NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Reliability and Security Technical Committee Informational Session

December 12, 2024

RELIABILITY | RESILIENCE | SECURITY

Cyber Threat Update

Hayley Floyd, Intelligence Analyst and E-ISAC Liaison to DHS/CISA
RSTC Informational Session
December 12, 2024

TLP:GREEN

RELIABILITY | RESILIENCE | SECURITY




2024 Cyber Threats – Nation State Actors

Volt Typhoon

- PRC state-sponsored cyber actor operating since at least 2021
- Known for the use of living off the land (LOTL) techniques
- Compromised the IT environments of multiple critical infrastructure organizations – including in the energy sector – in the U.S. and its territories
- Believed to be pre-positioning themselves on IT networks to enable lateral movement to OT assets
- Actors tailor their TTPs to the victim environment, however common TTPs include: pre-compromise recon; exploitation of know or zero-day vulnerabilities; privilege escalation

Salt Typhoon

- PRC state-sponsored group operating since at least 2019
- Primarily focused on cyber espionage operations targeting telecom, health, and hospitality sectors in the U.S. and Asia
- October 2024: Compromise of multiple of U.S. telecommunications companies
    - Enabled the theft of customer call records; compromised private communications; copying of certain information subject to U.S. law enforcement requests
- TTPs: exploitation of known vulnerabilities; exploitation of internet-facing assets; use of GHOSTSPIDER malware

Lemon Sandstorm/UNC757

- Iran-based group of cyber actors operating since at least 2017
- Two avenues of operations: ransomware operations and operations in support of the Government of Iran (GOI)
- August 2024: actors conducting high volume of computer network intrusion attempts against U.S. organizations
- Collaboration with ransomware affiliates to enable encryption operations in exchange for a percentage of ransom payments
- TTPs: exploitation of public-facing applications; exploitation of external remote services

APT 29 – Midnight Blizzard

- Russian Foreign Intelligence Service (SVR) cyber actors operating since at least 2010
- Focused on targeting cloud resources to obtain information
- January 2024: Compromise of Microsoft corporate emails and customer systems
    - Exfiltration of email correspondence between U.S. Federal Civilian Executive Branch (FCEB) agencies and Microsoft
- TTPs: password spraying; leveraging zero-day vulnerabilities; use of WELLMESS malware

GRU Unit 29155

- Cyber actors affiliated with the Russian General Staff Main Intelligence Directorate (GRU) 161st Specialist Training Center (Unit 29155) operating since at least 2020
- WhisperGate malware operations against Ukrainian victim organizations
- Website defacements, infrastructure scanning, data exfiltration, and data leak operations against critical infrastructure sectors
- TTPs: recon on victim networks to discover vulnerabilities; use of publicly available tools; exploitation of internet-facing systems; remote command execution via web

Additional Information

Volt Typhoon

- *aa24-038a_csa_prc_state_sponsored_actors_compromise_us_critical_infrastructure_3.pdf*
- TLP:AMBER – Article 000017085 - DOE Releases ARES Report on Threat Actor Volt Typhoon's TTPs Targeting U.S. Energy Sector

Salt Typhoon

- *Joint Statement from FBI and CISA on the People's Republic of China (PRC) Targeting of Commercial Telecommunications Infrastructure | CISA*
- TLP:AMBER+STRICT – Article 000017853 - Cyber Threat Intel Report: Mandiant's UNC2286, also Salt Typhoon, Associated Indicators
- TLP:GREEN – Article 000017999 - Cyber Threat Intel Report: Earth Estries (aka Salt Typhoon) leveraging new GHOSTSPIDER Malware

Lemon Sandstorm/UNC757

- *Iran-based Cyber Actors Enabling Ransomware Attacks on US Organizations*

APT 29 - Midnight Blizzard

- *ED 24-02: Mitigating the Significant Risk from Nation-State Compromise of Microsoft Corporate Email System | CISA*
- *Russian Foreign Intelligence Service (SVR) Cyber Operations: Trends and Best Practices for Network Defenders | CISA*

GRU Unit 29155

- *Russian Military Cyber Actors Target US and Global Critical Infrastructure | CISA*

2024 Cyber Threats – Ransomware Groups

Akira

- Ransomware-as-a-service (RaaS) variant operating since at least March 2023
- As of January 2024, Akira affiliates had impacted over 250 organizations and claimed approximately $42 million USD in ransomware proceeds
- TTPs: VPN services without MFA configured, mostly using known Cisco vulnerabilities; use of external-facing services (i.e., RDP); spear phishing; abuse of valid credentials
- Utilizes double-extortion model

BlackBasta

- Ransomware-as-a-service (RaaS) variant operating since at least April 2022
- Affiliates have impacted at least 12 out of 16 critical infrastructure sectors in North America, Europe, and Australia. Impacted over 500 orgs Globally since May 2024
- TTPs: spear-phishing; email bombing to aid social engineering over Microsoft Teams to gain access via remote monitoring and management tools
- Utilizes double-extortion model

LockBit

- Ransomware-as-a-service (RaaS) variant operating since at least January 2020
- Affiliates have targeted over 2,000 victims and have received more than $120 million USD in ransomware payments
- Operation Cronos: joint international law enforcement operation conducted in February 2024 to disrupt LockBit operations
- TTPs: vary significantly due to large number of unconnected affiliates in the operation

Hunters International

- Ransomware-as-a-service (RaaS) variant operating since at least 2023
- According to the group, they took over Hive ransomware group's source code and infrastructure
- Targeting multiple U.S. critical infrastructure sectors to exfiltrate data and extract ransom payments
- TTPs: exploitation of weak network protection

RansomHub

- Ransomware-as-a-service (RaaS) variant operating since at least February 2024
- Previously known as Cyclops and Knight
- Affiliates have impacted at least 210 victims representing 11 out of 16 critical infrastructure sectors
- TTPs: phishing emails; exploitation of known vulnerabilities; password spraying
- Utilizes double-extortion model

Play

- Presumed to be a "closed group" operating since at least June 2022
- Has impacted a wide range of businesses and critical infrastructure organizations in North America, South America, and Europe
- TTPs: exploitation of public-facing applications through known FortiOS and Microsoft Exchange vulnerabilities; use of external-facing services i.e. RDP and VPNs
- Utilizes double-extortion model

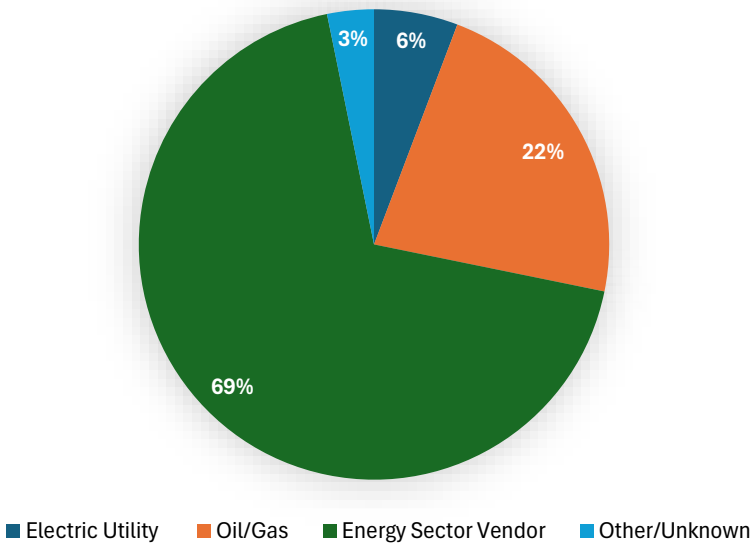
Additional Information

- *#StopRansomware: Akira Ransomware*
- *aa24-131a-joint-csa-stopransomware-black-basta_3.pdf*
- *aa23-165a_understanding_TA_LockBit.pdf*
- *#StopRansomware: RansomHub Ransomware*
- *aa23-352a-stopransomware-play-ransomware.pdf*

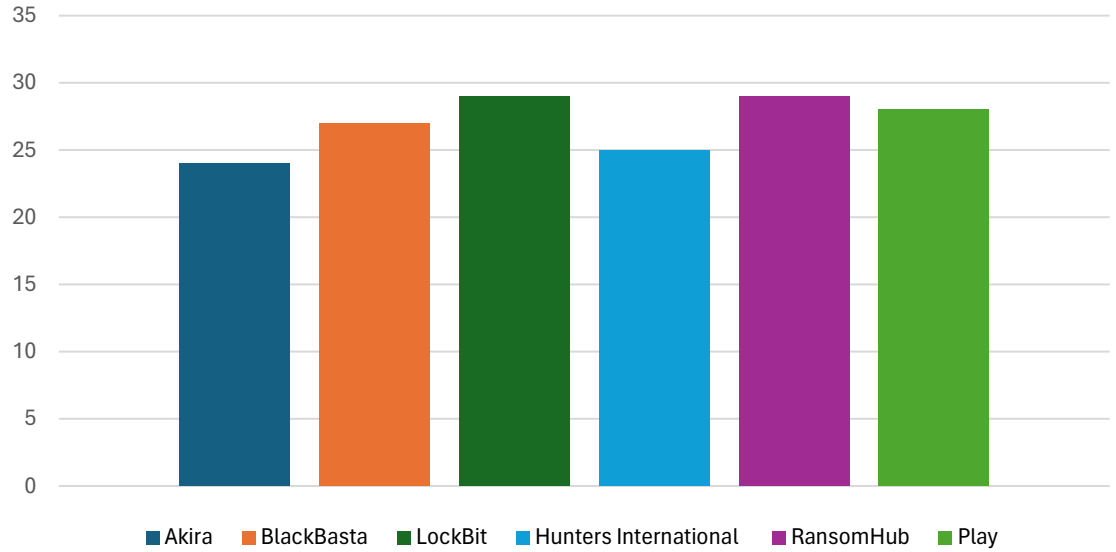
2024 Security Operations Monthly Open-Source Intelligence Report Statistics

The Security Operations Monthly Open-Source Intelligence Report provides a high-level analysis of incidents captured by the E-ISAC over various dark web and other emerging threat actors and provide an overview of this threat landscape as it pertains to the energy sector.

Ransomware Incident by Sector - 2024



Incidents by Ransomware Group - 2024



E-ISAC Security Operations Monthly Open-Source Intelligence Reports

- TLP:GREEN – Article 000017057 – EISAC Security Operations Monthly Open-Source Intelligence Report – January 2024
- TLP: GREEN – Article 000017155 - E-ISAC Security Operations Monthly Open-Source Intelligence Report – February 2024
- TLP:GREEN – Article 000017220 - E-ISAC Security Operations Monthly Open-Source Intelligence Report – March 2024
- TLP:GREEN – Article 000017341 - E-ISAC Security Operations Monthly Open-Source Intelligence Report – April 2024
- TLP:GREEN – Article 000017444 - E-ISAC Security Operations Monthly Open-Source Intelligence Report – May 2024
- TLP:GREEN – Article 000017559 - E-ISAC Security Operations Monthly Open-Source Intelligence Report – June 2024
- TLP:GREEN – Article 000017664 - E-ISAC Security Operations Monthly Open-Source Intelligence Report – July 2024
- TLP:GREEN – Article 000017744 - E-ISAC Security Operations Monthly Open-Source Intelligence Report – August 2024
- TLP:GREEN – Article 000017834 - E-ISAC Security Operations Monthly Open-Source Intelligence Report – September 2024
- TLP:GREEN – Article 000017953 - E-ISAC Security Operations Monthly Open-Source Intelligence Report – October 2024
- TLP:GREEN – Article 000018031 - E-ISAC Security Operations Monthly Open-Source Intelligence Report – November 2024

Questions and Answers

NATF Report to NERC RSTC

December - 2024

NATF - ERO Collaboration

NATF interfaces on key reliability, resiliency, security and safety topics

Promotes alignment and continuous improvement while reducing duplication of effort

Refer to NATF newsletters posted on public website for additional examples

- www.natf.net/news/newsletters

October NATF – ERO Leadership Meeting

Discussed coordination topics identified in earlier ERO-NATF leadership strategy meetings:

- *GridEx as it relates to resilient communications
- *Long-Range Planning: Joint NATF-NERC-EPRI workshop
- *Inverter-Based Resources: NATF lifecycle documents and NERC's support for NATF work
- *Tiering of Physical Assets: Avoid duplication on risk-assessment aspect
- *Grid-Enhancing Technologies: NATF staff continued work on AAR and potentially DLR

NATF Human Performance Certification

This was the first of many to come to recognize HPI professionals

Required completion of education, participation, application and examination

Covered 16 technical practices for safe, reliable operation of the electric transmission system

Administered by the NATF and is available to practitioners employed by NATF member organizations

NATF-NERC-EPRI Transmission Planning Workshop

Conducted November 19 -20, 2024

- Was held “virtually”
- Industry experts shared valuable insights
- Best practices were shared
- Innovative strategies were discussed to address challenges

Supply Chain Criteria and Questionnaire

Annual revision of the Supply Chain Security Criteria and the Energy Sector Supply Chain Risk Questionnaire is underway:

1. The process is open to industry, suppliers, regulators, and other stakeholders for input
2. Documents are useful for risk management and compliance efforts
3. Documents support a risk-based approach where entities determine which criteria or questions to apply for procurement
4. Input on the criteria and questionnaire can be submitted to supplychain@natf.net until close of business January 31, 2025, for consideration in the 2025 review cycle.

Redacted Operating Experience Reports

- Certain operating experience reports are made available to industry for continued learning
- You can review these shared reports at this link: Documents
- For more information about the NATF, please visit: *https://www.natf.net/*

NATF Mission

Promote excellence in the safe, reliable, secure, and resilient operation of the electric transmission system

NATF Vision

Continuously improve transmission system reliability, security, and resiliency, while ensuring the safety of utility personnel

Questions?

Comments?

Agenda Item 2b

North American Generator Forum RSTC Update

Allen Schriver
NAGF Policy Coordinator
aschriver@generatorforum.org
December 2024

NAGF Mission

The NAGF mission is to promote the safe, reliable operation of the generator segment of the bulk power system through generator owner and operator collaboration with grid operators and regulators.

Agenda

- **Areas of Focus**
- **Participation and Coordination**
- **NERC Standard Projects**

Areas of Focus

- **FERC Order No. 901, Milestone 2, IBR Registration and Standards**
- **IBR Performance and Modeling Requirements**
- **Extreme Cold Weather Reliability including Blackstart availability and Gas-Electric Coordination**
- **The NAGF process to comment on draft SARs being developed in the Subcommittees.**
- **NAGF-NERC Quarterly Collaboration Meeting**

NAGF 2024 Compliance Conference and Annual Meeting

- The NAGF 2024 Compliance Conference included presentations and discussions on:

  - Keynote Speaker – Mark Lauby
  - EOP-012 and Cold Weather Preparations, Best Practices and Compliance
  - ERO IBR Activities and Category 2 IBR Registration
  - CIP-003-9 Modifications and Compliance
  - IBR Modeling
  - IBR Protection System Challenges and Solutions
  - MOD-025/26/27 and PRC-019/024

NAGF Participation

- FERC Technical Conference, October 16, 2024
- NERC Trades and Forums Meeting, October 31, 2024
- NERC Cloud Services Technical Conference, November 1, 2024
- NERC Cold Weather Industry Webinar: Project 2024-03 Revisions to EOP-012-2, November 12, 2024
- ERO Enterprise Webinar: Inverter-Based Resource Registration Initiative, November 13, 2024

NERC Standard Projects

Through its Working Groups, the NAGF actively engages in the standards development process.

- Cold Weather Preparedness Working Group
  - The CWPWG's focus is on NERC Cold Weather initiatives.
  - 2024-03: Modifications to EOP-012-2 Draft #1
  - Continuing to share best practices to ensure cold weather preparations.

- CIP Working Group
  - The CIPWG reviews cyber security issues that impact generators.
  - Project 2021-03: CIP-002 Draft #2
  - Project 2023-04: CIP-003 Draft #4

- Markets and Policy Working Group
  - The MPWG focus is on FERC, NERC, and other government entity activities that impact the energy markets as well as energy policies.

NERC Standard Projects

Through its Working Groups, the NAGF actively engages in the standards development process (continued).

- Physical Security Working Group
  - The PSWG is focused on sharing of generator physical security issues as well as promoting physical security practices, threat mitigation strategies, incident prevention/response, training, and other relevant topics to enhance generator physical security .
  - 2023-01: EOP-004 IBR Event Reporting
  - 2023-06: CIP-014 Risk Assessment Refinement

- Standards Review Team
  - The Standards Review Team (SRT) works directly with NERC to address Generator Owners and Generator Operators' concerns regarding enforceable standards and standards under development.
  - Project 2022-02: MOD-032 Draft #3
  - Project 2022-04: FAC-002 Draft #1

NERC Standard Projects

Through its Working Groups, the NAGF actively engages in the standards development process (continued).

