

WELCOME TO TECHNICAL TALK WITH RF

March 11, 2024





TECHNICAL TALK WITH RF

Join the conversation at

[SLIDO.com](https://www.slido.com)

[#TechTalkRF](https://twitter.com/TechTalkRF)

TECHNICAL TALK WITH RF

Follow us on



[Linkedin.com/company/reliabilityfirst-corporation](https://www.linkedin.com/company/reliabilityfirst-corporation)

A screenshot of the ReliabilityFirst Corporation LinkedIn profile. The header features a banner image of power lines against a sunset sky. The profile name is "ReliabilityFirst Corporation" with a notification bell icon. Below the name, it states "RF works to maintain the reliability, security and resilience of the electric grid in the Mid-Atlantic region" and "Utilities · Cleveland, OH · 3,970 followers · 101 employees". A section indicates "Brian & 85 other connections work here" with buttons for "Following", "Invite", and "More". Navigation tabs include "Home", "My Company", "About", "Posts", "Jobs", and "People". The "Posts" tab is active, showing a post from "ReliabilityFirst Corporation" (3,970 followers, 2d) with the text: "ReliabilityFirst staff participated in our organization's annual Day of Giving last week. Thank you to [BOYS & GIRLS CLUB OF CLEVELAND](#), [Providence House](#), [Shoes and Clothes for Kids](#), [Arkansas Foodbank](#), and [City Mission](#) for having us as w...see more". The post includes two images: a group photo of staff in front of a building and a photo of a roof being worked on.

TECH TALK REMINDERS

Please keep your information up-to-date

- CORES, Generation Verification Forms, Entity Profile Questionnaires (quarterly)

Following an event, send EOP-004 or OE-417 forms to disturbance@rfirst.org

CIP-008-6 incident reports are sent to the [E-ISAC](#) and the [DHS CISA](#)

Check our [monthly CMEP update](#) and [quarterly newsletter](#):

- [2023 ERO Periodic Data Submittal schedule](#)
- Timing of Standard effectiveness

BES Cyber System Categorization (CIP-002-5.1 a)

- Assess categorization (low, medium, or high) regularly and notify us of changes

CIP Evidence Request Tool V8.1 was released and is on NERC's [website](#)



WELCOME TO TECHNICAL TALK WITH RF

March 11, 2024



TECH TALK ANNOUNCEMENT

U.S. DEPARTMENT OF
ENERGY

Office of
Cybersecurity, Energy Security,
and Emergency Response



Cybersecurity Training for the Utility Workforce

Click here for [Registration](#)

Each training event will provide 3 days of lectures and hands on exercises and challenges. Registration costs for the Cybersecurity Training for the Utility Workforce will be free for participants. Participants will be expected to cover their own costs for travel, lodging, and meals. This training is designed for technical practitioners in electric utilities that require a hybrid set of skills across information technology (IT), industrial control systems and operational technology (ICS/OT), cybersecurity, and electric grid operations.



Cybersecurity Training for the Utility Wor...

Amherst, NY

Apr 23 - 25, 2024

[Register Now](#)

TECH TALK ANNOUNCEMENT



NERC Launches IBR Registration Initiative Resources

Click here for [Announcement](#)

FERC issued an order in 2022 directing NERC to identify and register owners and operators of currently unregistered bulk power system-connected IBRs. Working closely with industry and stakeholders, NERC is executing a FERC-approved work plan to achieve the identification and registration directive by 2026

In Phase 1 of this project, NERC worked with the Regional Entities to develop potential Rules of Procedure revisions to address registration of owners and operators of unregistered IBRs that have an aggregate, material impact.



TECH TALK ANNOUNCEMENT



Industry Webinar Project 2023-03 Internal Network Security Monitoring March 6th

Click here to: [Join WebEx Meeting](#)

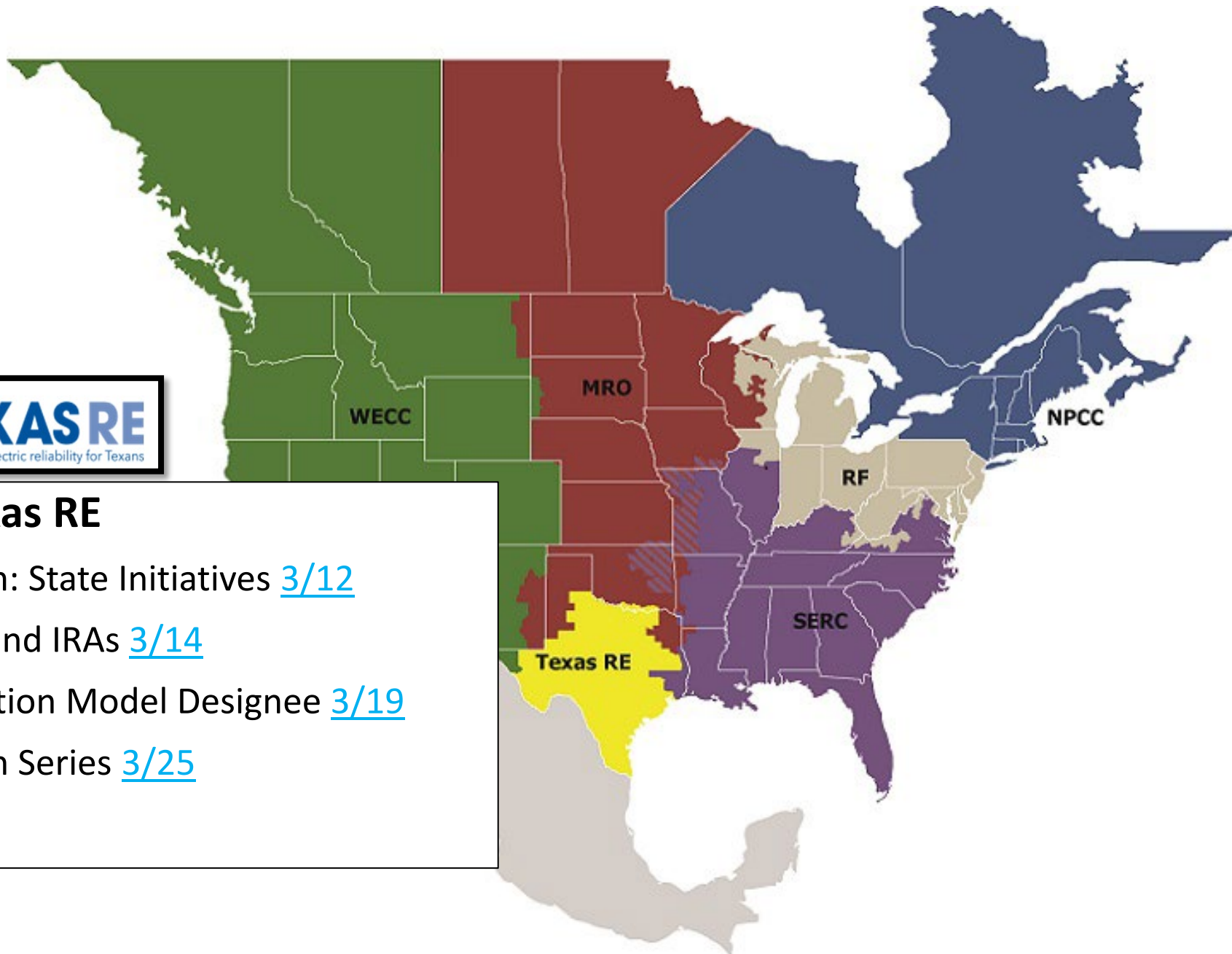
This webinar will cover the initial draft of CIP-015-1 Reliability Standard, associated Implementation Plan, and Technical Rationale. Draft 1 of proposed Reliability Standard CIP-015 is being developed in response to the Federal Energy Regulatory Commission (FERC) issued Order No. 887 directing NERC to develop requirements within the Critical Infrastructure Protection (CIP) Reliability Standards for internal network security monitoring (INSM) of all high impact BES Cyber Systems and medium impact BES Cyber Systems with External Routable Connectivity (ERC).





