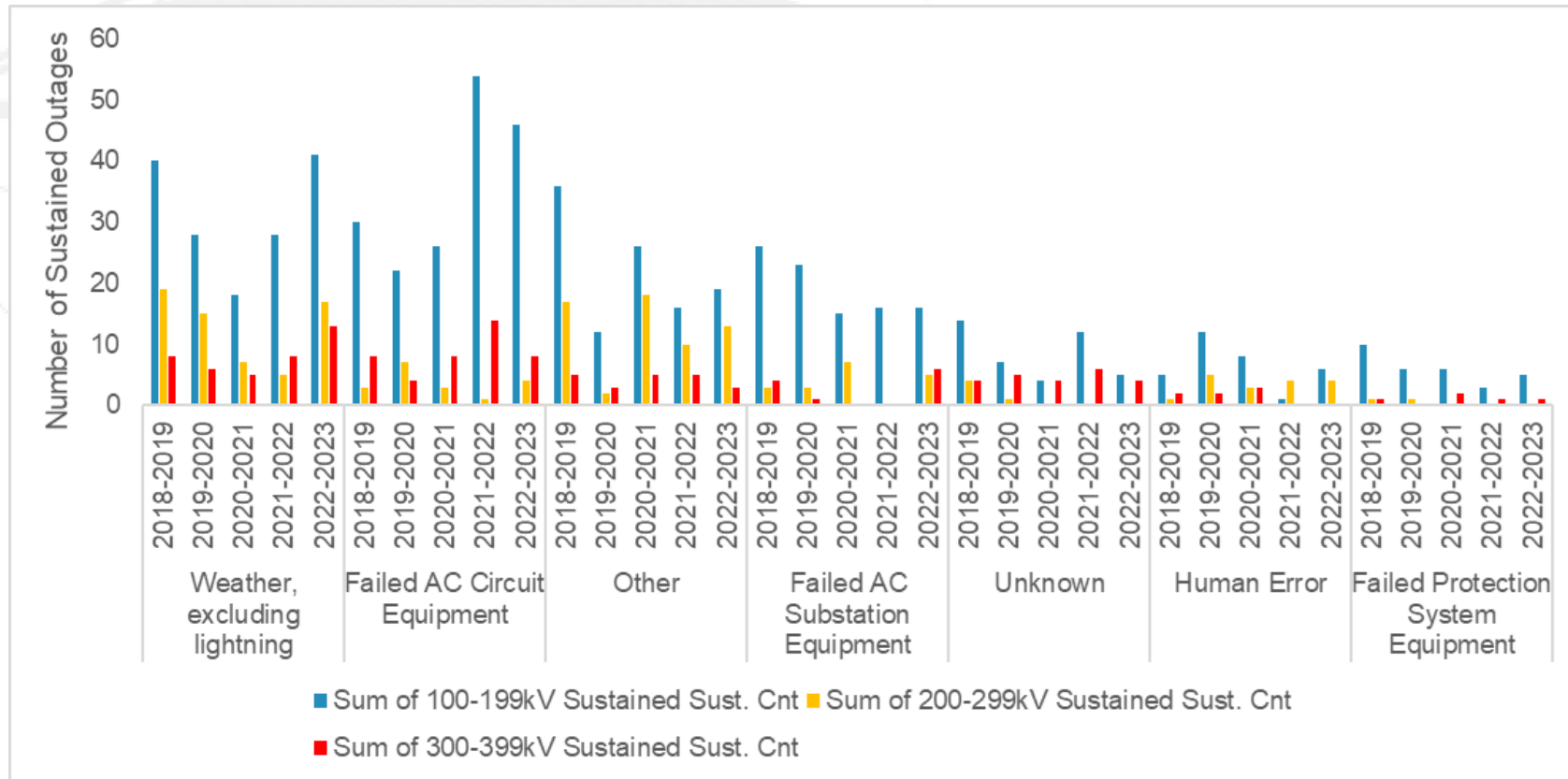
Winter Automatic Outages by Month

Transmission Availability Data System (TADS)