- Variable Resources Working Group
  - The VRWG's focus is on NERC Reliability Standards implementation and best practice sharing for utility scale Variable Resources (mainly for wind and solar) connected at transmission voltages of 100kV or greater. Distributed Energy Resources (DER) topics are also welcomed in this working group.
  - 2020-02: Modifications to PRC-024 (new PRC-029)
  - 2020-06: IBR Glossary Terms
  - 2021-04: Modifications to PRC-002 Phase II – new PRC-028
  - 2023-02: Performance of IBRs (new PRC-030)
  - 2024-01: Rules of Procedure Definitions Alignment (Generator Owner and Generator Operator)

Thank you!

www.GeneratorForum.org

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Agenda Item 3

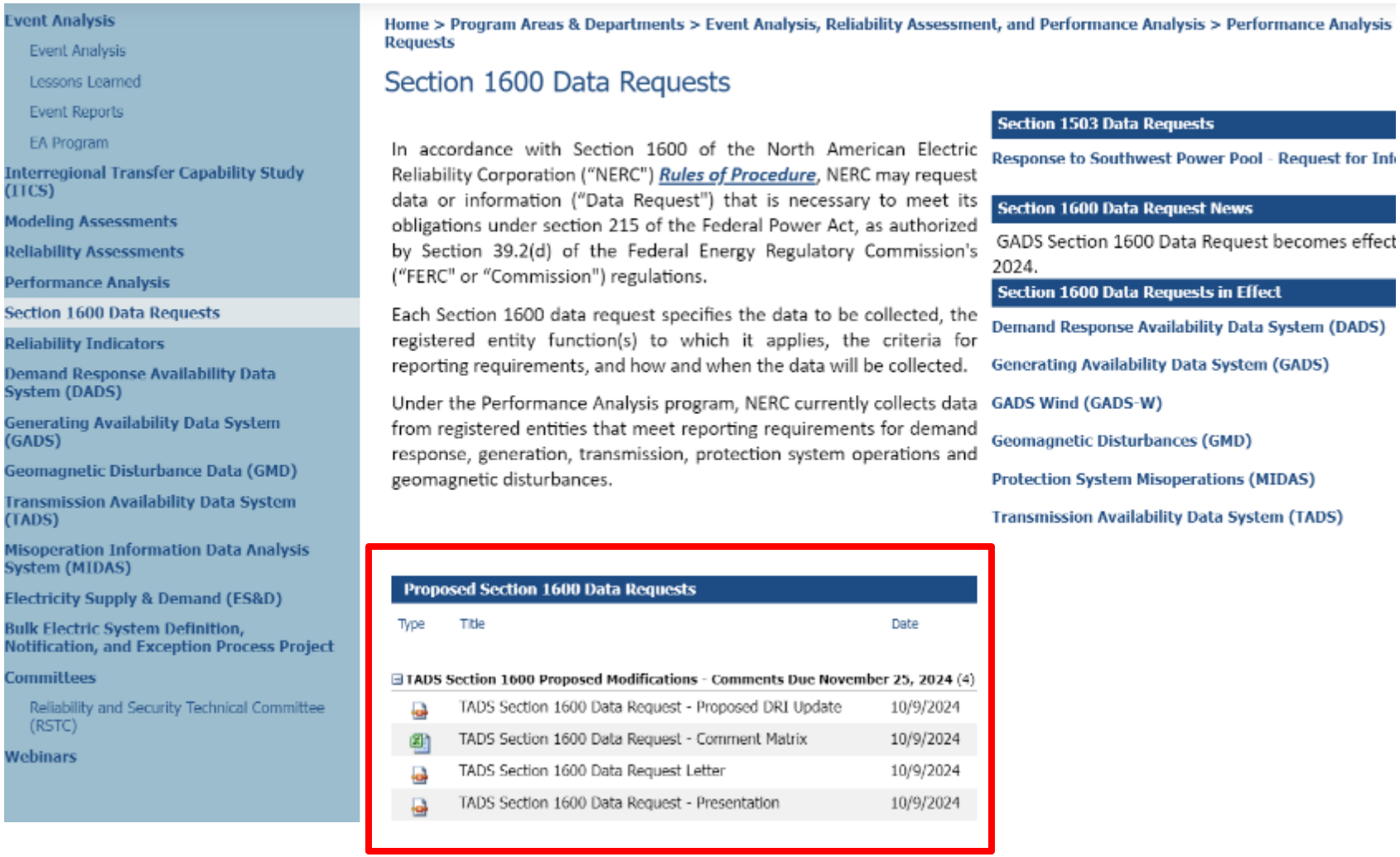
TADS Section 1600 Data Request

Donna Pratt, Manager Performance Analysis
RSTC Informational Session
December 12, 2024

TADS Section 1600 Data Request

- The proposed TADS Section 1600 Data Request includes:
  - Geographical data for TADS elements:
    - To identify the longitude and latitude coordinates
    - To improve the accuracy of evaluating the extent of system outages
  - Load loss data resulting from a transmission system outage:
    - To improve the load loss component of the Severity Risk Index (SRI)
    - To capture times when there is an operational break in continuously transmitted electrical energy to planned in-service points
  - Equipment sub-cause codes:
    - To enhance existing initiating and sustained equipment cause codes
    - To improve the understanding of transmission outages
    - To track and trend outages due to equipment failures in more detail

Section 1600 Page on NERC.com



Event Analysis
- Event Analysis
- Lessons Learned
- Event Reports
- EA Program

Interregional Transfer Capability Study (ITCS)
Modeling Assessments
Reliability Assessments
Performance Analysis
Section 1600 Data Requests
Reliability Indicators
Demand Response Availability Data System (DADS)
Generating Availability Data System (GADS)
Geomagnetic Disturbance Data (GMD)
Transmission Availability Data System (TADS)
Misoperation Information Data Analysis System (MIDAS)
Electricity Supply & Demand (ES&D)
Bulk Electric System Definition, Notification, and Exception Process Project
Committees
- Reliability and Security Technical Committee (RSTC)

Webinars

Home > Program Areas & Departments > Event Analysis, Reliability Assessment, and Performance Analysis > Performance Analysis Requests

Section 1600 Data Requests

In accordance with Section 1600 of the North American Electric Reliability Corporation ("NERC") *Rules of Procedure*, NERC may request data or information ("Data Request") that is necessary to meet its obligations under section 215 of the Federal Power Act, as authorized by Section 39.2(d) of the Federal Energy Regulatory Commission's ("FERC" or "Commission") regulations.

Each Section 1600 data request specifies the data to be collected, the registered entity function(s) to which it applies, the criteria for reporting requirements, and how and when the data will be collected.

Under the Performance Analysis program, NERC currently collects data from registered entities that meet reporting requirements for demand response, generation, transmission, protection system operations and geomagnetic disturbances.

Section 1503 Data Requests

Response to Southwest Power Pool - Request for Inf

Section 1600 Data Request News

GADS Section 1600 Data Request becomes effect 2024.

Section 1600 Data Requests in Effect

Demand Response Availability Data System (DADS)
Generating Availability Data System (GADS)
GADS Wind (GADS-W)
Geomagnetic Disturbances (GMD)
Protection System Misoperations (MIDAS)
Transmission Availability Data System (TADS)

Proposed Section 1600 Data Requests

Type	Title	Date
TADS Section 1600 Proposed Modifications - Comments Due November 25, 2024 (4)		
	TADS Section 1600 Data Request - Proposed DRI Update	10/9/2024
	TADS Section 1600 Data Request - Comment Matrix	10/9/2024
	TADS Section 1600 Data Request Letter	10/9/2024
	TADS Section 1600 Data Request - Presentation	10/9/2024

Public Comments

- Public Comment period: October 10 – November 25, 2024
- 24 Entities
- 90 Comments received
- Comments assigned to four topic categories

	Number of Comments
Geographical	21
Load Loss	40
Equipment Sub-Cause Codes	21
Applicable to All Areas	8

Comment Responses

Comment Category	Geographical	Load Loss	Equipment Sub-Cause Codes	Applicable to All
Added burden	1	14	3	
Confidentiality of geographical data	3			5
Clarification of capacity at the TCP		9		
Definitions and clarifications	16	13	18	1
No response Required	1	4		2

Key Comment Topic: Purpose of Load Loss Data Collection

- The purpose for collecting load loss that is a result of reported transmission outages
  - Voluntarily reported data is incomplete and may not be representative of the event or area being studied.
  - Voluntarily reported data or data reported under Reliability Standard EOP-004 for larger events is not available to NERC at the level of detail necessary to facilitate an assessment of the BPS.
  - The purpose of TADS data collection is to measure the performance of the transmission system, not the performance of individual entities, Reliability Standard compliance, or the distribution system.

Key Comment Topic: Load Loss Reporting Threshold

- Technical Justification
  - It is necessary to meet NERC's reliability assessment obligations, to understand the magnitude, frequency, and duration of any load loss.
  - A 20 MW threshold allows NERC to better assess the performance of the system with respect to electric service uptime for a broader and equitable set of transmission users.
  - Applying a 20MW threshold is also consistent with prior activities where 20MW has been identified as a reasonable threshold at which an incident may pose a BPS reliability concern worthy of further assessment.
  - GADS reporting is required for thermal units 20MW or greater.
  - A loss of 20MW capacity is the reporting threshold for wind and solar outages.

Key Comment Topic: Security of TADS Information

- Geographical information
  - The proposed format for latitude and longitude is the Degrees+Minutes/60 rounded to one decimal place (e.g., 60.1), which is within 11 kilometers or 6.6 miles of the exact location of the element.
  - Geo locations are not considered to be more sensitive than other reported operational data.
    - Transmission line locations are traceable through several public sources, such as Google Earth and the Energy Information Administration.
  - Geo location information is collected by NERC for wind and solar plants, geomagnetic monitoring devices; available through EIA for thermal generating units.
- Access to TADS
  - Requires a user-specific digital certificate
  - Users only have access to their entity/entities
  - No APIs or other automated access is permitted

Next Steps

Date	Action
December 2024	Review Comments with RSTC, Performance Analysis Subcommittee, and TADS User Group
February 2025	Target NERC Board of Trustees February Meeting to seek approval for proposed modifications

Questions and Answers

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Agenda Item 4

ERO Event Analysis Program

Snapshot

Matt Lewis, Manager of Event Analysis
RSTC Informational Session
December 12, 2024

Informing Reliability

Projects/Products

- Misops Reduction Workshop (OCT)
- Monitoring & SA Tech. Conference (OCT)
- 2024 LLs – 2 (published), 4 (development)
- Technical input to various standards projects

Working Publications

- Supporting SPCWG annual misops analysis
- Loss of data center/ large load incidents
- VELCO DER Reliability Vignette