Talk with Texas RE

- Policy Forum: State Initiatives [3/12](#)
- Align COPs and IRAs [3/14](#)
- Interconnection Model Designee [3/19](#)
- Supply Chain Series [3/25](#)



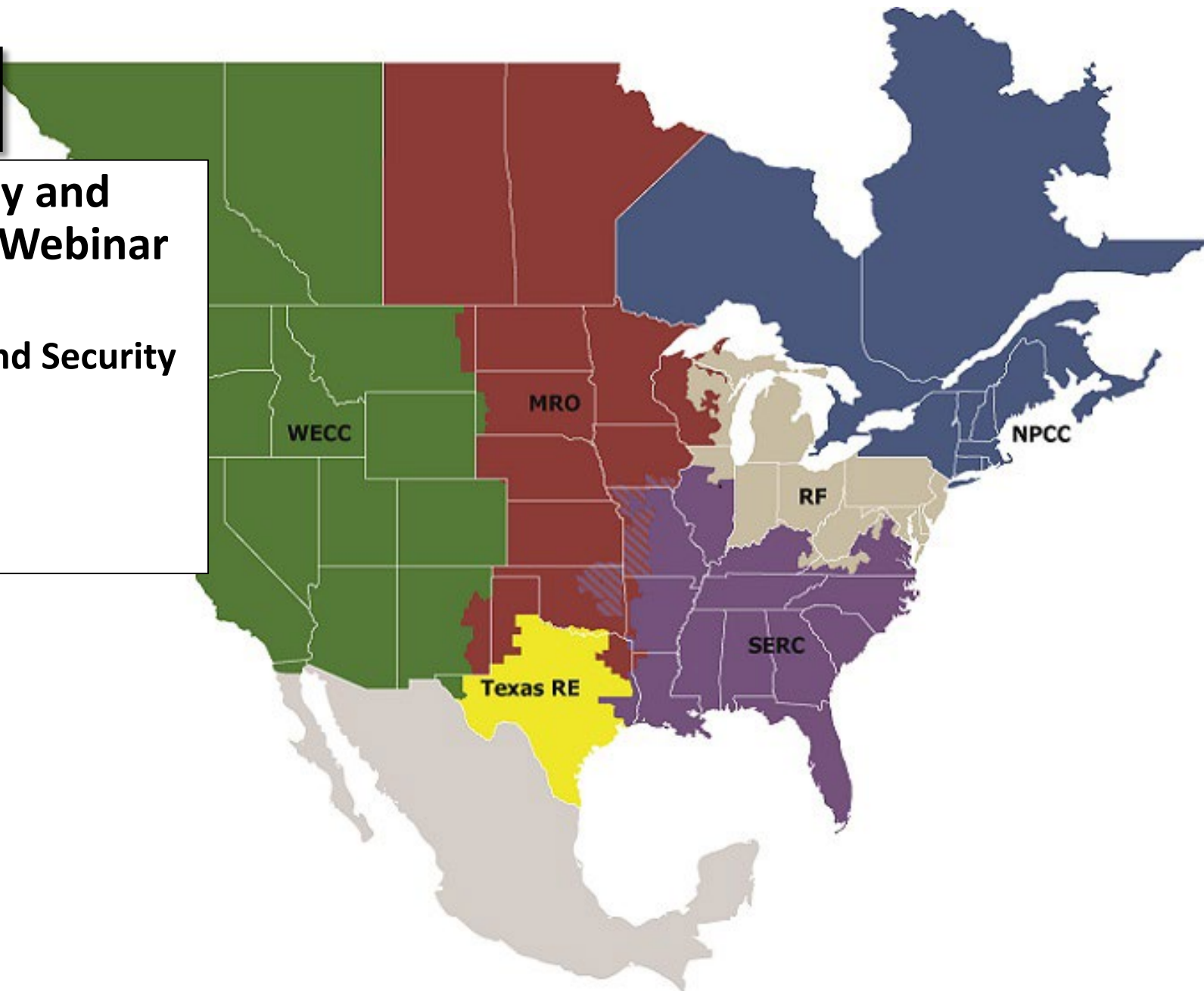


Monthly Reliability and Security Monthly Webinar

- [March 21st](#)

Monthly Reliability and Security Hybrid Workshop

- [March 26th](#)
- [March 27th](#)