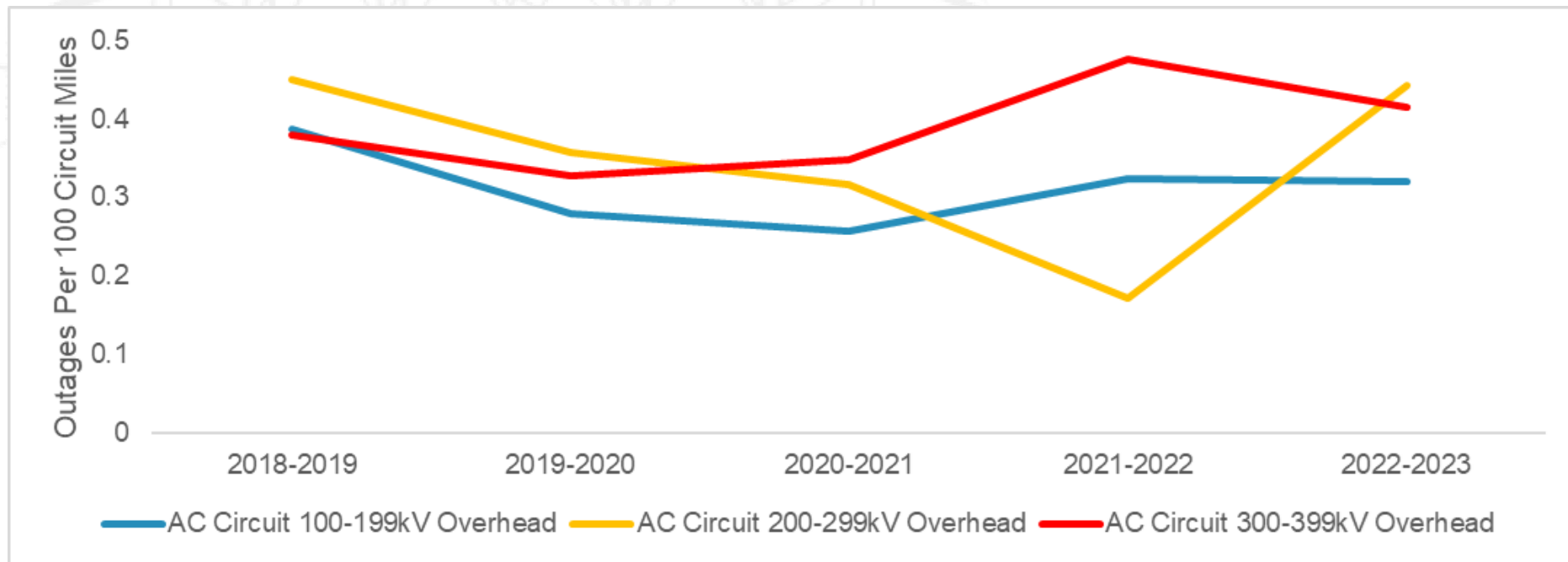
Winter Momentary Outages by Cause

Transmission Availability Data System (TADS)



Winter Sustained Outages by Cause

Transmission Availability Data System (TADS)