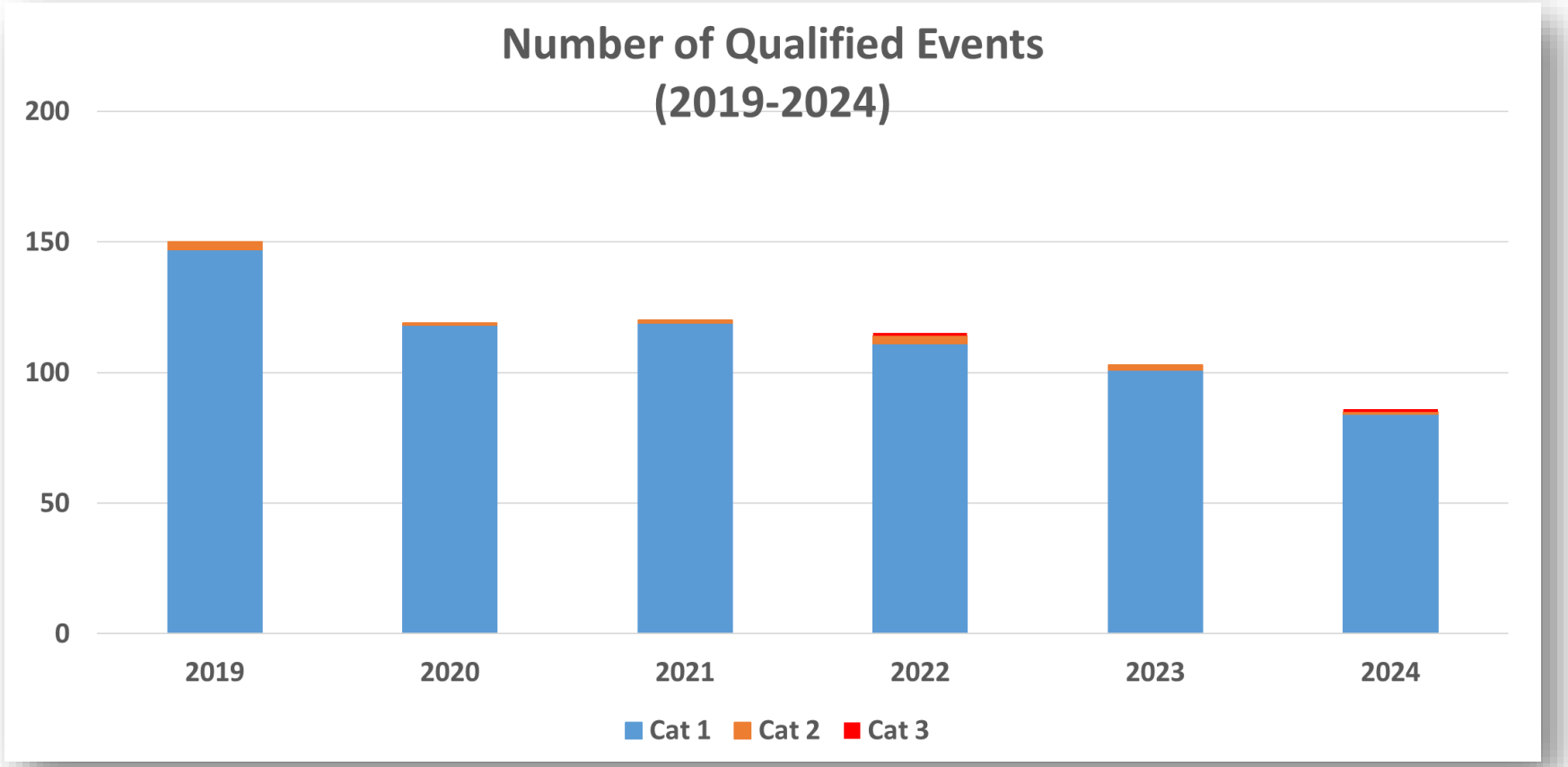
RSTC Support

EAS – Brad Gordon
- EMSWG – Wei Qiu
- FMMWG – Rick Hackman

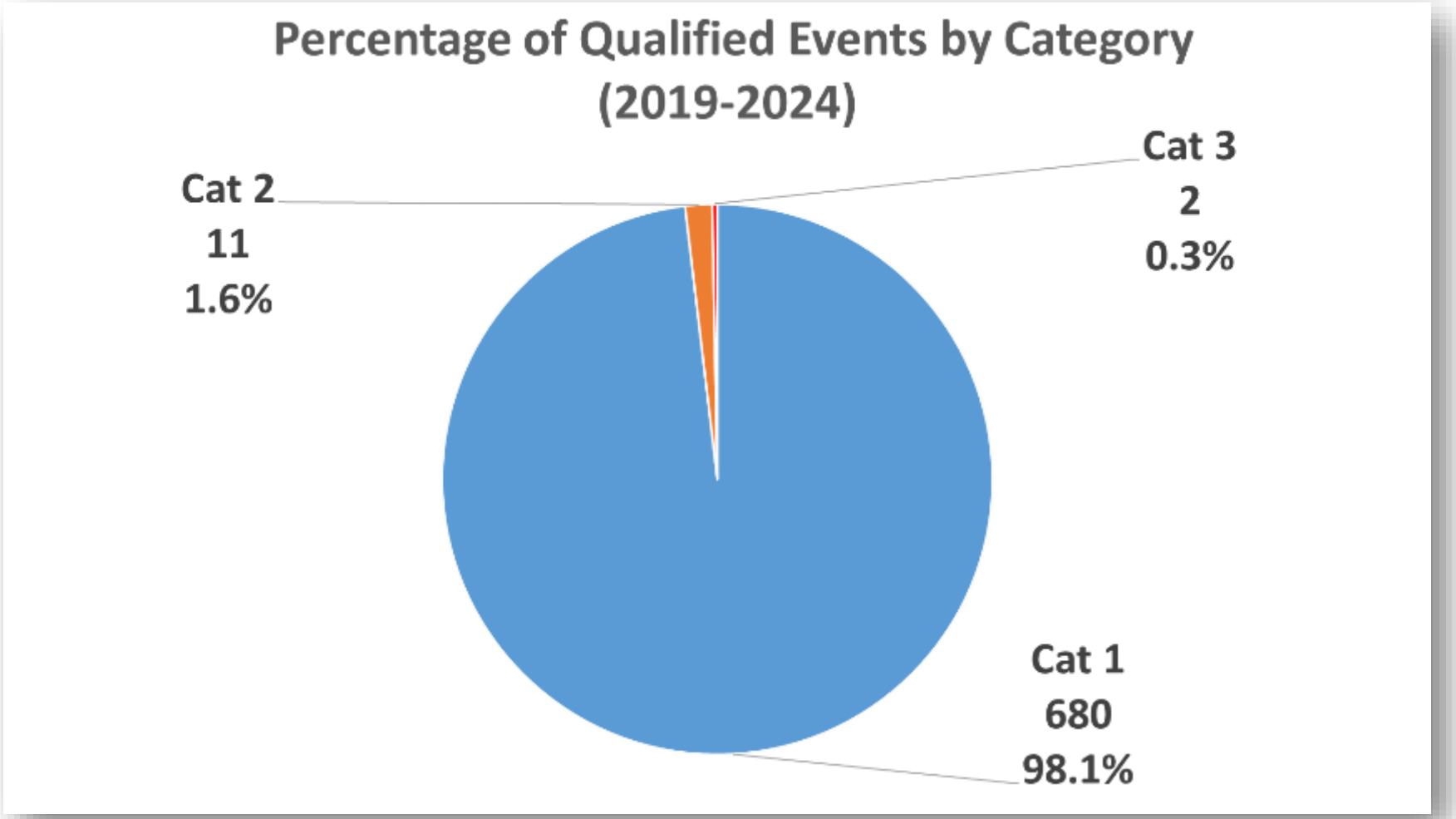
SPCWG – Rich Bauer and Ed Ruck

6 GHz TF – Valerie Carter-Ridley

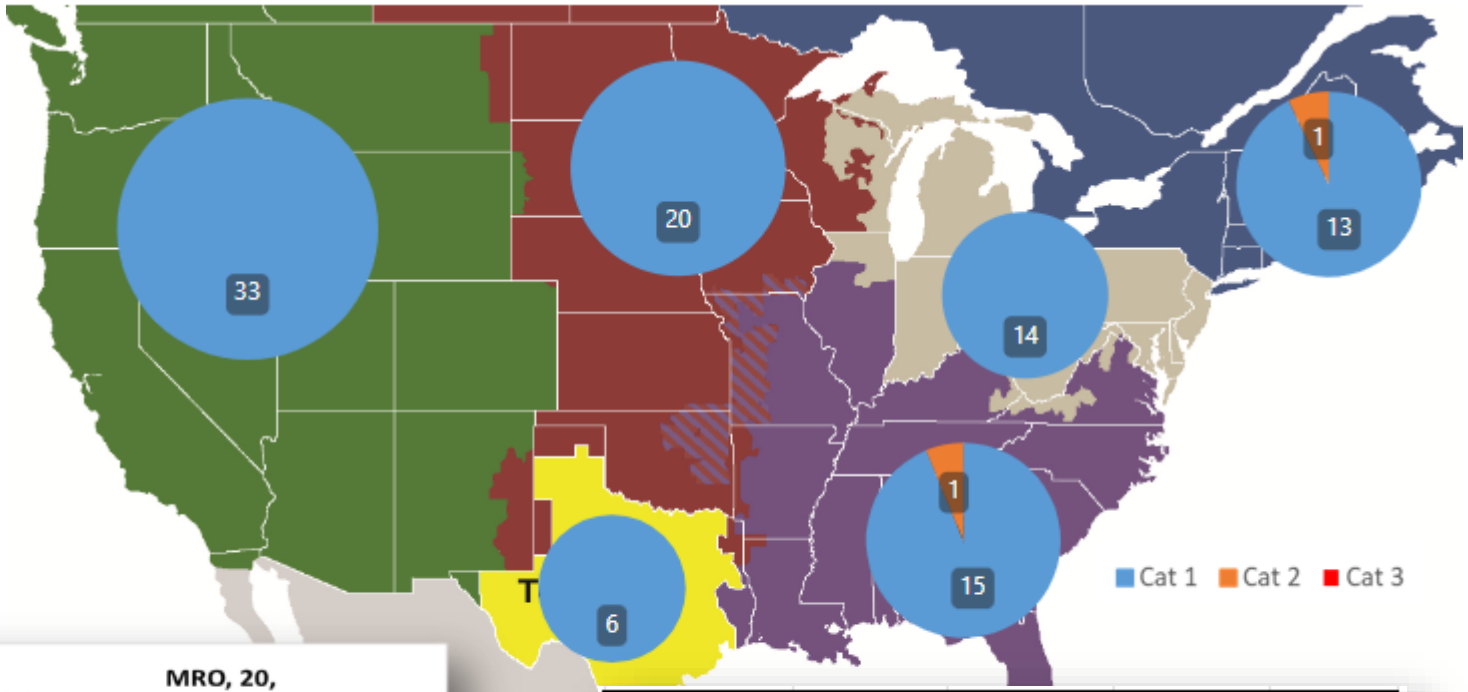
Trending of Qualified Events

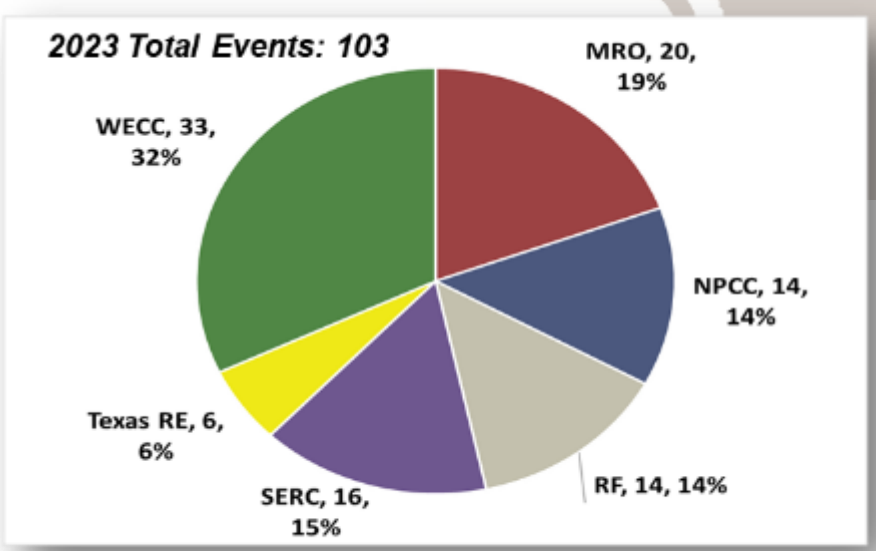


Trending of Qualified Events



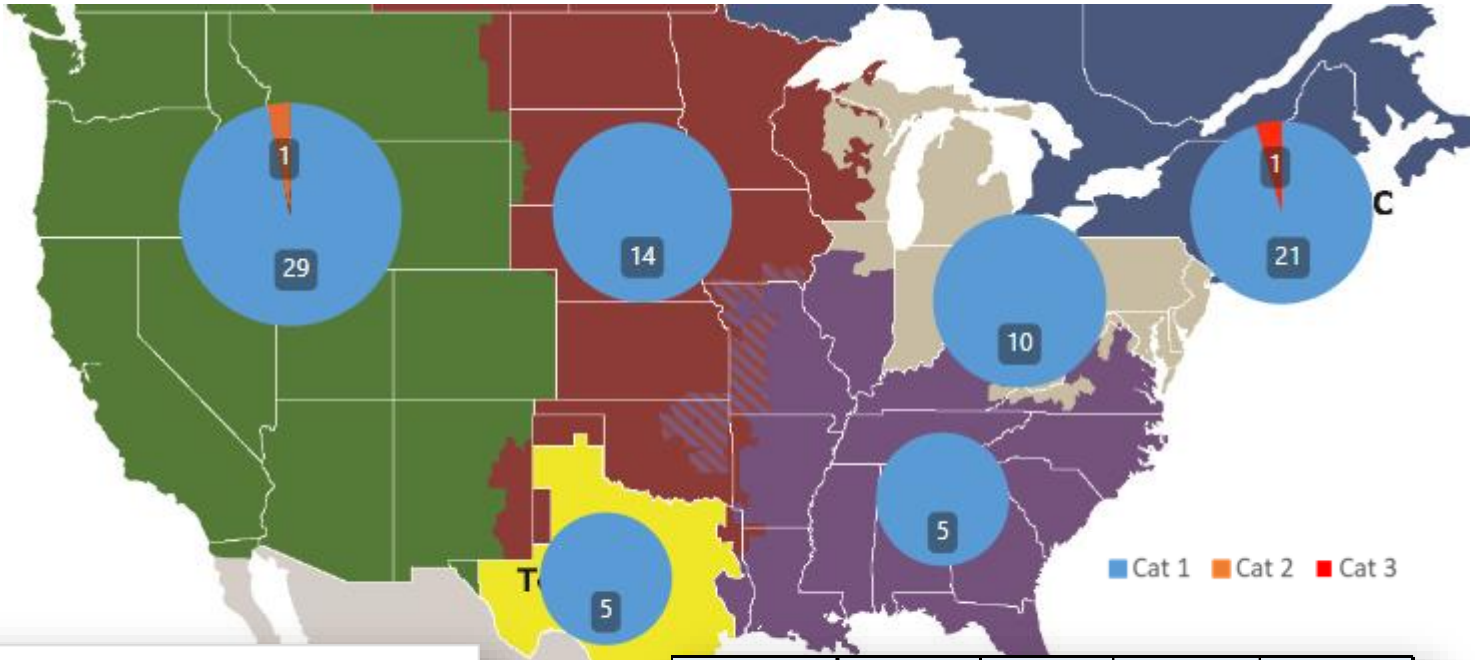
Qualified Events – Grid View (2023)

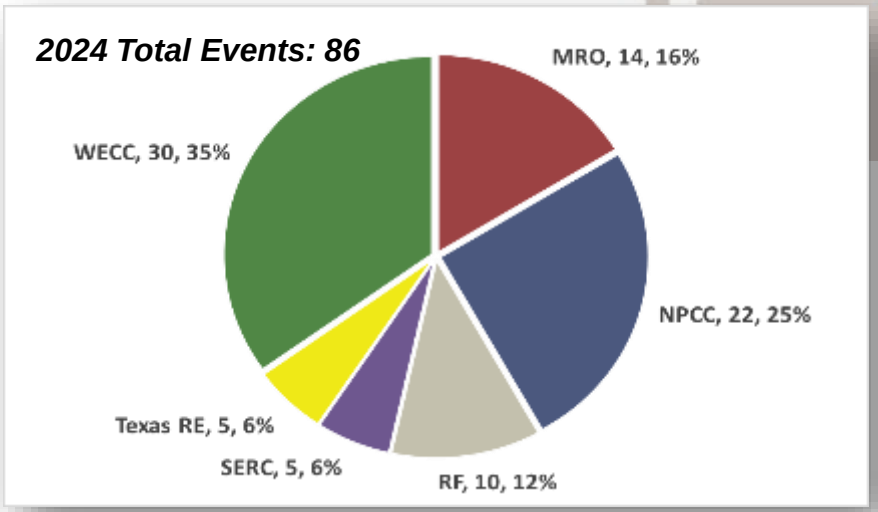




Region	Qtr1	Qtr2	Qtr3	Qtr4
MRO	4	5	6	5
NPCC	3	1	5	5
RF	2	2	5	5
SERC	3	7	4	2
Texas RE	2	2	1	1
WECC	8	11	9	5
Total	22	28	30	23

Qualified Events – Grid View (2024)





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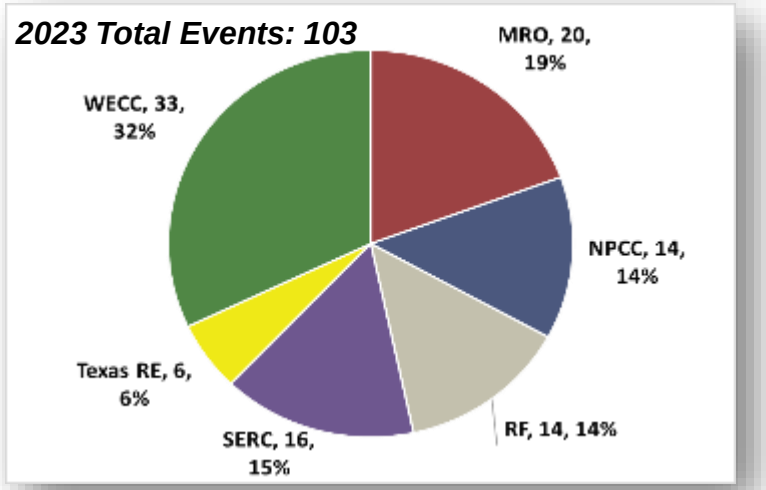
Total	19	31	31	5

Qualified Events (2023 vs. 2024)

2023



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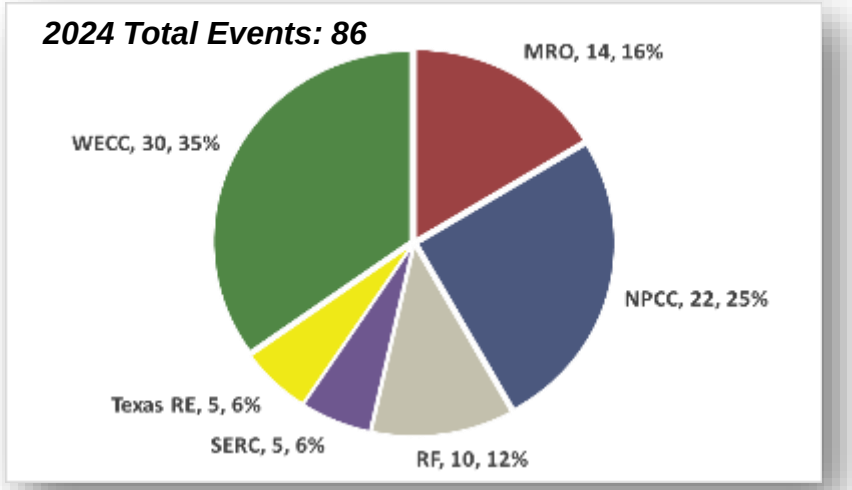
2024



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RF	2	3	5	
SERC	2	2	1	
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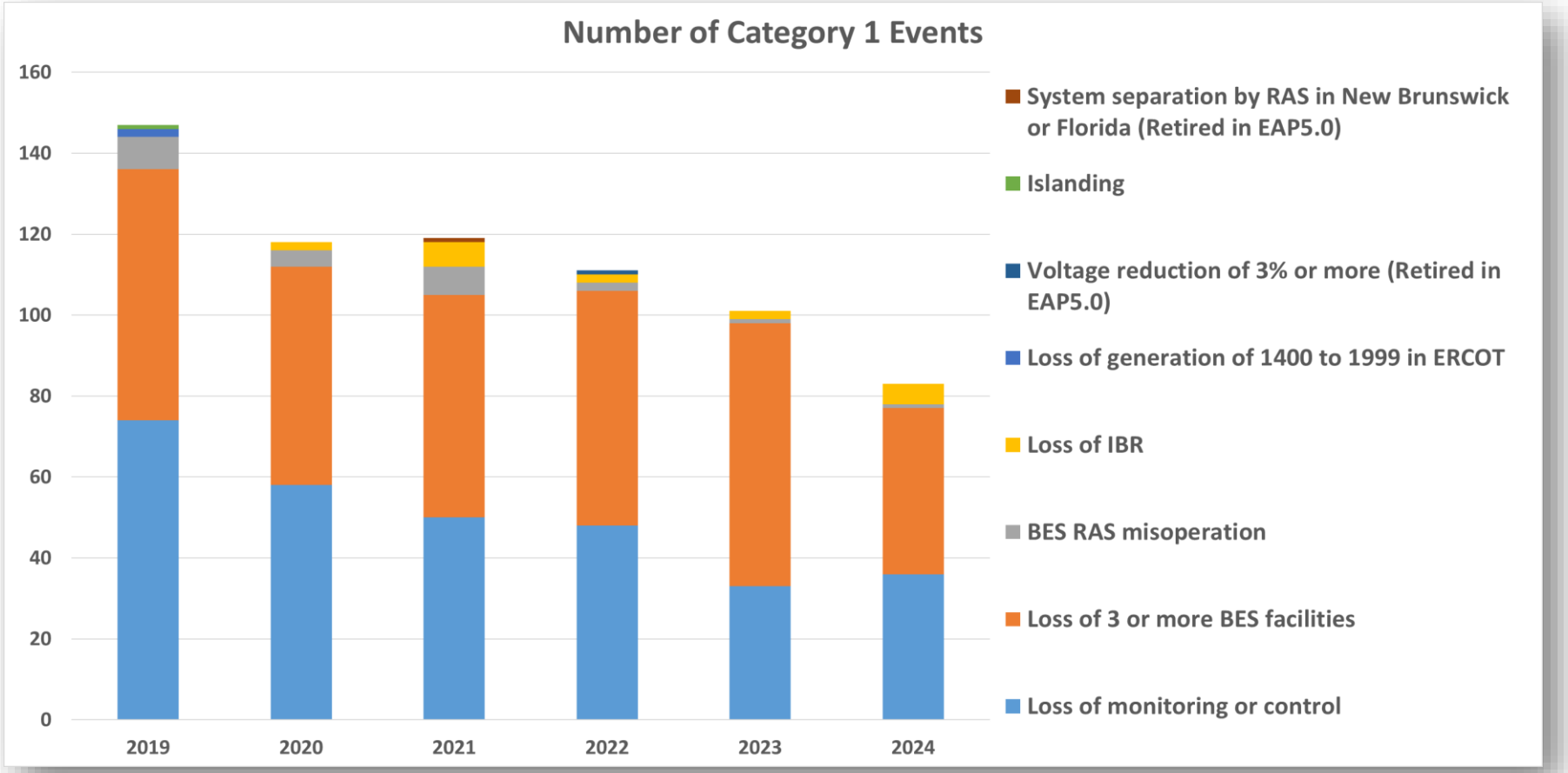
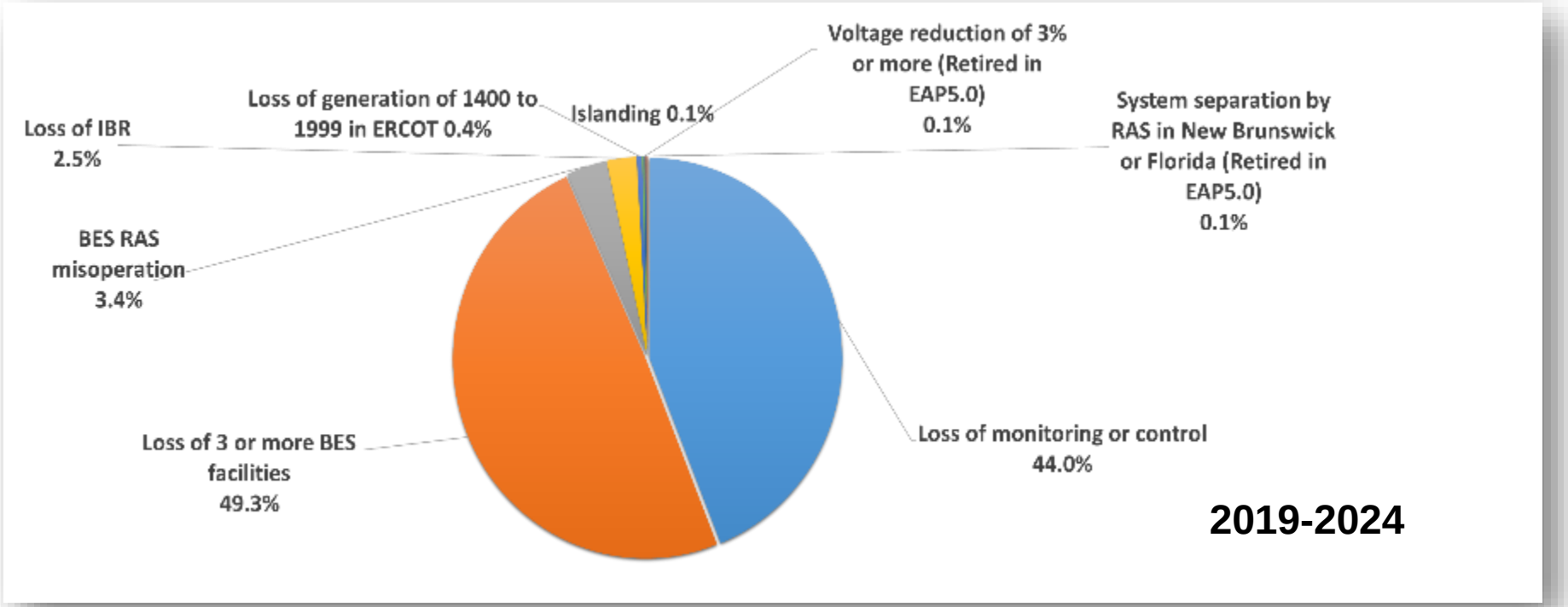
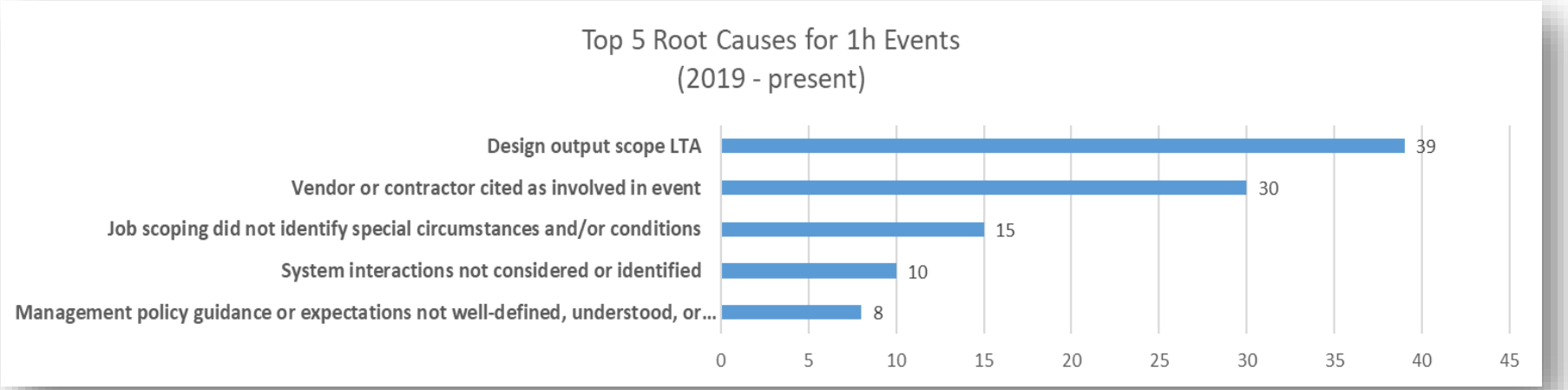
Trending of Category 1 Events