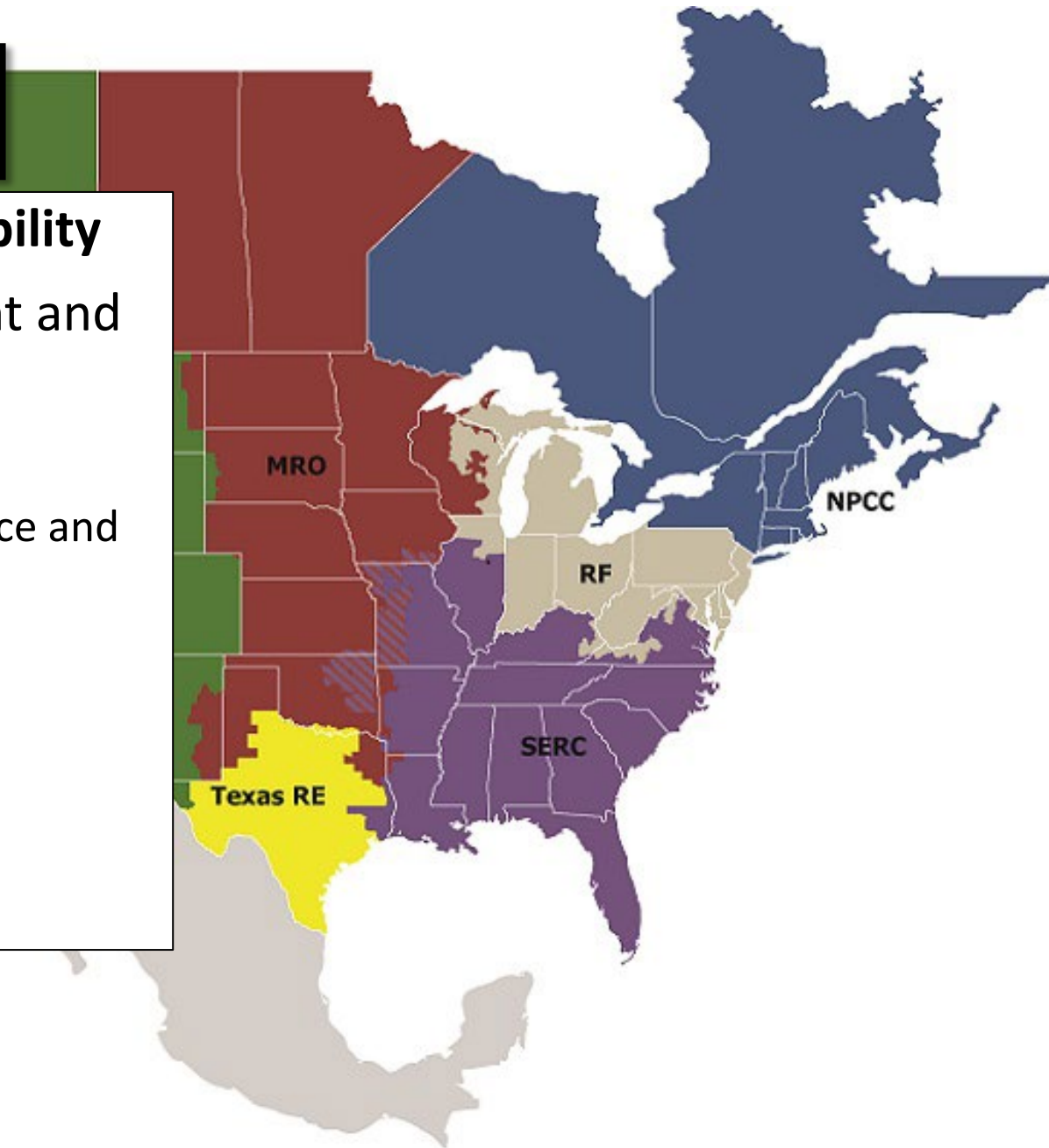
2023 Long-Term Reliability

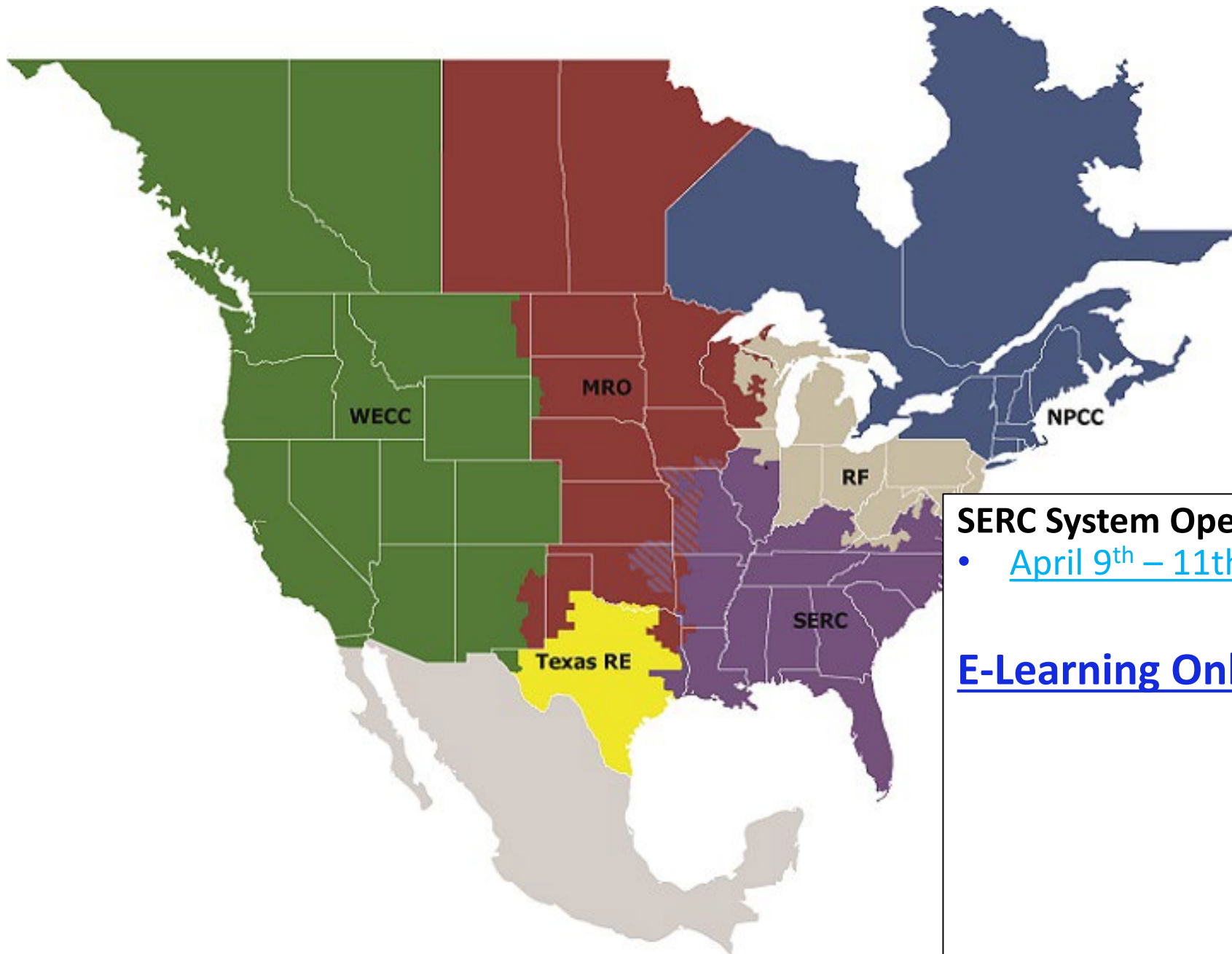
Virtual Risk Assessment and Mitigation Conference

- [March 20th](#)

Hybrid Reliability Conference and Networking Reception

- [May 14th – 15th](#)