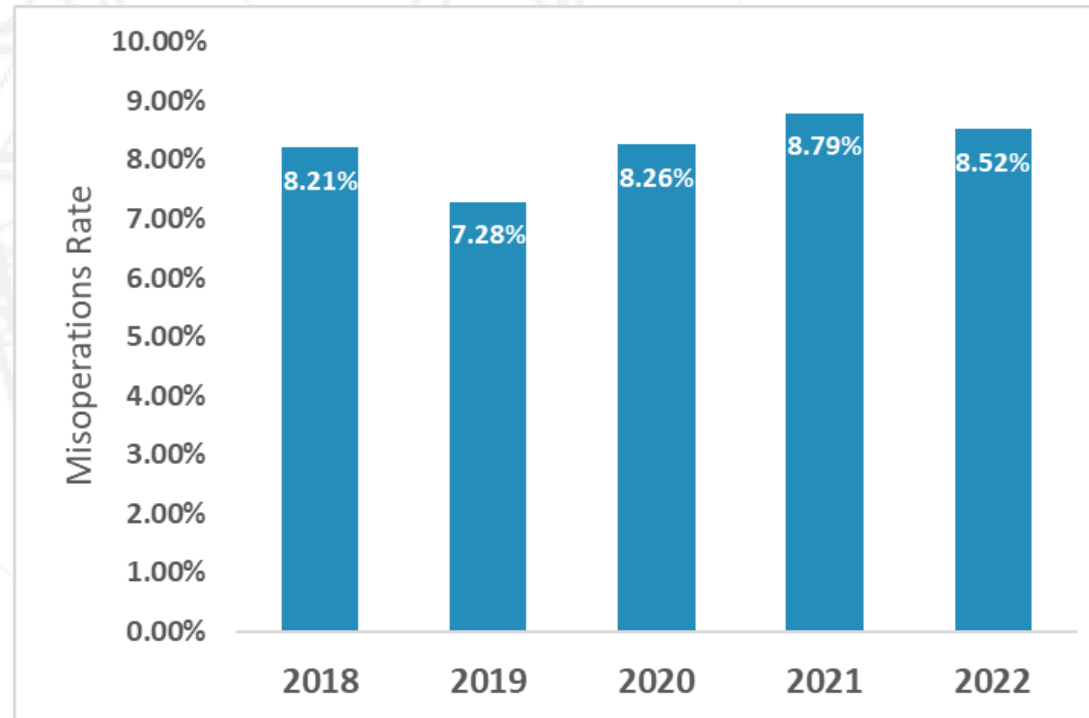


Winter Total Transmission Outages per 100 Circuit Miles

Misoperations Information Data Analysis System (MIDAS)

- **Data is collected and analyzed based on MRO regional footprint.**
- **Review historical performance on protection system operations and misoperations.**
- **Collected per Section 1600 data request.**

Misoperations Information Data Analysis System (MIDAS)

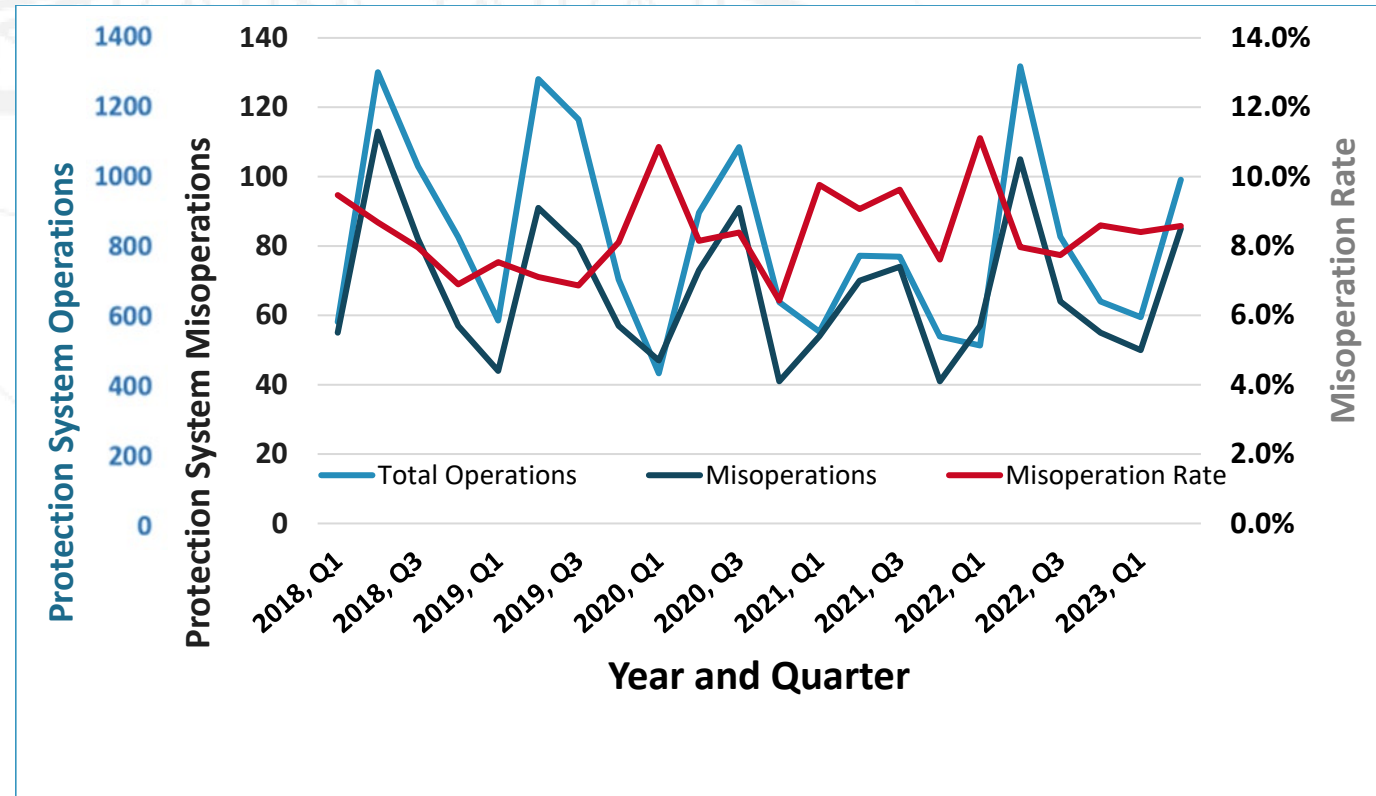


- Upward trend seen in 2020 and 2021 did not continue in 2022
- Total protection system operations increased about 25% and total misoperations increased approximately 18%