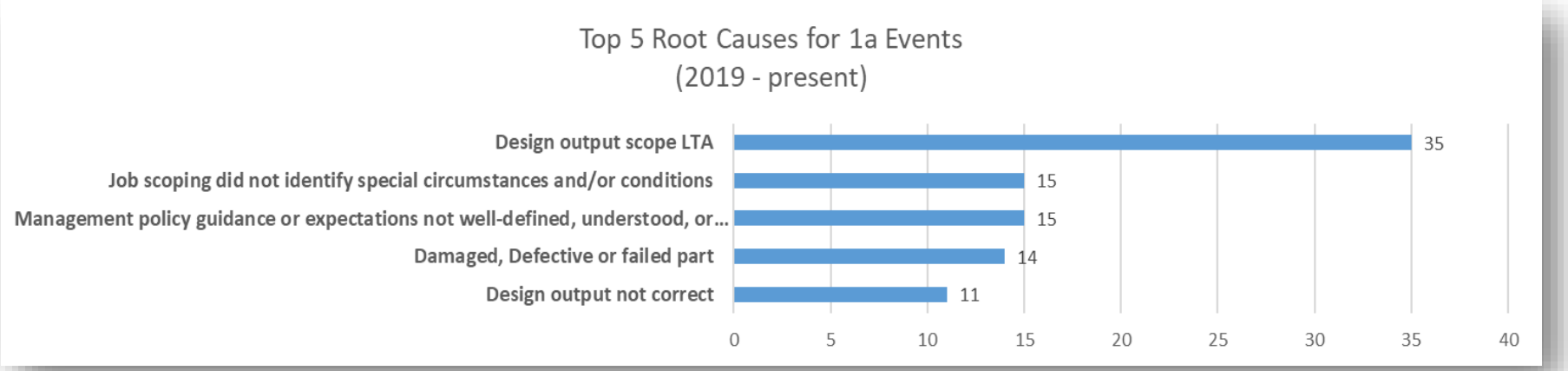


Trending of Category 1 Events

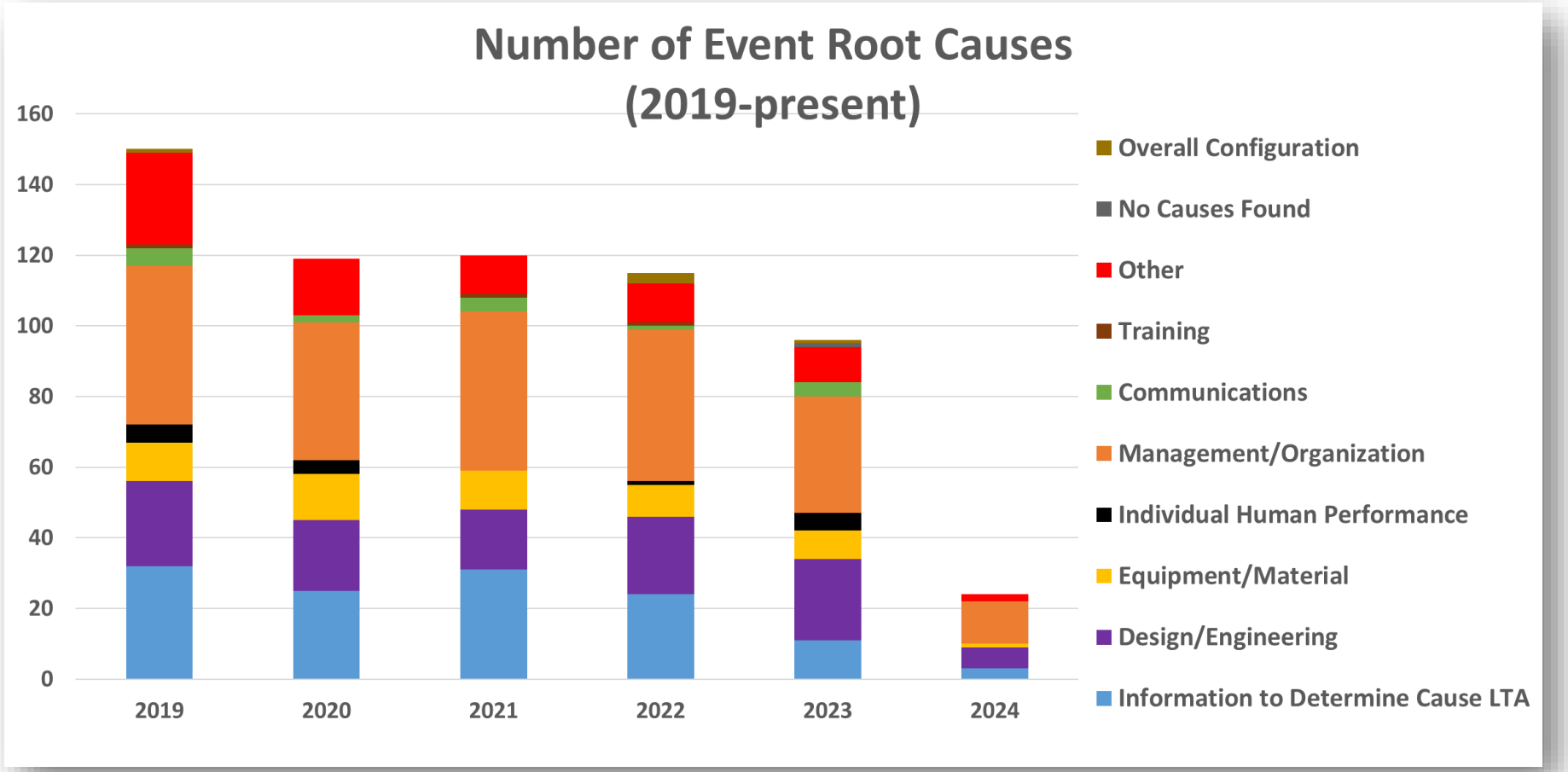


Frequent Cat 1 Event Root Causes

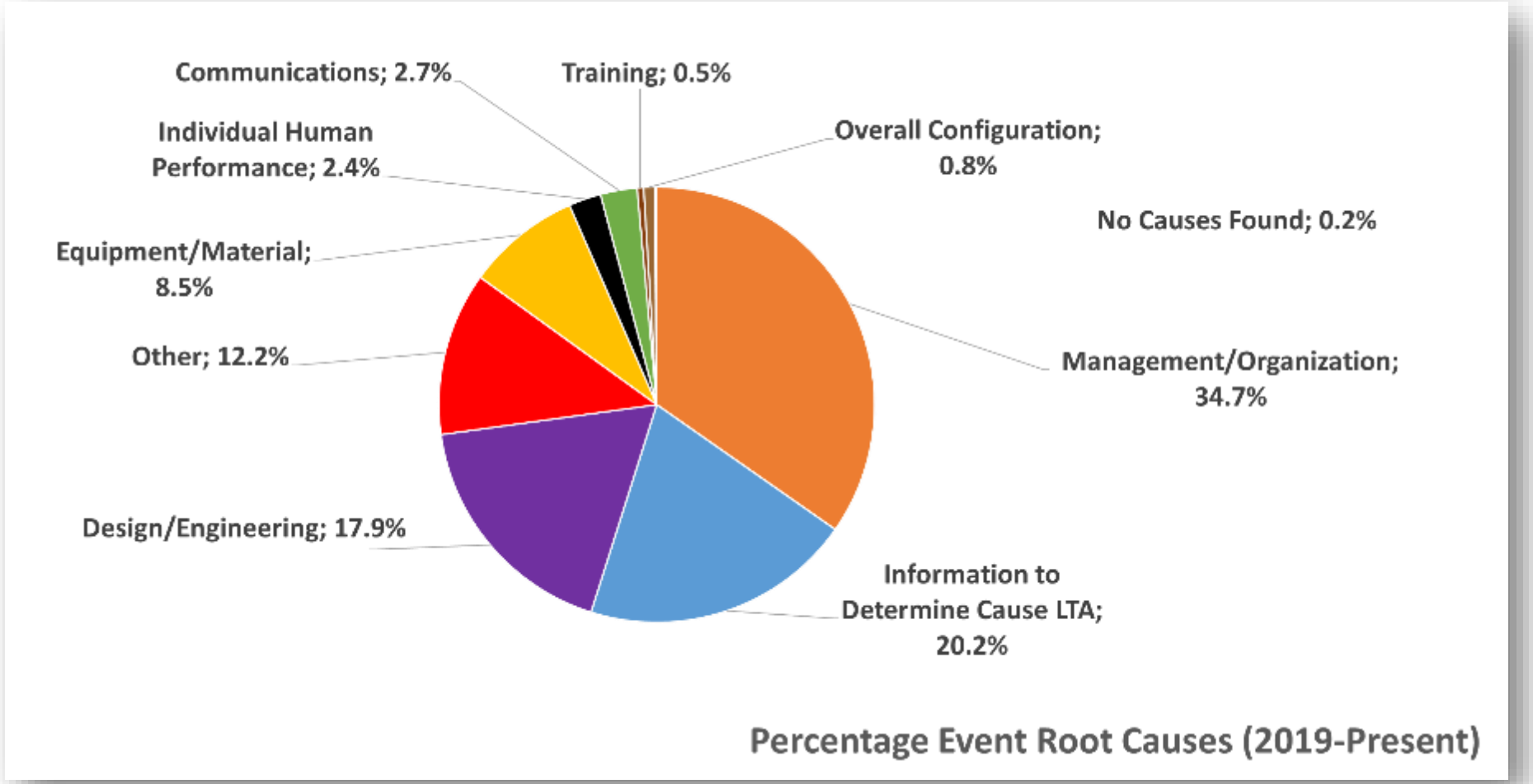




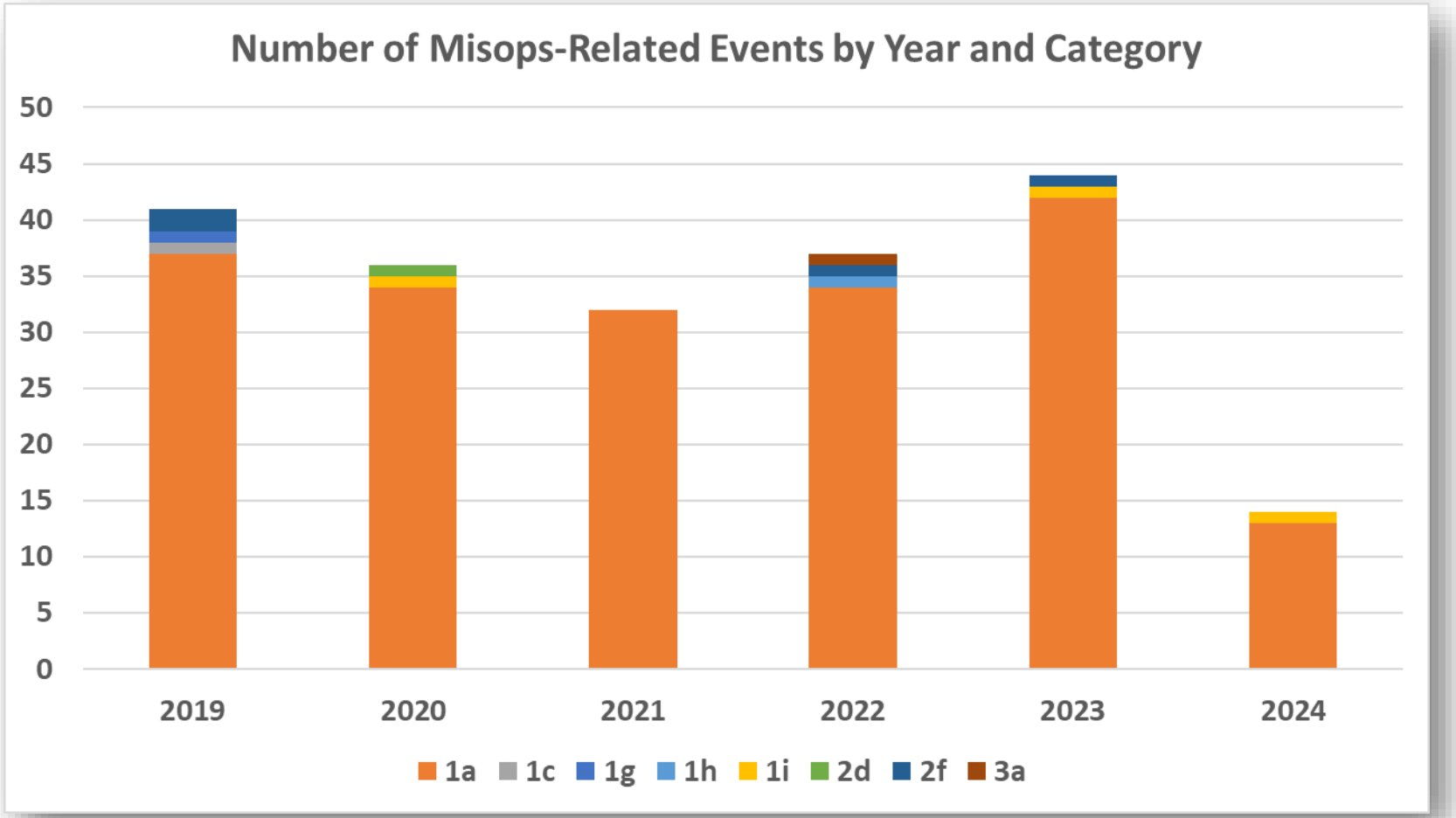
Trending of Event Top-level Root Causes



Trending of Event Root Causes

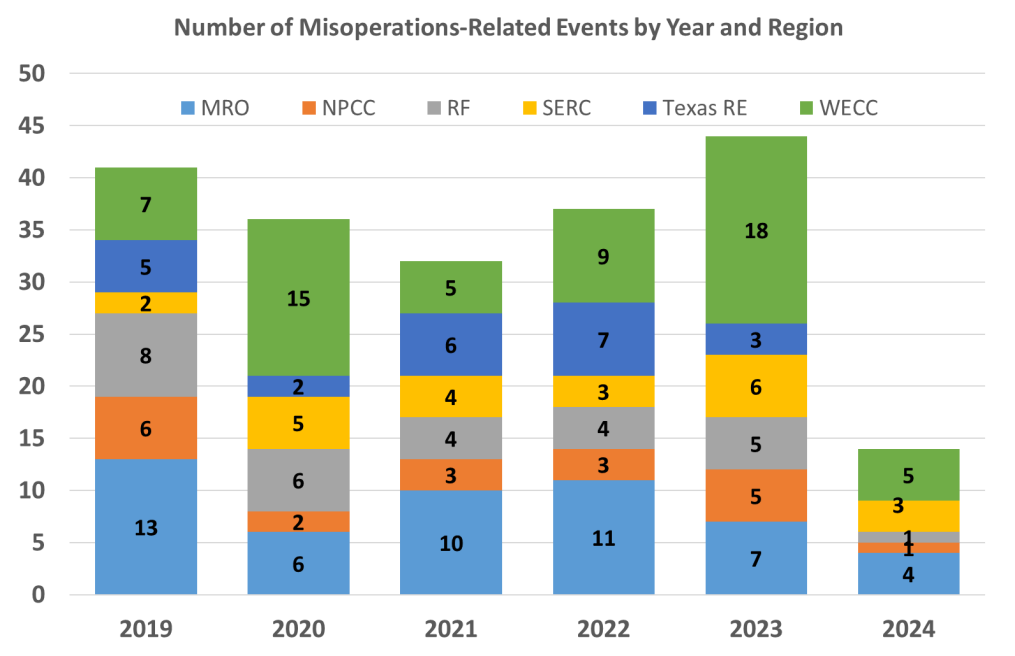


Misoperation Event Type by Year



Category 1a: An unexpected outage, that is contrary to design, of three or more BES facilities caused by a common disturbance...