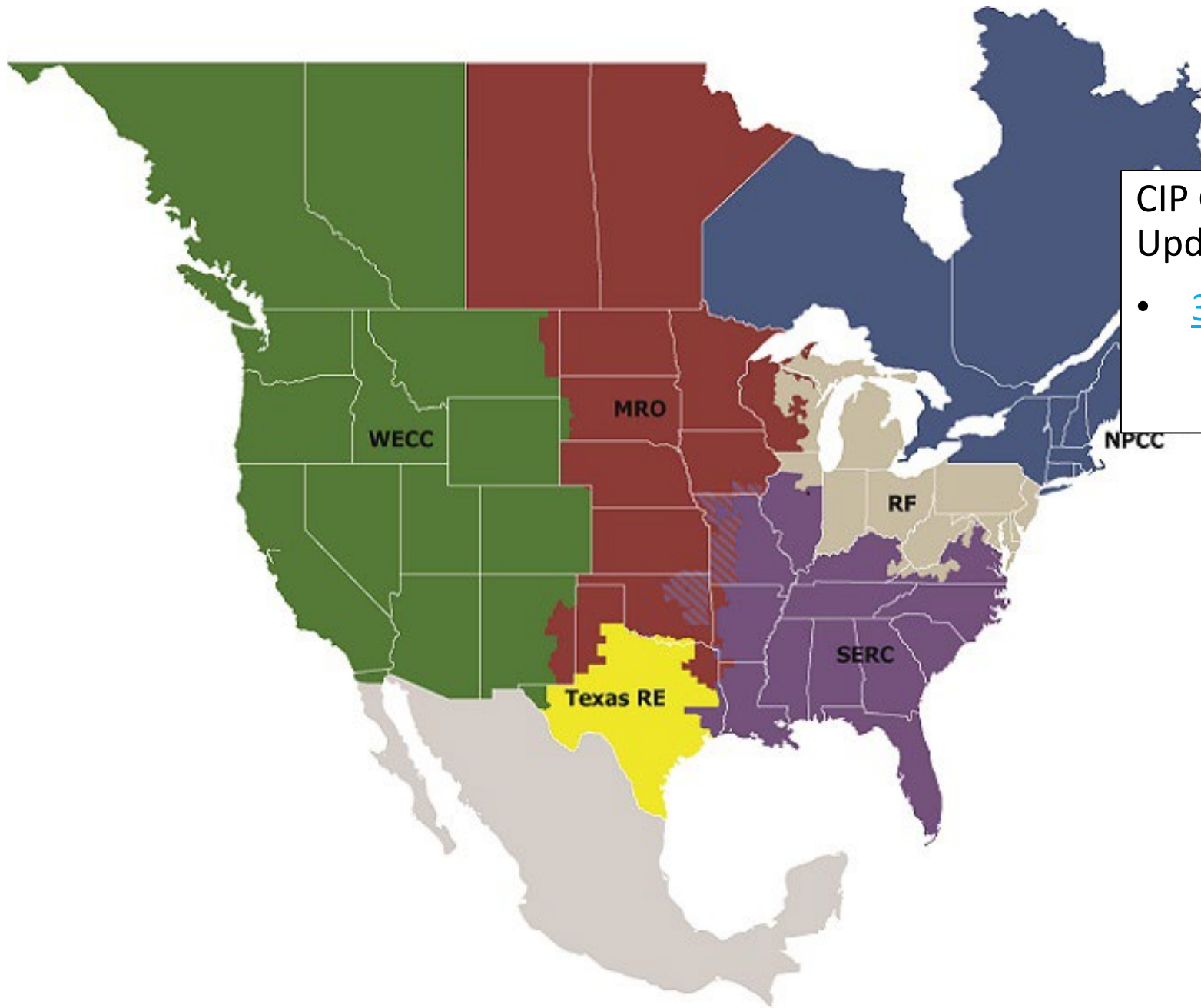




SERC System Operator Conference

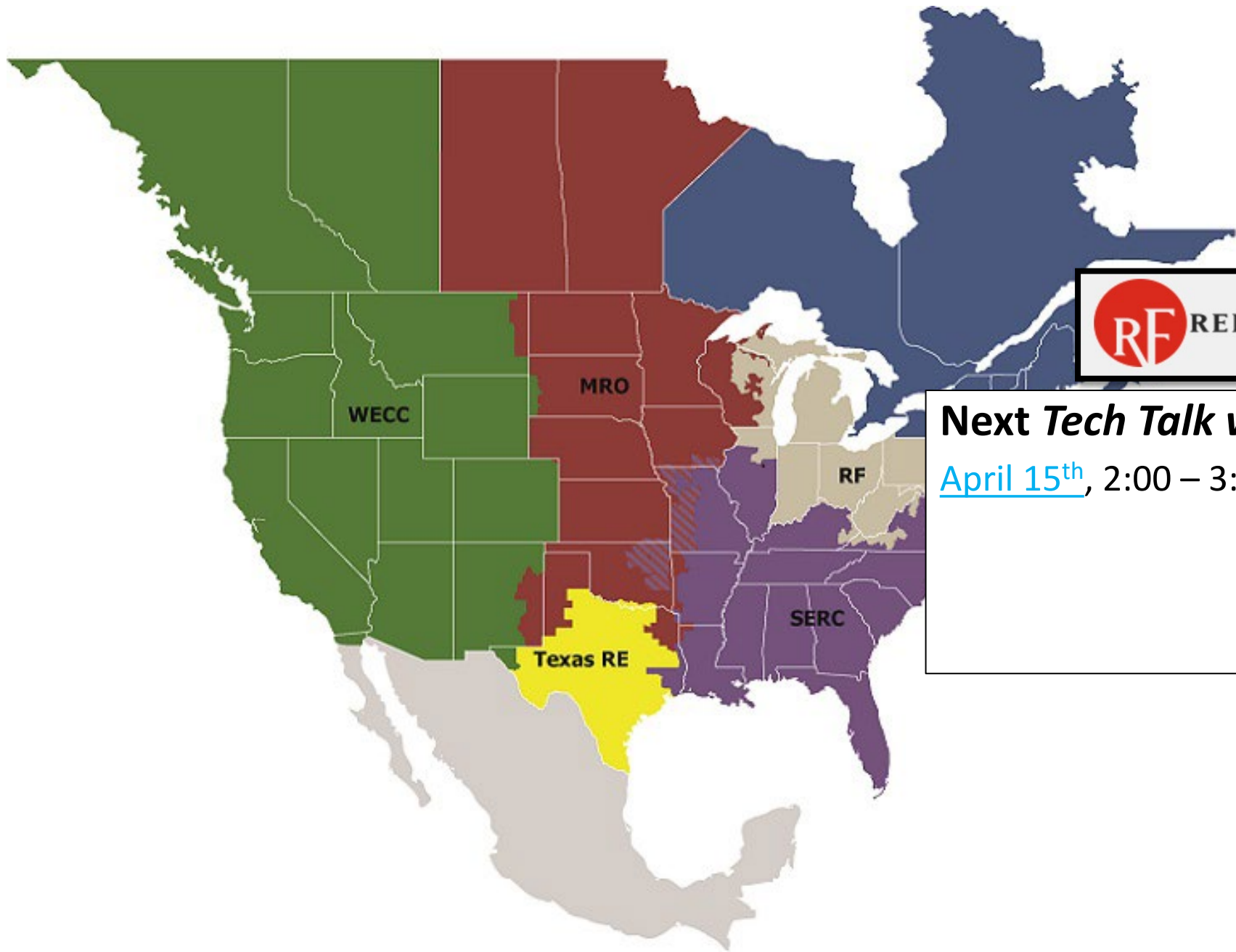
- [April 9th – 11th](#)

[E-Learning Online Courses](#)



CIP Compliance Monitoring
Updates Webinar

- [3/26](#)



Next *Tech Talk with RF*
[April 15th](#), 2:00 – 3:30 PM

TECH TALK REMINDER

Tech Talk with RF announcements are posted on our calendar on www.rfirst.org under Calendar

March 2024

MON
11

March 11 @ 2:00 pm - 3:30 pm

Technical Talk with RF

Virtual (Webex)

Technical Talk with RF is a monthly webinar ReliabilityFirst hosts to discuss key reliability, resilience and security topics with our stakeholders.