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



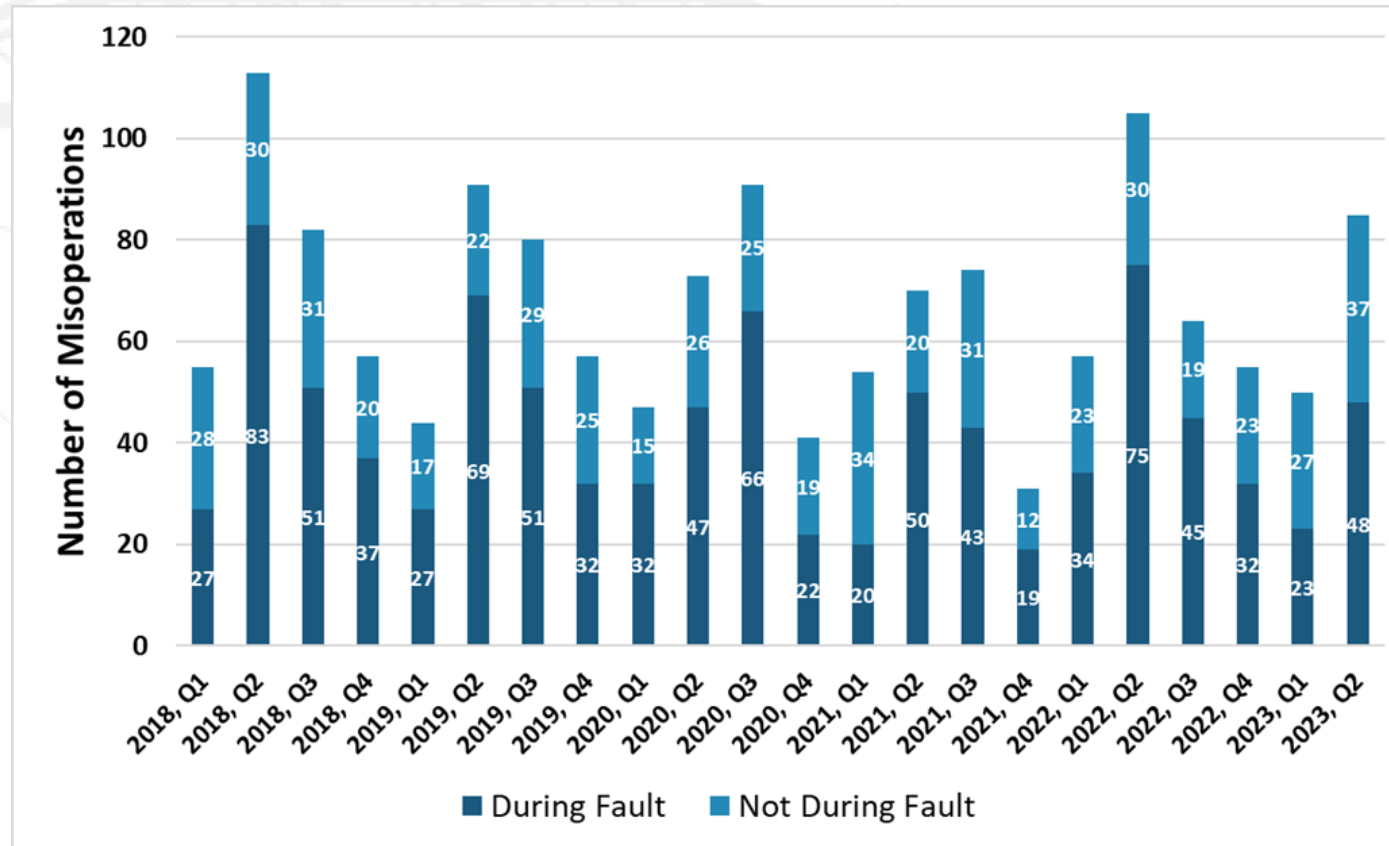
Misoperations Information Data Analysis System (MIDAS)