Misoperation Snapshot



- Gold: incorrect settings
- Silver: relay failures
- Bronze: medley of reasons
- Seeking better understanding of mitigation impacts

Total Events (2019-present)	693	Percentage of Total Events (2019-present)
Misops-related Events (2019-present)	204	29%
Reasons		**Percentage of Misops-related Events**
Incorrect Settings	81	39.7%
Relay Failure	27	13.2%
Other	96	47.1%

Questions and Answers

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Agenda Item 5

Bulk Power System Awareness

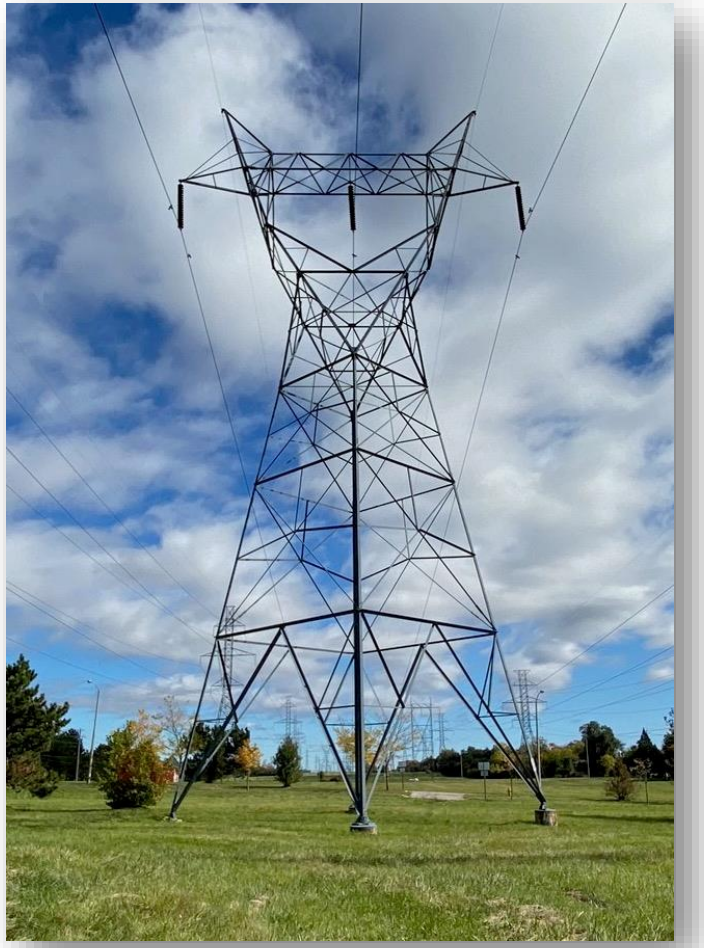
Situational Awareness Q4 2024

Bill Graham, Manager, BPSA
RSTC Informational Session
December 12, 2024

Recent BPS Threats

Notable recent BPS threats

- Atlantic Hurricane Season
- Geomagnetic Storms
- United States Presidential Election



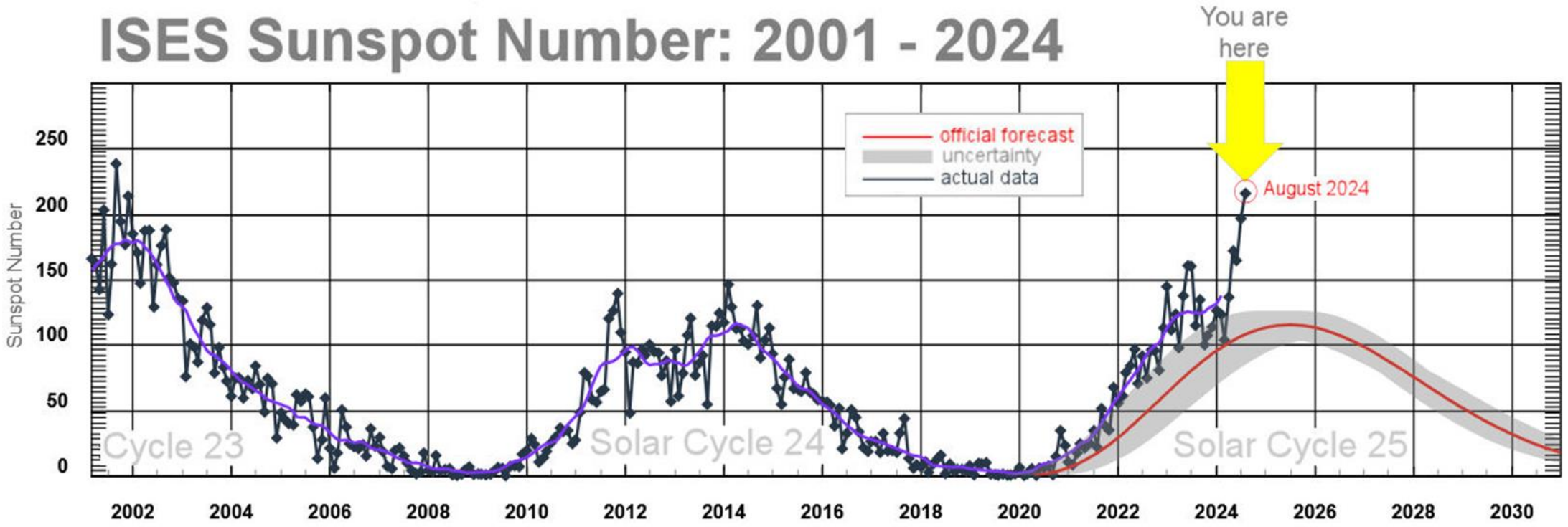
Atlantic Hurricane Season

- Hurricane Francine
  - Early September
  - Strengthened to Cat 5 - earliest on record
  - Central Louisiana Cat 2 landfall
  - 450k peak outages
- Hurricane Helene
  - Late September
  - Big Bend Florida Cat 4 landfall
  - 6M peak outages
- Hurricane Milton
  - Early October
  - Strengthened to Cat 5
  - Siesta Key, Florida Cat 3 landfall
  - 3.4M peak outages

Geomagnetic Storms

- Reliability Coordinators closely followed space weather conditions and vigilantly monitoring bulk power system facilities.
- Operators postured the system to ensure reliability.
- Only weak GICs was observed some northern areas.
- The NOAA Space Weather Prediction Center (SWPC) initiated multiple RC Hotline Telephone calls to keep system operators informed of conditions.

Geomagnetic Storms



The current solar cycle, Solar Cycle 25, wasn't expected to be this strong. When it began in Dec. 2019, experts predicted it would be weak like its immediate predecessor Solar Cycle 24. Instead, Solar Cycle 25 may be on pace to rival some of the stronger cycles of the 20th century.

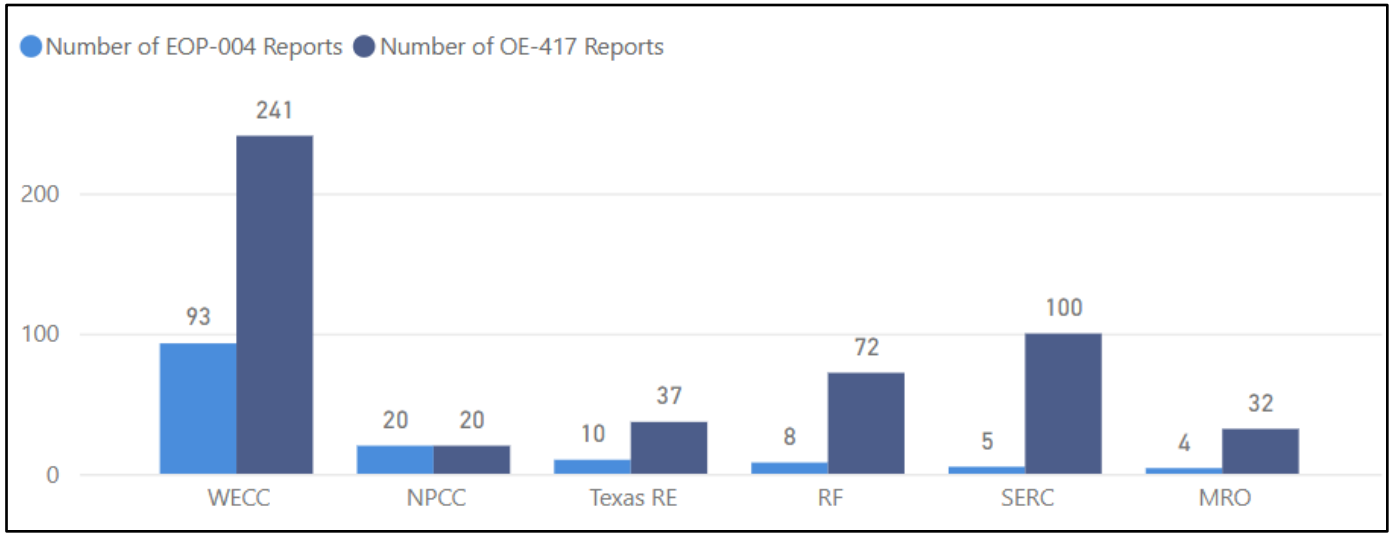
United States Presidential Election

There have been no specific or credible threats to the bulk power system with regards to the presidential election cycle.

- Key Dates
  - November 5: Election Day
  - January 6: Election Certification Day
  - January 20: Inauguration Day
- Points of Interest
  - E-ISAC issued two industry preparedness advisories.
  - ERO Enterprise Crisis Action Plan was activated at the partial level.
  - SERC Incident Response Plan was activated at the partial level.
  - BPSA assumed a heightened awareness and threat response posture.
  - PJM Interconnection declared Conservative Operations.

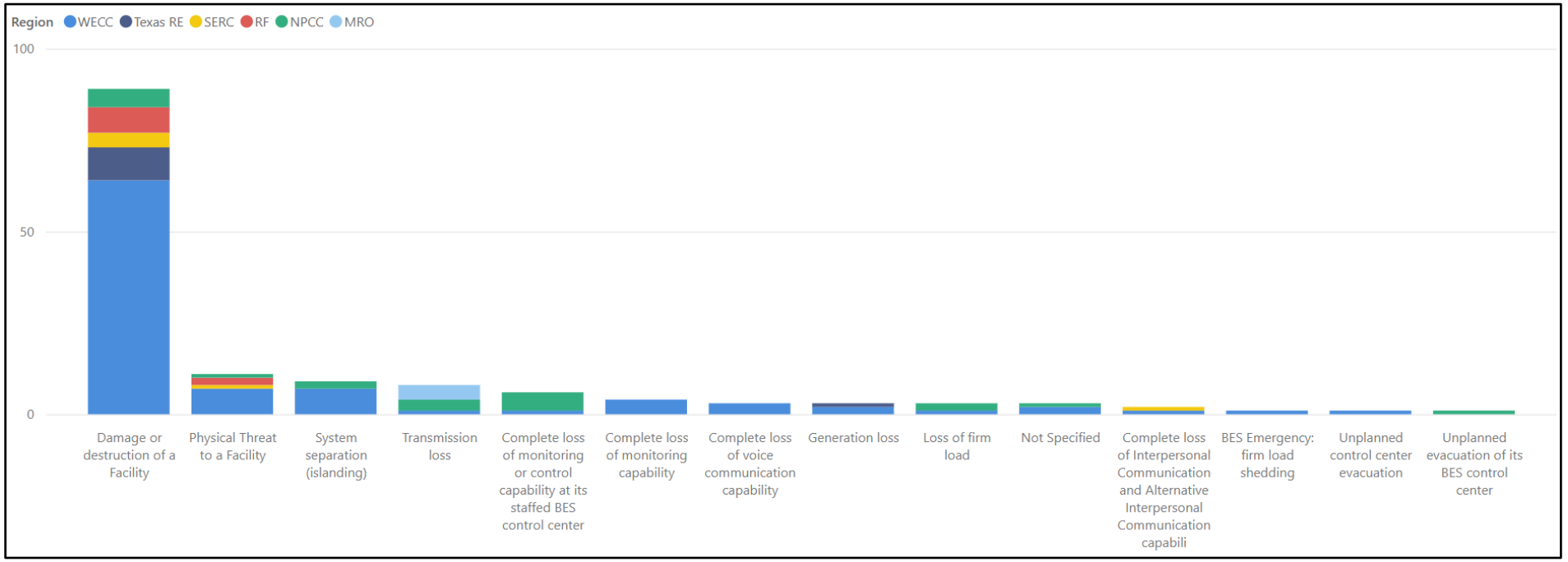
Mandatory Reports

Region	Number of Events	Number of EOP-004 Reports	Number of OE-417 Reports
MRO	36	4	32
NPCC	40	20	20
RF	80	8	72
SERC	105	5	100
Texas RE	47	10	37
WECC	334	93	241
Total	**642**	**140**	**502**



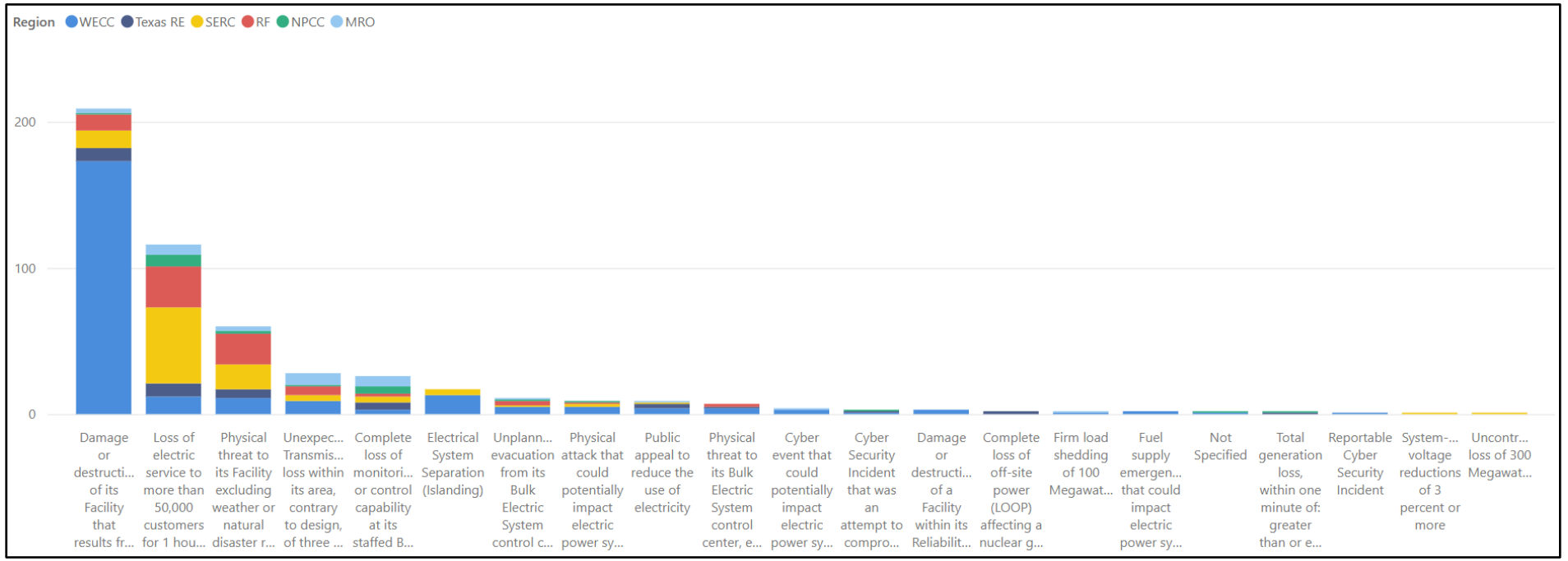
Mandatory reports submitted this year through November 13, 2024.

EOP-004 Reports by Category



Mandatory reports submitted this year through November 13, 2024.

OE-417 Reports by Category



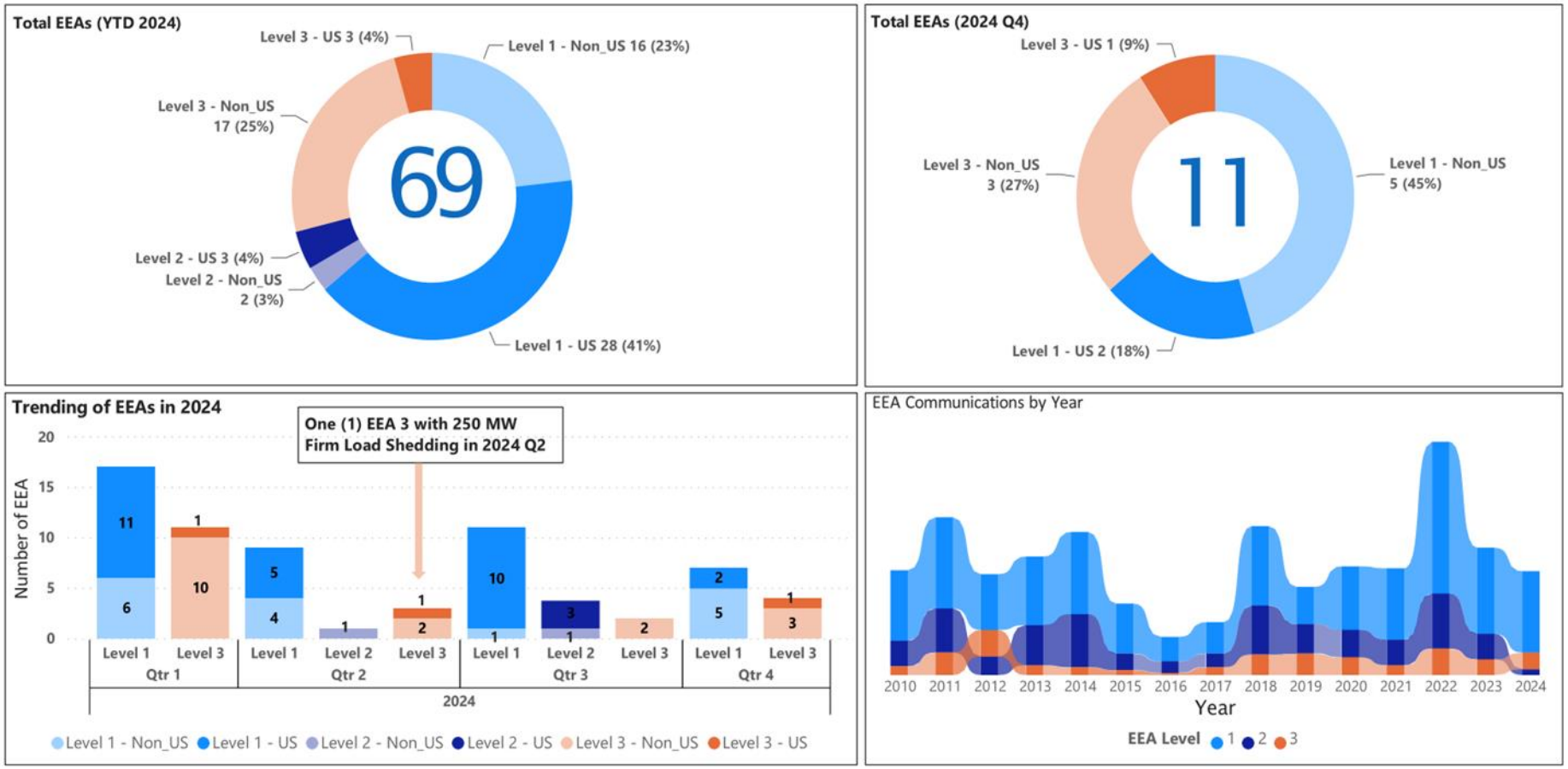
Mandatory reports submitted this year through November 13, 2024.