CLICK HERE





TECHNICAL TALK WITH RF

Join the conversation at

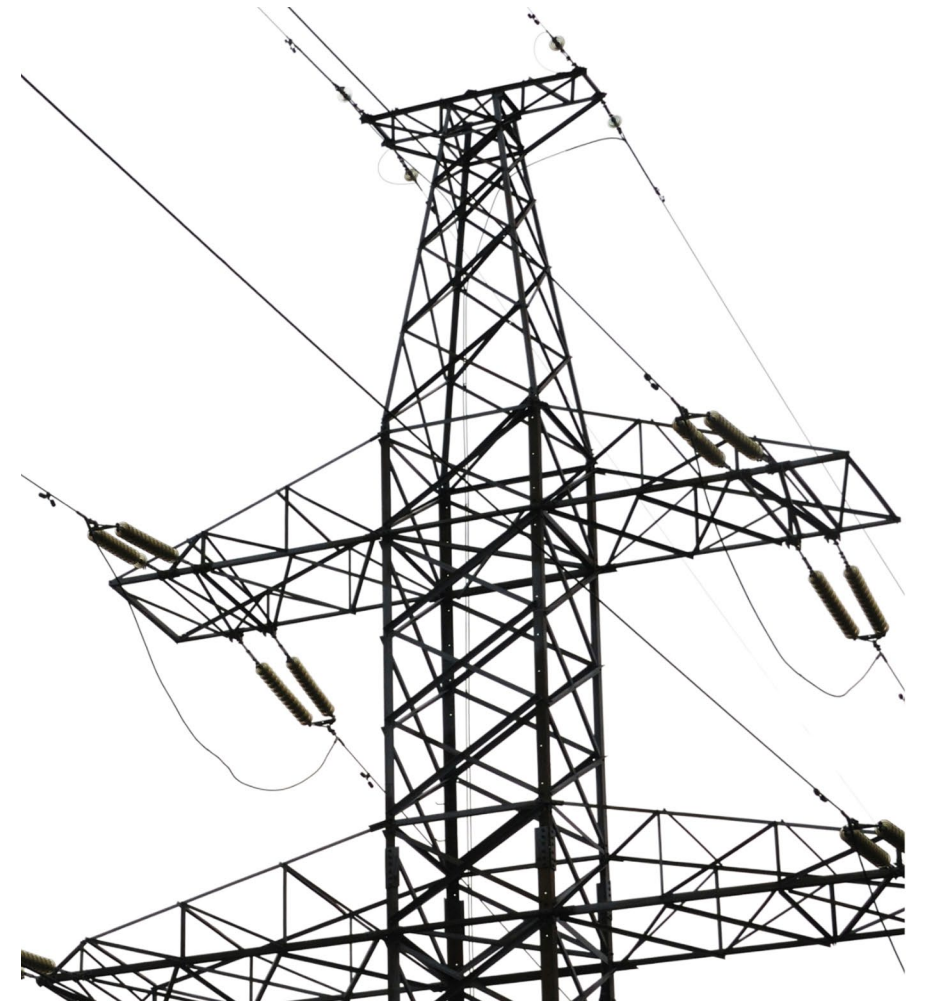
[SLIDO.com](https://www.slido.com)

[#TechTalkRF](https://twitter.com/TechTalkRF)

Anti-Trust Statement

It is ReliabilityFirst's policy and practice to obey the antitrust laws and to avoid all conduct that unreasonably restrains competition. This policy requires the avoidance of any conduct which violates, or which might appear to violate, the antitrust laws. Among other things, the antitrust laws forbid any agreement between or among competitors regarding prices, availability of service, product design, terms of sale, division of markets, allocation of customers or any other activity that unreasonably restrains competition.

It is the responsibility of every ReliabilityFirst participant and employee who may in any way affect ReliabilityFirst's compliance with the antitrust laws to carry out this policy.



AGENDA

NERC RELIABILITY STANDARDS EFFECTIVE APRIL 1, 2024

- LATRICE HARKNESS, NERC DIRECTOR OF STANDARDS DEVELOPMENT

OVERVIEW OF RF REGIONAL RISK ASSESSMENT

- JOHNNY GEST, RF MANAGER ENGINEERING AND SYSTEM PERFORMANCE

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Reliability First Corporation (RF) Technical Conference

Latrice Harkness, Director, Standards Development
Technical Talk with RF
March 11, 2024

RELIABILITY | RESILIENCE | SECURITY



- Presentation Objectives
- Establish and Communicate System Operating Limits
- Modifications to PRC-002 - Disturbance Monitoring and Reporting Requirements
- Modifications to PRC-023 – Transmission Relay Loadability
- Helpful Reminders

- Project 2015-09
 - FAC-003-5 Transmission Vegetation Management
 - FAC-011-4 System Operating Limits Methodology for the Operations Horizon
 - FAC-014-3 Establish and Communicate System Operating Limits
 - IRO-008-3 Reliability Coordinator Operational Analyses and Real-time Assessments
 - PRC-023-5 Transmission Relay Loadability
 - PRC-026-2 Relay Performance During Stable Power Swings
 - TOP-001-6 Transmission Operations
- Project 2021-04
 - PRC-002-4 Disturbance Monitoring and Reporting Requirements
- Project 2021-05
 - PRC-023-6 Transmission Relay Loadability

- Project 2015-09
 - Primary objective is to align the FAC standards with existing IRO, TOP, and TPL standards as well as new definitions for Operational Planning Analysis and Real-time Assessment
 - FAC-011
 - Combined Requirement R3 sub-requirements 3.5, 3.6, and 3.7 into one sub-requirement 3.5
 - Revised sub-requirement 4.2 to focus only on the more severe stability impacts
 - Revised sub-requirement to allow for different contingency lists to determine stability and steady state system impacts
 - Revised Requirement R6 and its sub-requirements based upon significant industry comment
 - Made changes in TOP-001 and IRO-008 (see below) to reference this framework for determining SOL exceedances