Protection System Operations and Misoperations Rate



Misoperations Information Data Analysis System (MIDAS)



Fault Associated and Non-Fault Associated Misoperations

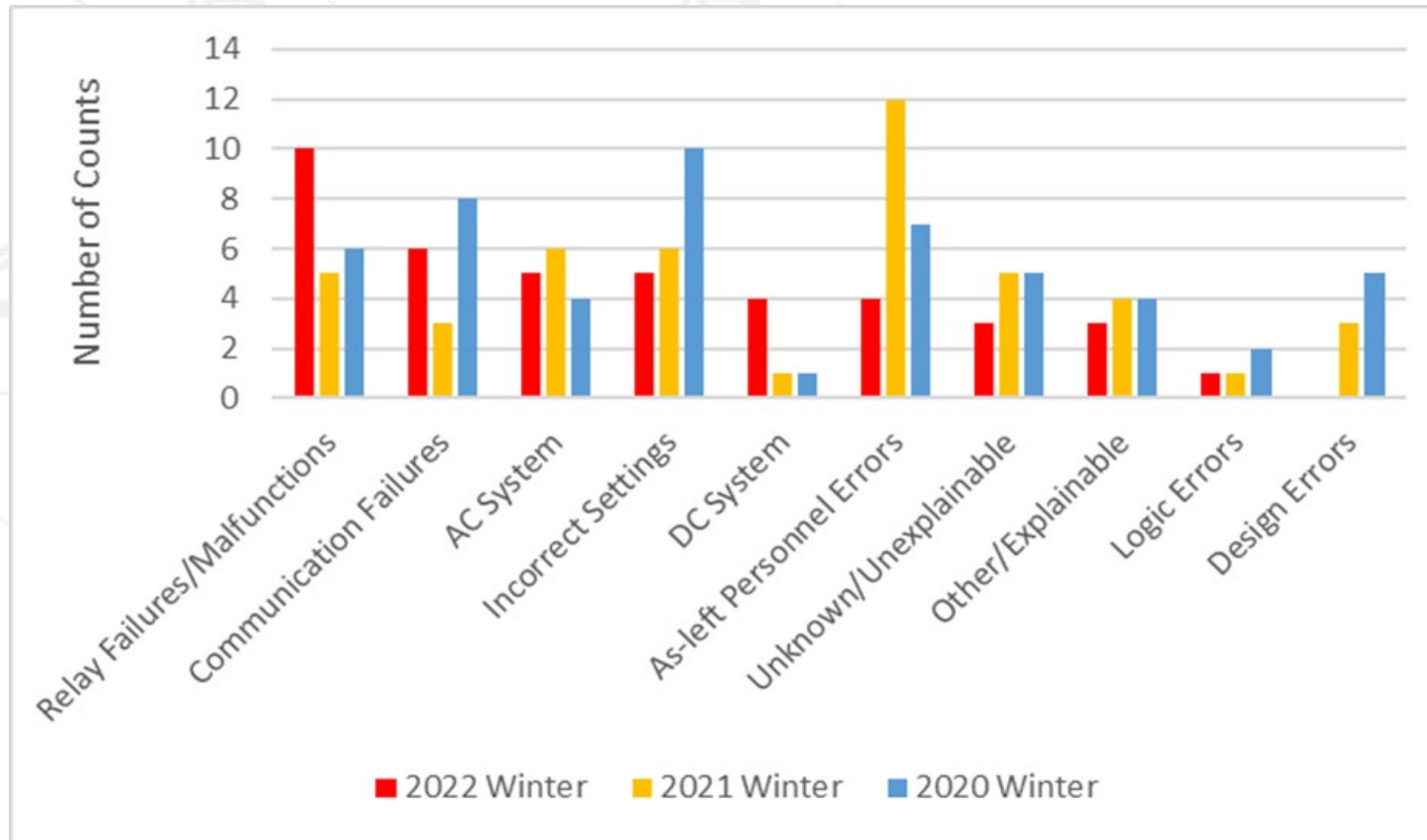


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Misoperations Information Data Analysis System (MIDAS)



Winter 2020-2022 Misoperations by Cause

- Total 41 misoperations between December 1, 2022 and February 28, 2023
- Relay failure/malfunction-related misoperations accounted for nearly a quarter
- Improved human error related misoperations (incorrect settings, as-left personnel errors, logic errors and design errors)



For more information, please contact:

John Grimm
Principal Systems Protection Engineer
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Questions

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