Energy Emergency Alerts

Quarterly Emergency Operations Reporting (2024 Q4*)

Public

EEA Overview Public

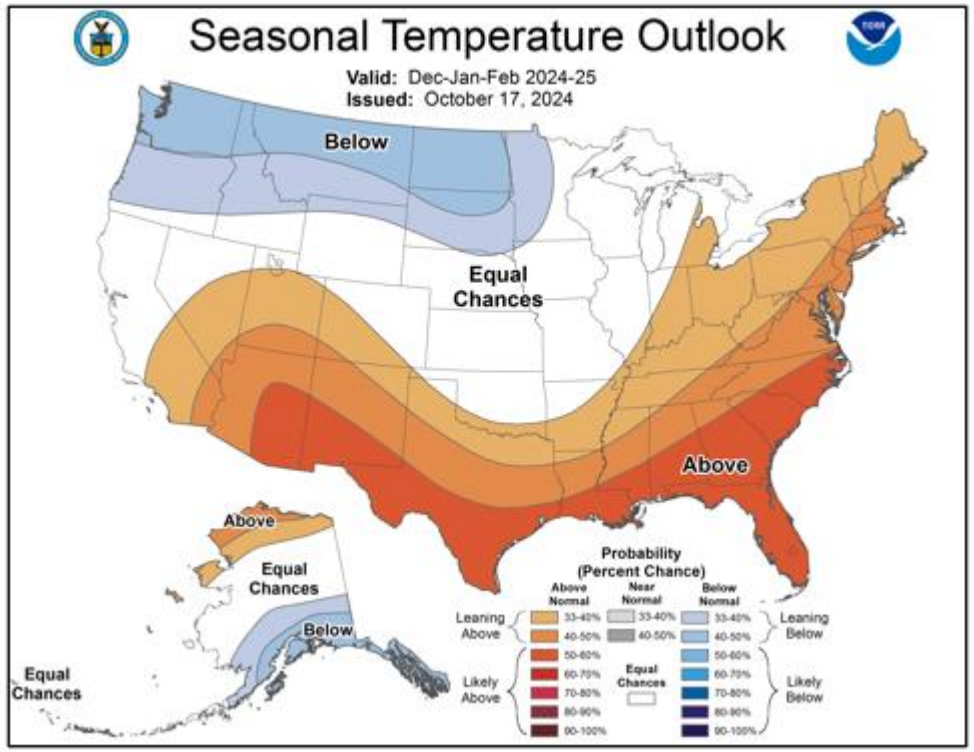


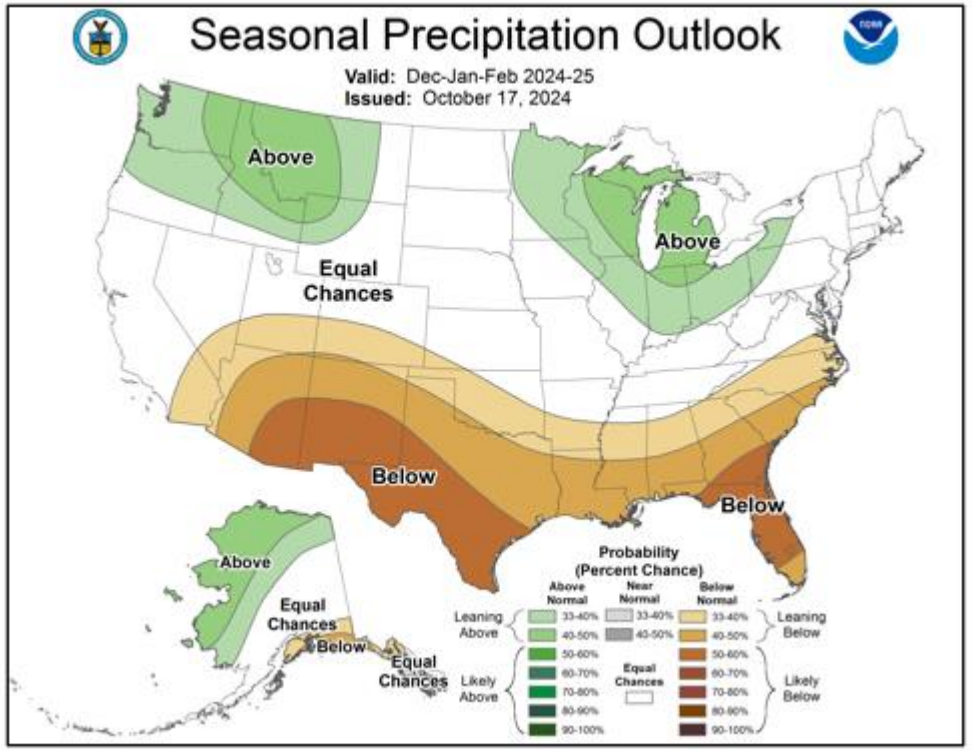
* Quarters are based on calendar year

Page 1 of 1

Data Through Date: 11/13/2024 Published Date: 11/13/2024

Winter Weather Forecast





- U.S. Winter Outlook: Warmer and drier South, wetter North
- Drought relief likely in the Ohio River Valley and Great Lakes regions due to La Nina

Questions and Answers

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Agenda Item 6

Engineering and Security Integration Program and FERC Order 901, Technical Conference Update

Latrice Harkness, Director of Engineering
RSTC Informational Session
December 12, 2024

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LUNCH BREAK

We will resume at 1:20 p.m. Eastern

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Agenda Item 7

May 2024 Solar Storm

After-Action Review

Mark Olson, Manager of Reliability Assessment
Donna Pratt, Manager of Performance Analysis
RSTC Informational Session
December 12, 2024

Background | After Action Review

- May 2024 GMD Event: the strongest geomagnetic disturbance (GMD) in past two decades
- BPS remained stable with limited impact to system voltage and equipment
- NERC data collection systems and industry feedback are providing insights:
  - Impact of GIC on the BPS
  - Validation of models used for GMD Vulnerability Assessments
  - Effectiveness of operating mitigations
- After-action review supports effective GMD tools and operating procedures
- Results will be available in early 2025

The May 2024 GMD Event has been named the *Gannon Storm* after Dr. Jenn Gannon (1978-2024), earth scientist and electric power industry research collaborator

Progress to Date

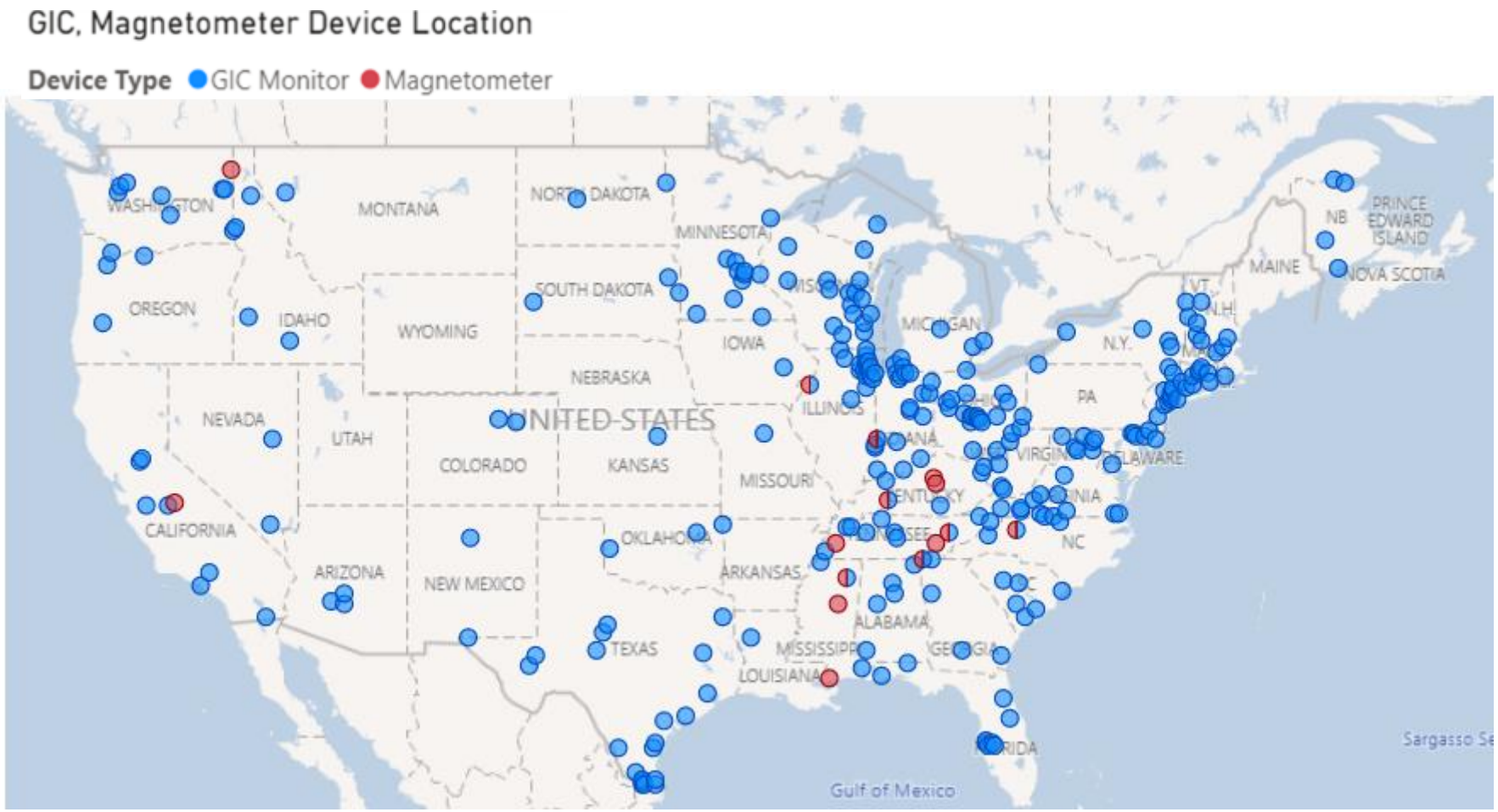
Analysis of NERC data sources is progressing

- GMD Data: over 390 geomagnetically-induced current (GIC) monitors reporting
- Transmission Availability Data System (TADS): Review in progress
- Generator Availability Data System (GADS): Commence after November reporting deadline

NERC-EPRI GMD Workshop held in October

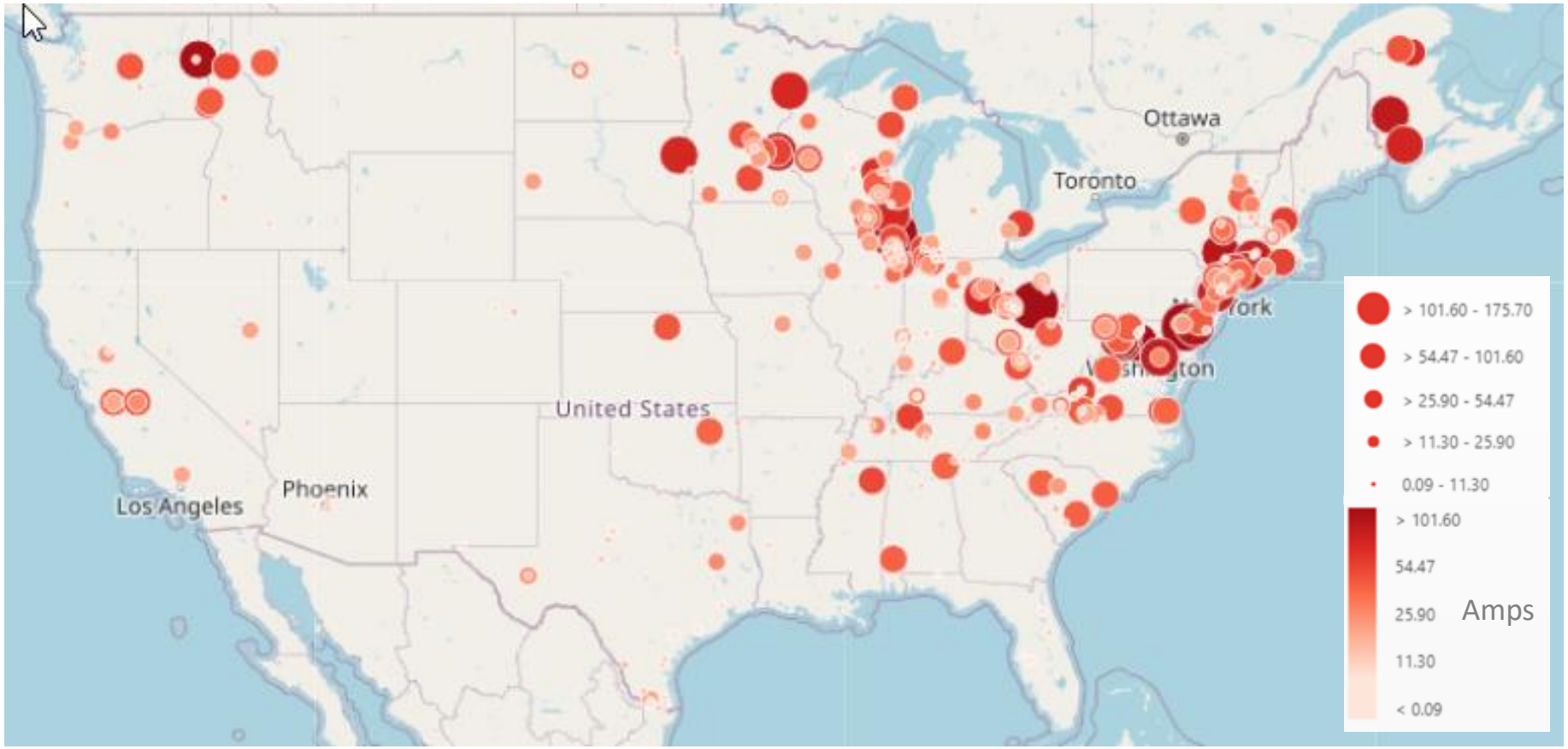
- Updates from EPRI on earth conductivity model validations
- Insights from space weather operators and research community
- Analysis from the vendor-manufacturers

NERC GMD Data System Reporting Device Locations



The available NERC data set enables examination of GIC across North America for the entire event

Maximum GIC per Device 2024E04



Bubble Size Indicates Size of Maximum Reading

Observations From the Industry Workshop

- Excellent opportunity for GIC model validations
  - Validation studies have been conducted by EPRI, electric industry, and others in the space weather community
  - Lack of magnetometer coverage poses a challenge in some regions
- Examine periods of peak GIC for observations of system performance (e.g., system voltage or harmonic impacts)
- Spacing and duration of peak geoelectric fields in the Gannon Storm had similarities to NERC's Benchmark Event used to assess transformer heating
- Important to share insights on harmonics: observed levels, impacts, and system designs to reduce system risk

Next Steps

- Analysis for TADS and GADS continues through year-end
- Share findings and recommendations with industry (January 2025)
  - Gannon storm after-action review participants
  - Real Time Operations Subcommittee (RTOS)
  - RSTC
- Document results for State of Reliability Report (released in Summer 2025)

Questions and Answers

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Agenda Item 8

Strengthening Reliability through the Energy Transformation

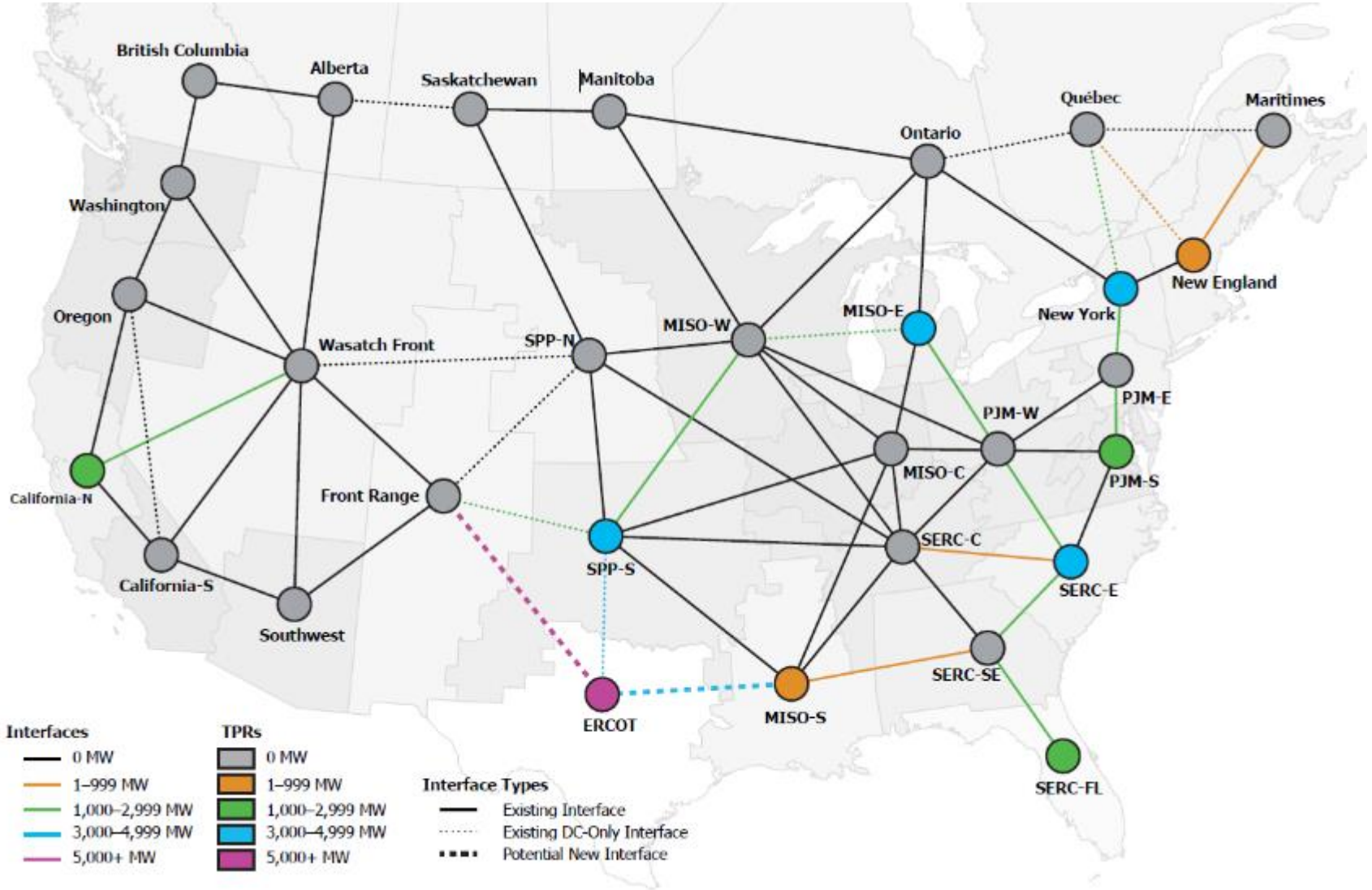
Interregional Transfer Capability Study (ITCS)

Saad Malik, Manager of Transmission Assessment
RSTC Informational Session
December 12, 2024

Key Finding Takeaways

- Energy deficiencies were identified **in all 12** weather years studied. Additional **35 gigawatts** of transfer capability across the United States was identified as being beneficial for reliability.
- Import capability needed during extreme conditions varied significantly across the country—**no one-size-fits-all** answer.
- There are **numerous barriers** to realizing the benefits of interregional transmission in a timely manner.
- Some identified transmission needs **could be alleviated** by projects already in the planning, permitting, or construction phases.
- Higher than expected retirements (without replacement capacity) would lead to **increased energy deficiencies** and potentially more transfer capability needed than recommended in this study.
- Transmission upgrades alone will not fully address all risks, and **a broader set of solutions** should be considered, emphasizing the need for local resources, demand-side management, and storage solutions.