- FAC-011
 - Added new Requirement 7 which requires risk-based methods be included in the SOL Methodology to be used by the Reliability Coordinator (RC) and Transmission Operators (TOPs) when determining and communicating SOL exceedances
 - Addresses existing SOL exceedance communication requirements in TOP-001 and IRO-008
 - Revised the two sub-requirements in Requirement R8 into one
- FAC-014
 - Revised purpose of FAC-014 and included Planning Assessment criteria be coordinated with System Operating Limit Methodologies
 - Revision to simplify / improve Requirement R3 and R4
 - Revision to sub-requirements 5.1 and R5.2 based upon comments
 - Added Transmission Planners as recipients of data from RC per requirement R5

- FAC-014
 - Removed proposed Requirement R6, which required use of Requirement R6 from proposed FAC-011-4 to determine SOL exceedances
 - Replaced by new Requirements in TOP-001 and IRO-008 to use the RC's SOL methodology, and the new framework for determining SOL exceedances, per numerous industry comments (see below for proposed TOP-001 and IRO-008 changes)
 - FAC-015 withdrawn and replaced with new Requirement R6 in FAC-014
 - New requirement R6 – requires Planning Coordinator (PC) and Transmission Planner (TP) to implement a process
 - The process documents how the PCs and TPs use Facility Ratings, Voltage Limits and Stability Criteria that are at least as conservative at those used in Operations
 - Exception allowances exist to describe cases where planning ratings and criteria are less conservative than those used in operations
 - Based on FERC staff comments, this provision is required to allow retirement of FAC-010

- FAC-014
 - Added new requirement R7 – requires PCs and TPs to identify Corrective Action Plans developed to address any instability identified in its Planning Assessment of the Near-Term Transmission Planning Horizon to RCs and TOPs
 - Sub-requirements include added information to fully describe the instability conditions
 - Considered by SDT complimentary to removing FAC-010 and replacing the Planning responsibilities in existing R5 and R6 in current FAC-014-2

- New Requirement R6 in FAC-011-4 provides clear, consistent framework for SOL exceedance determination across industry
- New Requirement R25 in TOP-001-6 requires RC's SOL methodology to be used by the TOP to determine SOL exceedances
- New Requirement R7 in FAC-011-4 provides consistent, documented method for communicating SOL exceedances, as indicated in TOP-001-6 Requirement R15, between RCs and TOPs
- Revised measure for Requirement R14 provides other examples that may be used to document actions taken per the requirement

- Revised Requirements R5 and R6 to add language “in accordance with its SOL Methodology”
- New Requirement R7 requires RC’s SOL methodology to be used when determining SOL exceedances for Real-time Assessments, Real-time monitoring, and Operational Planning Analysis.

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

PRC-002 Disturbance Monitoring and Reporting Requirements

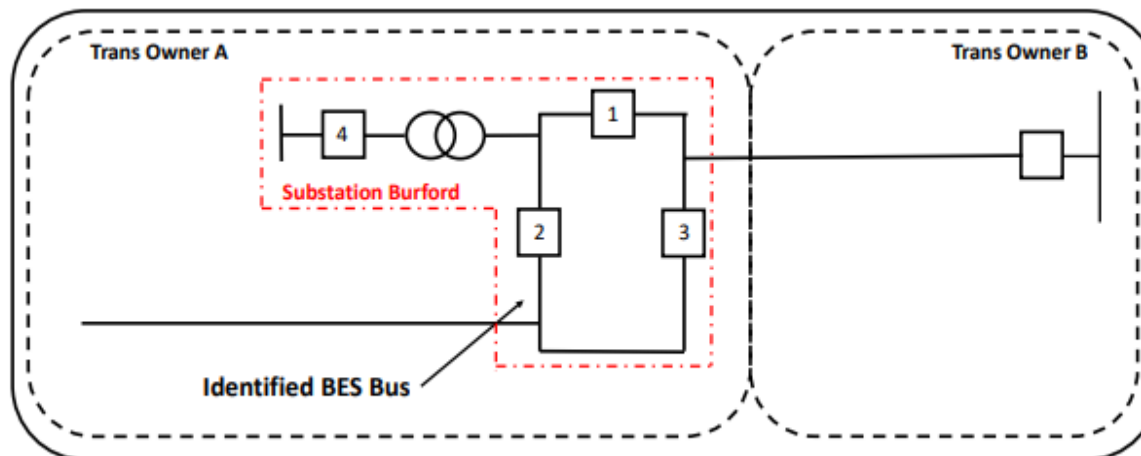
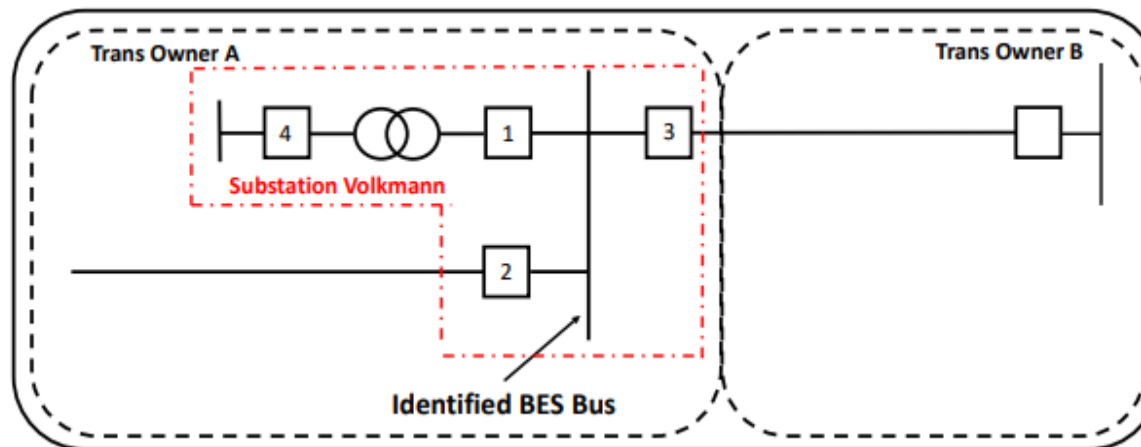
RELIABILITY | RESILIENCE | SECURITY



- The goal of the proposed project is to:
 - Clarify the necessary notifications in Requirement R1, Part 1.2 relative to the SER/FR data, and clearly identify the BES Element owners that need to have SER/FR data for transformers and transmission lines with the associated identified bus.
 - Move requirement to be 100 percent compliant within three (3) years following notification of a re-evaluated list by the responsible entity from the implementation plan to the standard itself.
 - Add a criterion that constitutes a substantial change in fault current levels which would require changing SER/FR data recording locations.
 - If appropriate, add Planning Coordinator to the Western Interconnection in Section 4.1.3 as a possible Responsible Entity.