Prudent Addition Recommendations



Prudent Addition Recommendations

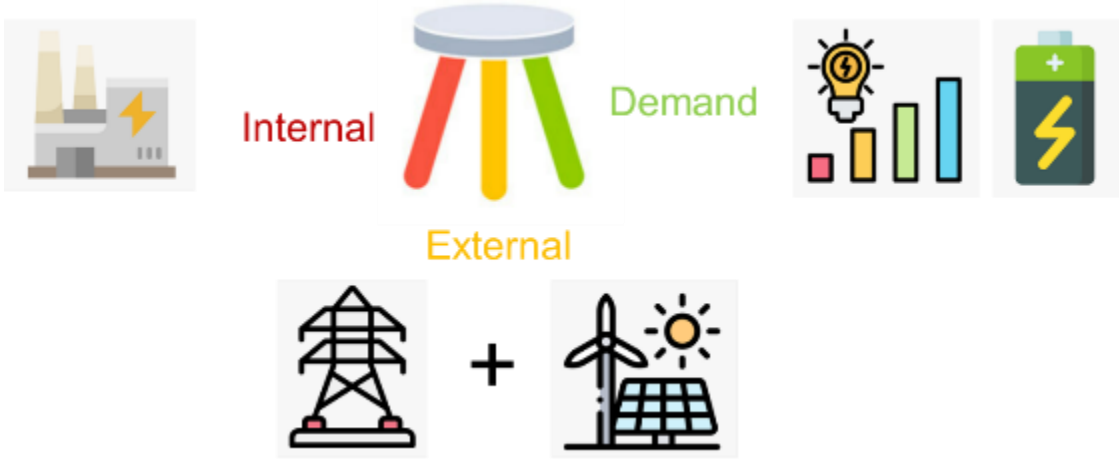
Increasing Energy Deficiency Hours

Table ES.1: Recommended Prudent Additions Detail

Transmission Planning Region	Weather Years (WY) / Events	Resource Deficiency Hours	Maximum Deficiency (MW)	Additional Transfer Capability (MW)	Interface Additions (MW)
ERCOT	Winter Storm Uri (WY2021) and nine other events	135	18,926	14,100	Front Range (5,700) MISO-S (4,300) SPP-S (4,100)
MISO-E	WY2020 Heat Wave and two other events	58	5,715	3,000	MISO-W (2,000) PJM-W (1,000)
New York	WY2023 Heat Wave and seven other events	52	3,729	3,700	PJM-E (1,800) Québec (1,900)
SPP-S	Winter Storm Uri (WY2021)	34	4,137	3,700	Front Range (1,200) ERCOT (800) MISO-W (1,700)
PJM-S	Winter Storm Elliott (WY2022)	20	4,147	2,800	PJM-E (2,800)
California North	WY2022 Heat Wave	17	3,211	1,100	Wasatch Front (1,100)
SERC-E	Winter Storm Elliott (WY2022)	9	5,849	4,100	SERC-C (300) SERC-SE (2,200) PJM-W (1,600)
SERC-Florida	Summer WY2009 and Winter WY2010	6	1,152	1,200	SERC-SE (1,200)
New England	WY2012 Heat Wave and two other events	5	984	700	Québec (400) Maritimes (300)
MISO-S	WY2009 and WY2011 summer events	4	629	600	ERCOT (300) SERC-SE (300)
TOTAL				**35,000**	

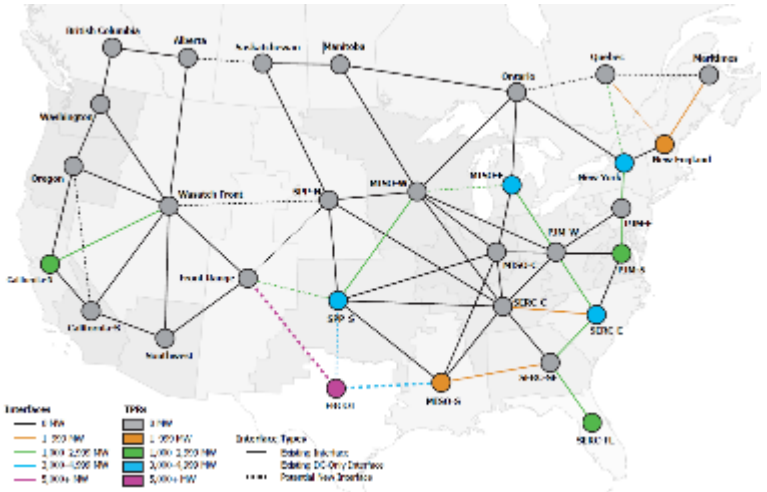
Multiple Options to Address Prudent Addition Recommendations

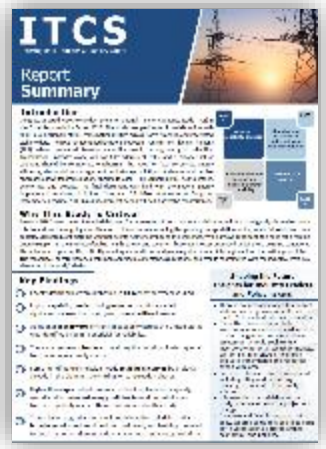
- Internal resources
  - Consider resource availability expectations during extreme conditions
- Transmission enhancements to neighbors
  - Resource evaluations
  - Siting and permitting
  - Cost-allocation
- Demand-side management
  - Demand shifting
  - Energy efficiency
  - Demand response
  - Storage



How to Use the Report?

- Understand analysis limitations
- Identify existing projects
- Recommendations are directional
- Prioritize high-risk areas
- Consider implementation barriers
  - Lack of a process and forum to consider large multiregional transmission opportunities
  - Cost allocation and recovery
  - Seams issues
  - Siting and permitting
- Consider each Region's unique circumstances
- Consider a combination of multiple strategies





What's Next?

FERC

- Will post ITCS report for public comment
- Will submit report to Congress with recommendations on statutory changes if any (12 months after comment period ends)

NERC

- Integrate transmission assessment into Long-term Reliability Assessments
- Enhancements to study data and models
- Canadian Analysis

Questions and Answers

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Agenda Item 10

2024 Case Quality Metrics Assessment

Jack Gibfried, Engineer - Power Systems Modeling and Analysis, NERC

RSTC Meeting
December 11-12, 2024

RELIABILITY | RESILIENCE | SECURITY

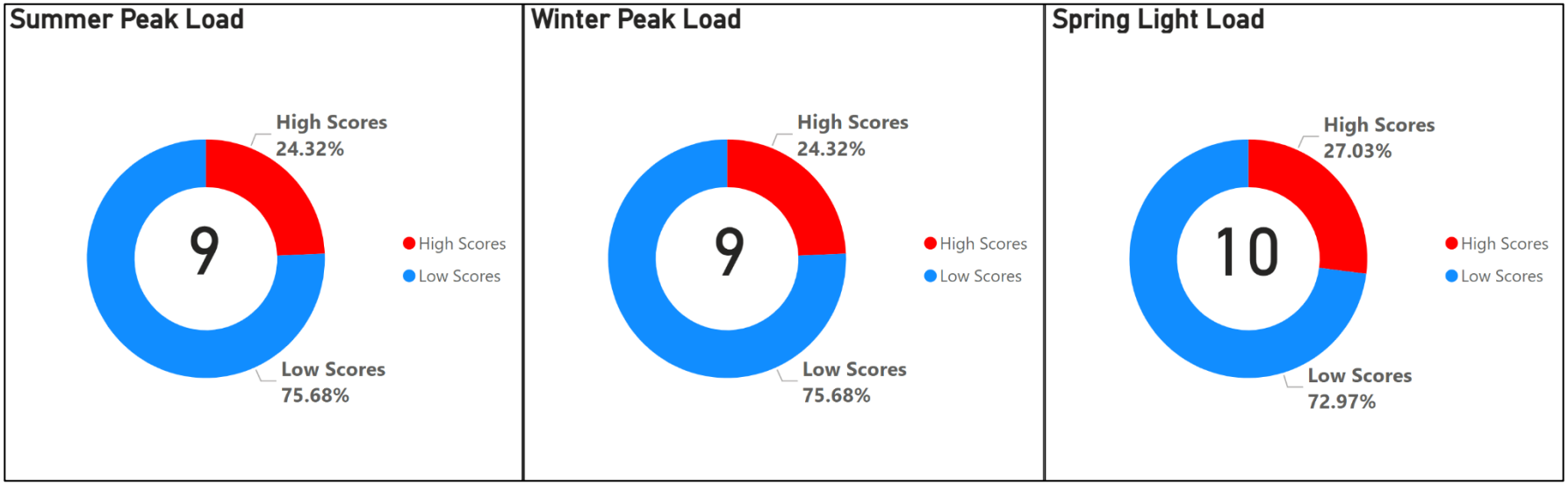



2024 Case Quality Metrics

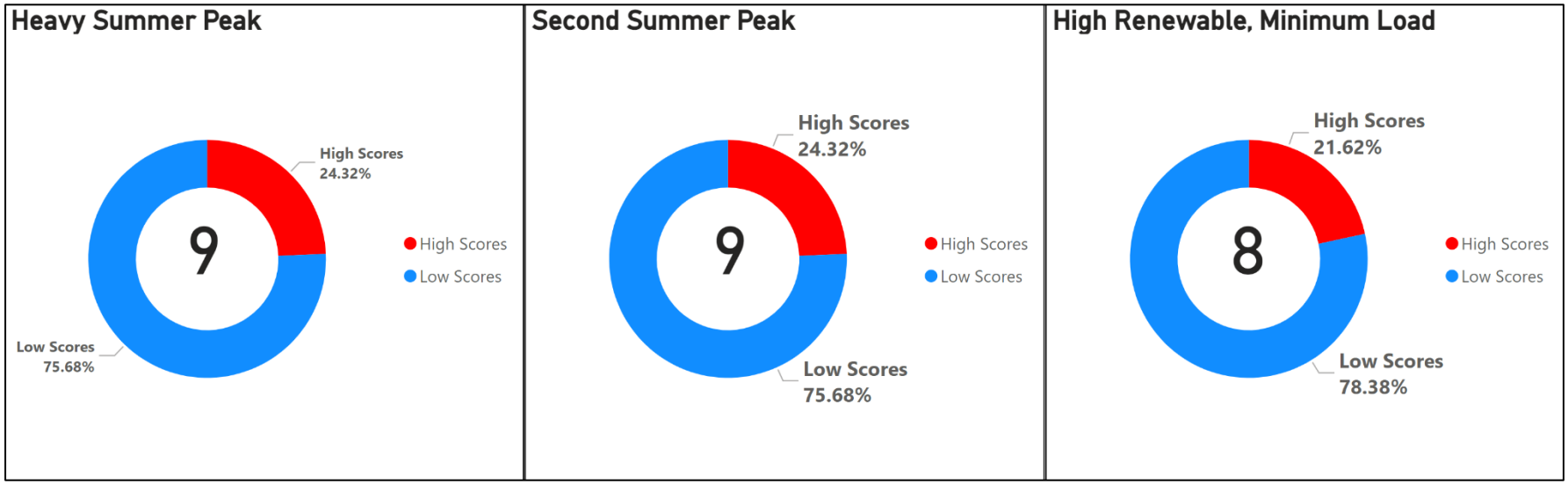
This 2024 Case Quality Metrics Assessment tracks the quality of the Base Cases created by the MOD-032 designees for the purposes of Interconnection-wide modeling and subsequent system studies.