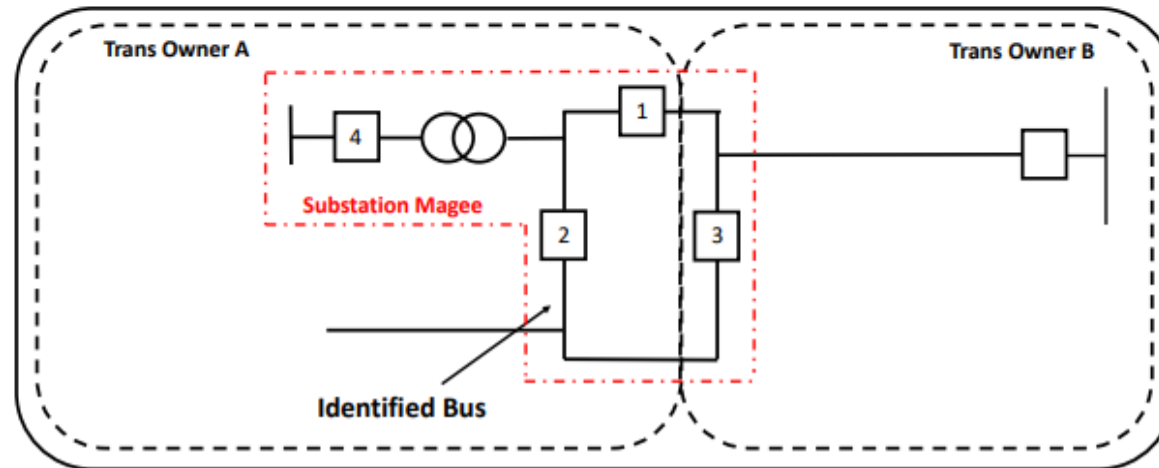
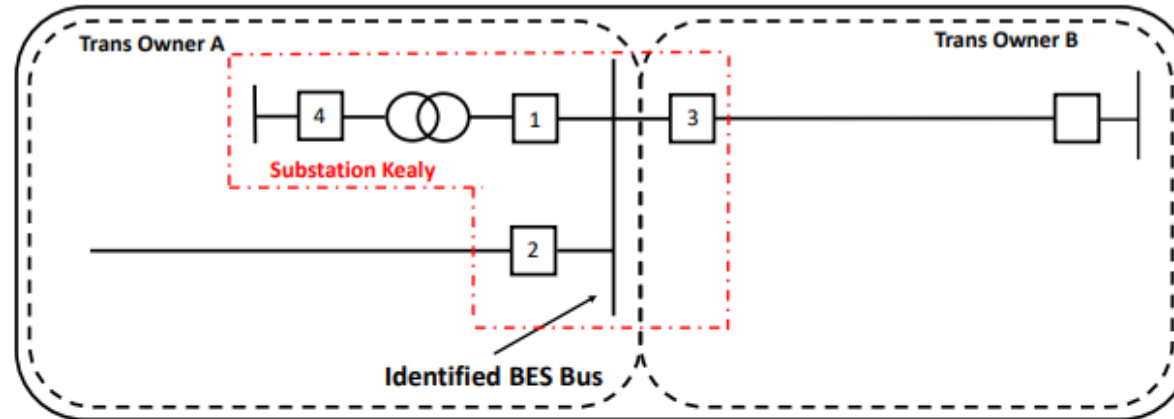
- R1.** Each Transmission Owner shall: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*
- 1.1.** Identify BES buses for which sequence of events recording (SER) and fault recording (FR) data is required by using the methodology in PRC-002-34, Attachment 1.
 - 1.2.** Notify other owners of BES Elements, for which the Transmission Owner does not record SER or FR data, connected directly to those BES buses that they are responsible for recording the SER or FR data. This notification is required, if any, within 90-calendar days of completion of Part 1.1, ~~that those BES Elements require SER data and/or FR data.~~ If the owner of a BES Element is no longer required to have SER or FR data, notify the owner within 90-calendar days.

- TO A records SER/FR data for all three circuit breakers.
- TO A is not required to send notification to TO B.





- TO A is responsible for SER/FR data for CBs 1 & 2.
- If TO A does not record SER/FR data for CB 3, then TO B must be notified of responsibility to record SER/FR data for CB 3.



- 1.3. Re-evaluate all BES buses at least once every five calendar years in accordance with Part 1.1 and, **if necessary**, notify other owners **of their responsibilities, if any**, in accordance with Part 1.2, ~~and implement the re-evaluated list of BES buses as per the Implementation Plan.~~

Revisions to Requirement R5, Part 5.4

- 5.4. Re-evaluate all BES Elements **under its purview** at least once every five calendar years in accordance with Parts 5.1 and 5.2, and notify owners in accordance with Part 5.3 ~~to implement the re-evaluated list of BES Elements as per the Implementation Plan.~~

R13. Each Transmission Owner and Generator Owner shall: *[Violation Risk Factor: Lower]*
[Time Horizon: Long-term Planning]

13.1. Within three (3) years of notification under Requirement R1, Part 1.3, have SER or FR data as applicable for BES Elements directly connected to BES buses identified during the re-evaluation.

13.2. Within three (3) years of notification under Requirement R5, Part 5.4, have DDR data for BES Elements identified during the re-evaluation.

If there are no BES buses on the list: the procedure is complete and no FR and SER data will be required. Proceed to Step 9.

If the list has 1 or more but less than or equal to 11 BES buses: FR and SER data is required at the BES bus with the highest maximum available calculated three phase short circuit MVA as determined in Step 3. Proceed to Step 9.

During re-evaluation per Requirement R1, Part 1.3, if the three phase short circuit MVA of previously identified BES bus is within 15% of three phase short circuit MVA of the newly identified BES bus then it is not necessary to change the applicable BES bus where FR and SER data is required.

If the list has more than 11 BES buses: SER and FR data is required on at least the 10 percent of the BES buses determined in Step 6 with the highest maximum available calculated three phase short circuit MVA. Proceed to Step 8.