2024 Case Quality Metrics Assessment

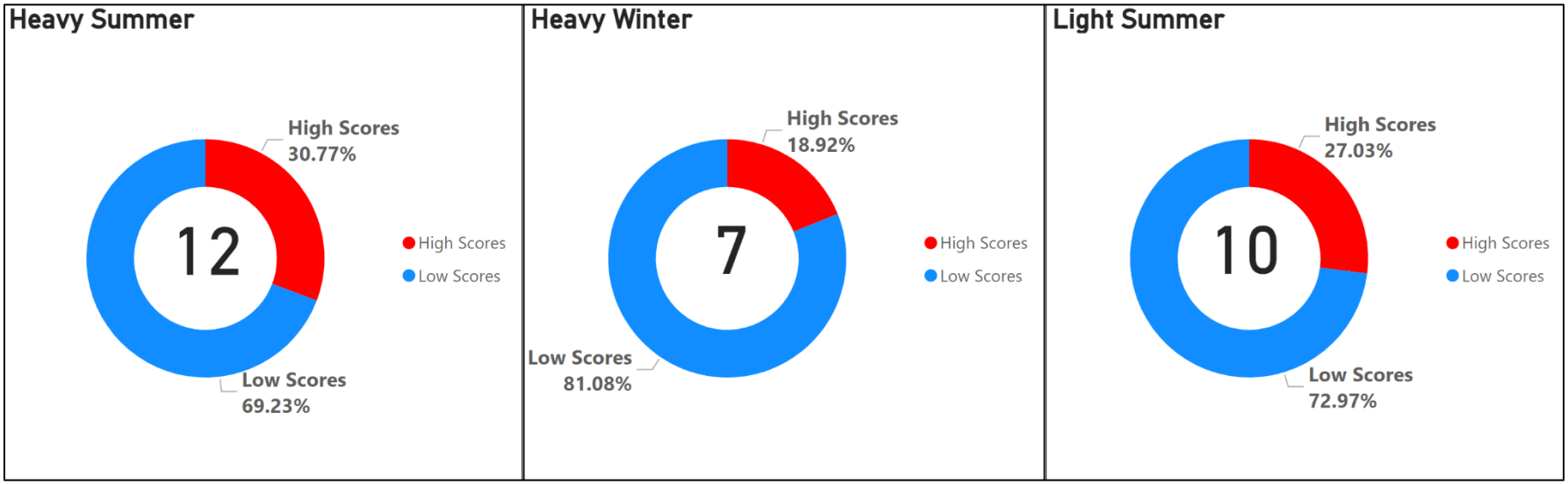
2024 EI High/Low Scores



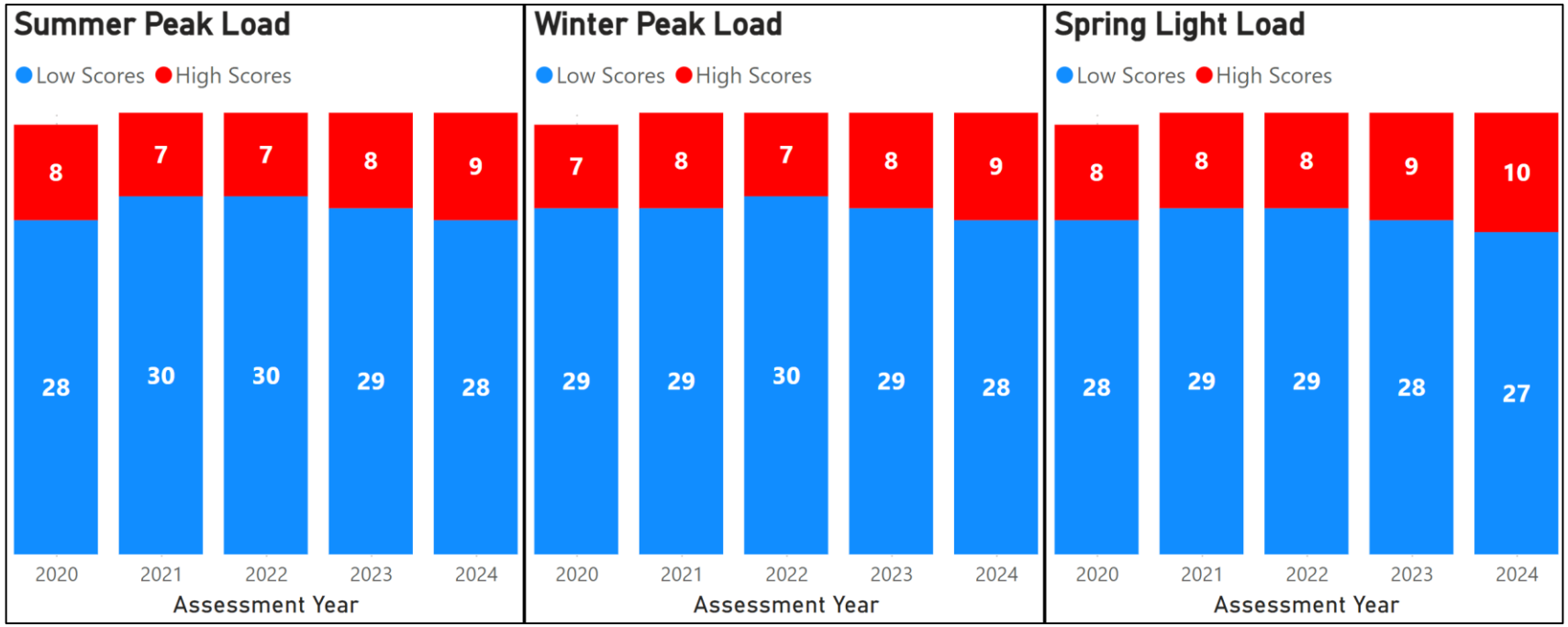
2024 TI High/Low Scores



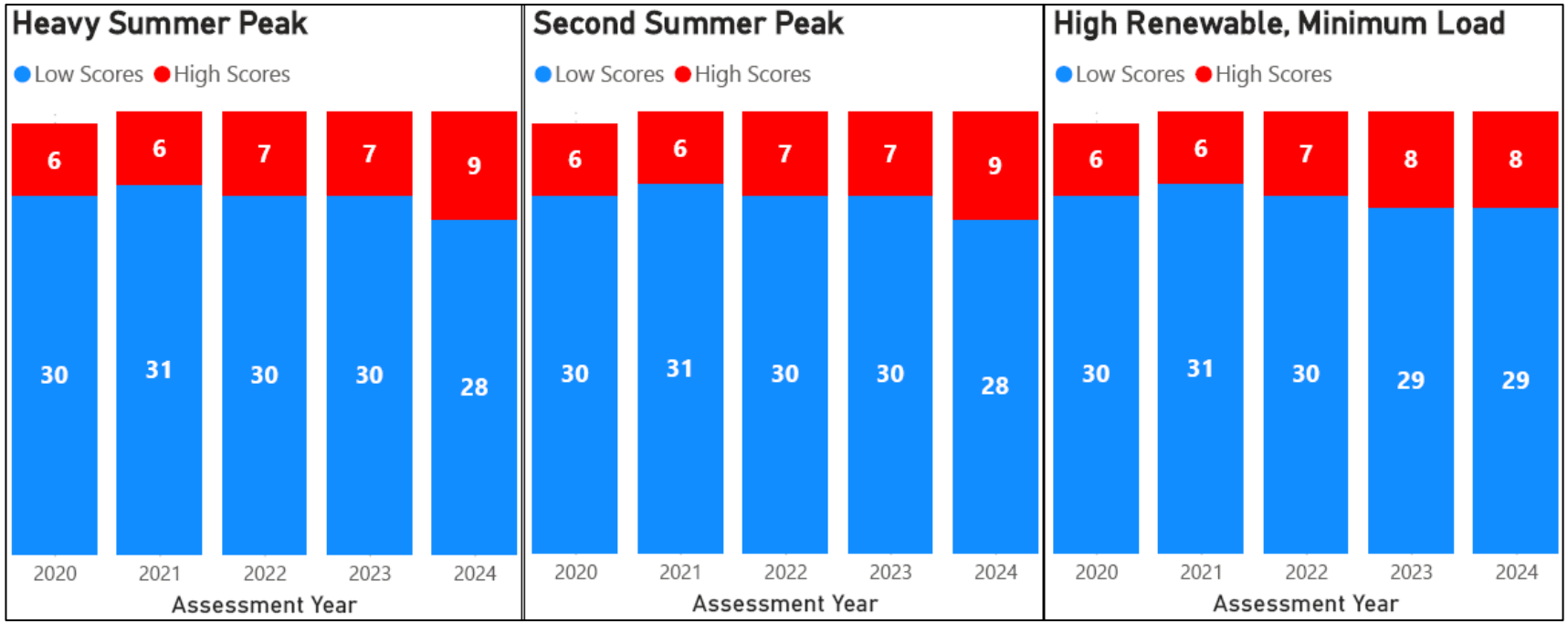
2024 WI High/Low Scores



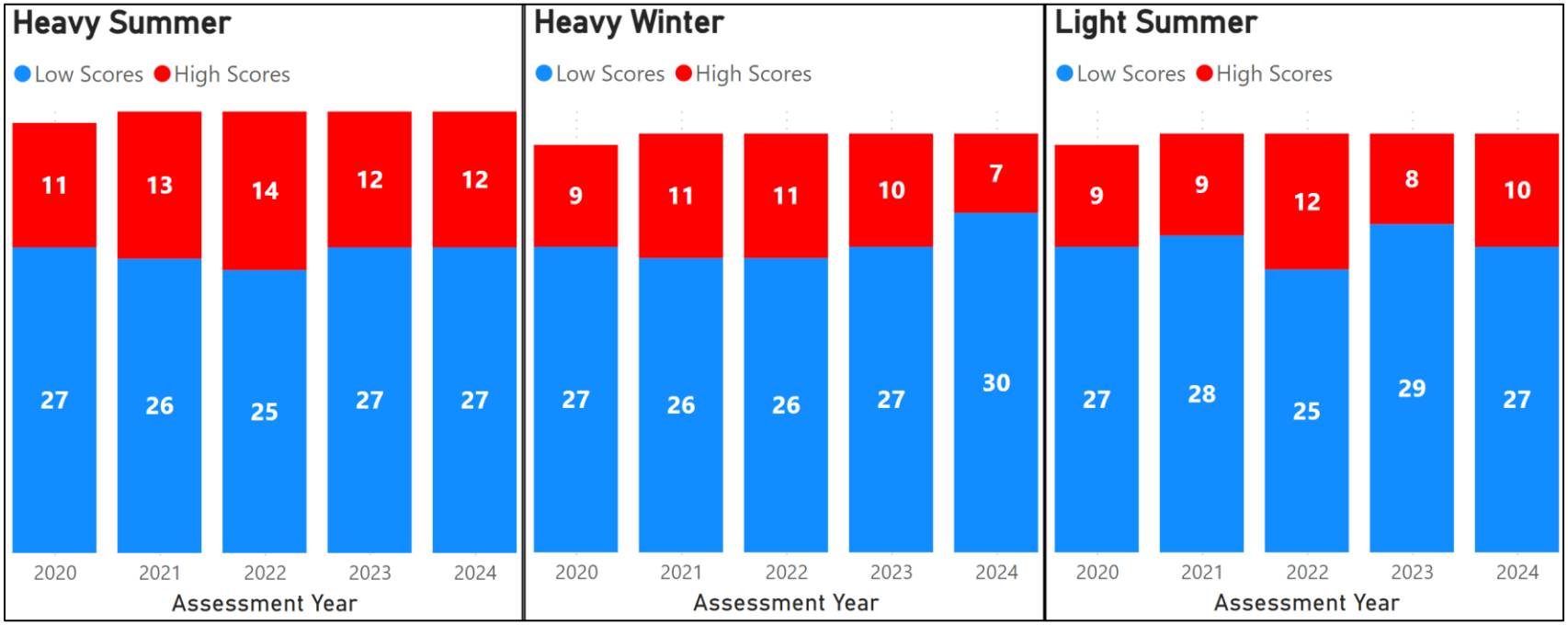
2020-2024 EI High/Low Scores



2020-2024 TI High/Low Scores



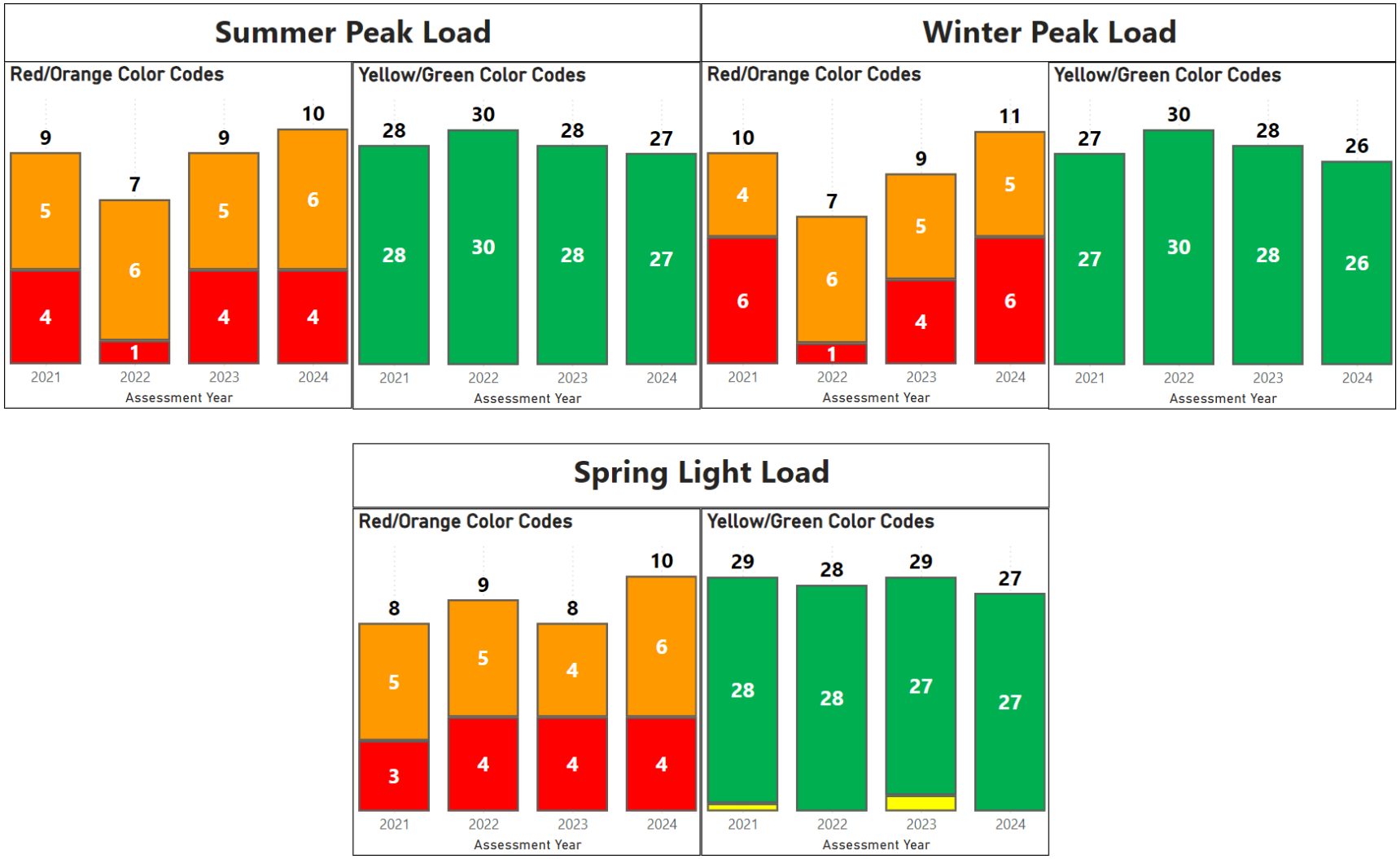
2020-2024 WI High/Low Scores



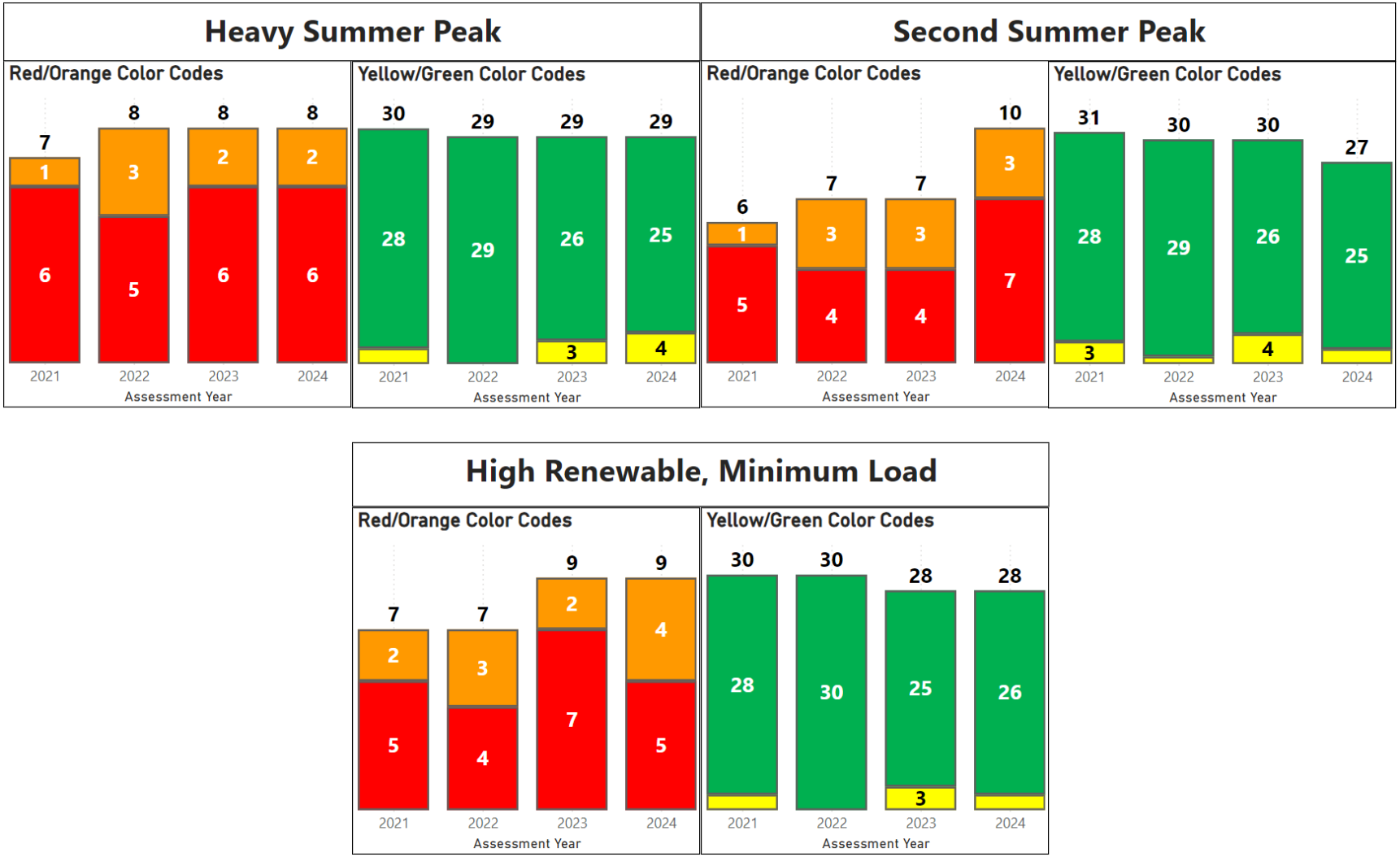
Color Code Legend

	Consistent performance under 5% performance score, or performance score moved from greater than 5% to less than 5%
	Positive performance improvements (decrease in score of 2% or more from previous year)
	Continued performance above 5% performance score with no noticeable improvement
	Noticeable performance degradation (increase of 1% or more from previous year), or performance score moved from less than 5% to greater than 5%

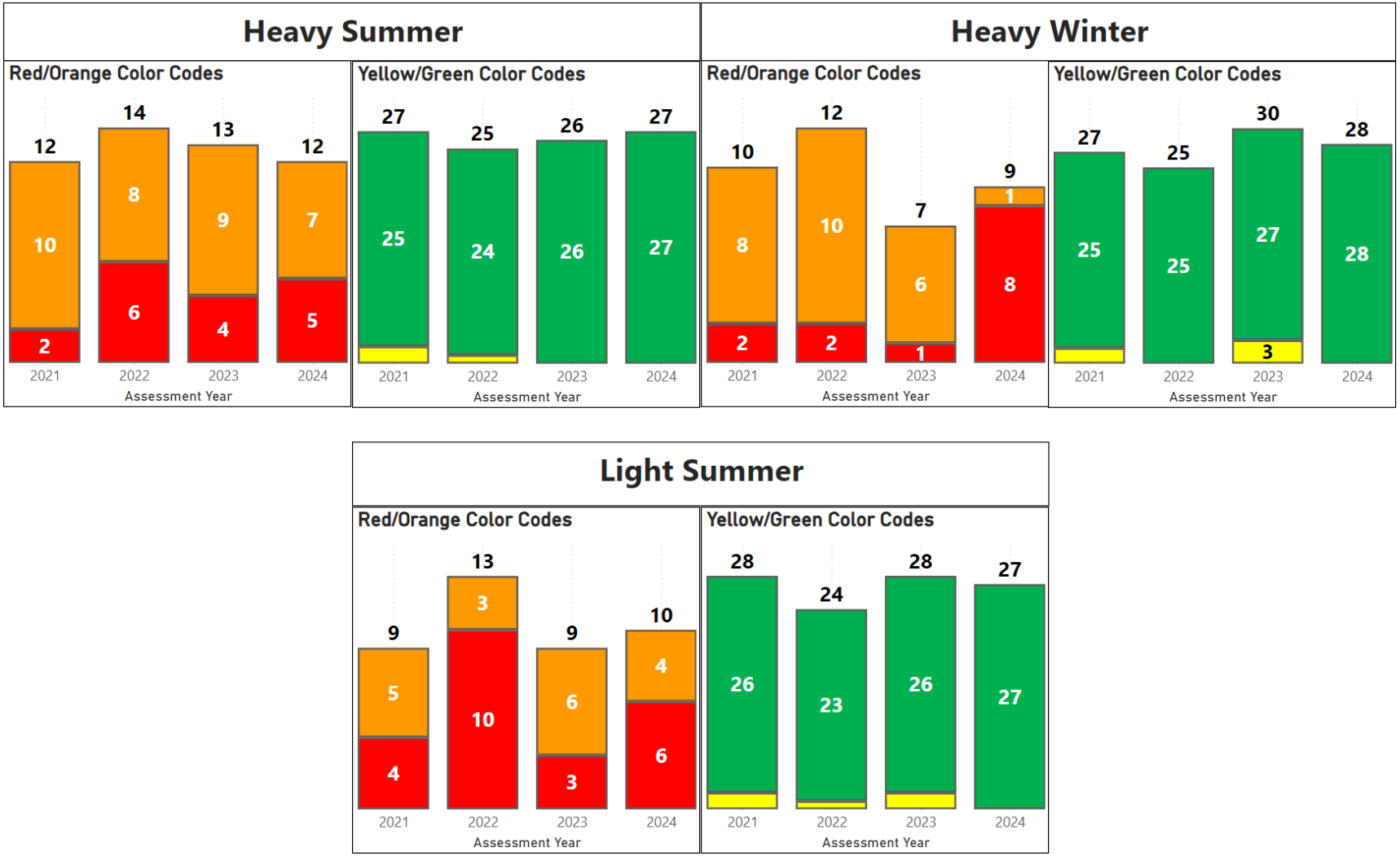
EI Color Codes 2021-2024



TI Color Codes 2021-2024



WI Color Codes 2021-2024



Questions and Answers