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Modifications to PRC-023 – Transmission Relay Loadability

RELIABILITY | RESILIENCE | SECURITY



- Purpose/Goal
 - Modifying or eliminating PRC-023-5 Requirement R2 to more effectively apply PSB when appropriate to improve BES reliability
 - Modify or remove an exclusion (Attachment A – 2.3) that may no longer be needed

- Retire Requirement R2
 - ~~Each Transmission Owner, Generator Owner, and Distribution Provider shall set its out-of-step blocking elements to allow tripping of phase protective relays for faults that occur during the loading conditions used to verify transmission line relay loadability per Requirement R1. [Violation Risk Factor: High] [Time Horizon: Long Term Planning].~~
- Retire Attachment A Section 2.3
 - ~~Protection systems intended for protection during stable power swings.~~

- [One Stop Shop](#)
- 2021-05 [Modifications to PRC-023](#)
- 2021-04 [Modifications to PRC-002-2](#)
- [Archived Reliability Standards Under Development](#)
- Point of Contact
 - Latrice.Harkness@nerc.net or call 404-858-8088



Questions and Answers

2023-24 REGIONAL RISK ASSESSMENT

Johnny Gest - Manager, Engineering & System Performance

March 11, 2024



AGENDA

RF FAST FACTS

RRA OVERVIEW

CHANGES FROM PREVIOUS RRA

RF COMMITTEES

RISK CONSIDERATIONS

RISK PRIORITIZATION

REVIEW OF RISKS

RISK INTERDEPENDENCIES

FAST FACTS



RRA OVERVIEW

- Examines risk from a regional perspective
- Focuses on pertinent risks
- Utilizes performance data, reviews trends, identifies areas that require focus
- Informs future work
- Conducted approximately every two years

List of Risks

Environmental Factors

Cyber Security

Supply Chain

Changing Resource Mix

Physical Security

Misoperations

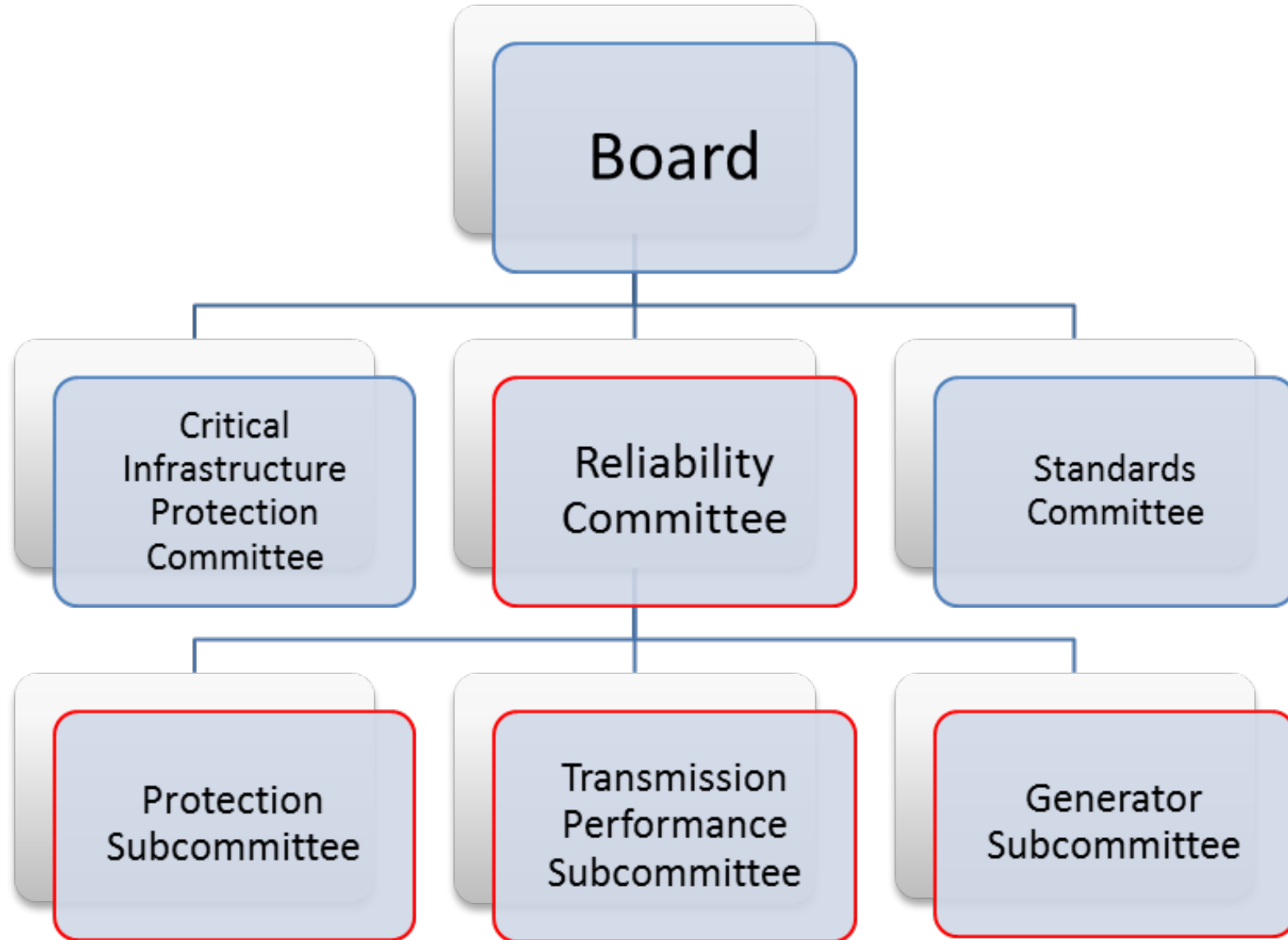
Modeling

Situational Awareness

CHANGES FROM PREVIOUS RRA

- First-time release of a public-facing RRA
- Input obtained from industry stakeholders via RF technical committees
- Development of Risk Considerations
- Cyber and Physical Security broken into separate risks
- Supply Chain added as a top regional risk

RELIABILITYFIRST TECHNICAL COMMITTEES



ONGOING COMMITTEE WORK

RELIABILITY COMMITTEE

- Assist in the development and ranking of RRA risk categories
- Endorse subcommittee reports

PROTECTION SUBCOMMITTEE

- Development with protection system risk report
- Assist in the selection of metrics
- Review content associated with protection systems
 - Misoperations
 - Environmental Factors
 - Human Performance
- Provide insight on trending and conclusions
- Provide recommendations for improvement

TRANSMISSION PERFORMANCE SUBCOMMITTEE

- Development with transmission risk report
- Assist in the selection of metrics
- Review content associated with protection systems
 - Event Response/Resilience
 - Environmental Factors
 - Human Performance
- Provide insight on trending and conclusions
- Provide recommendations for improvement

RISK CONSIDERATIONS

We analyzed four common considerations for each risk:



Human Performance

The capability of the workforce to complete the tasks associated with a given risk. This includes consideration of established processes and procedures, training, and capability to mitigate human error, as well as skilled workforce retention and retirements.



Policy & Standards

The implementation of rules and regulations at federal, state, and local levels that directly or indirectly impact the reliability of the Bulk Power System. This includes the NERC Reliability Standards.



Resilience






The ability to anticipate, absorb, adapt to, minimize the impact of, and/or rapidly recover from a potentially disruptive event.



Uncertainty

The confidence level associated with the overall evaluation of risk. This includes the availability of data to perform analysis, the quality of the data available, the level of expertise held by the risk analysts, and consideration of external sources that could indirectly impact risk.

RISK PRIORITIZATION

	Environmental Factors		Physical Security
	Cyber Security		Misoperations
	Changing Resource Mix		Modeling
	Supply Chain		Situational Awareness

ENVIRONMENTAL FACTORS

Naturally occurring phenomena, such as extreme weather and vegetation related issues

Cold Weather

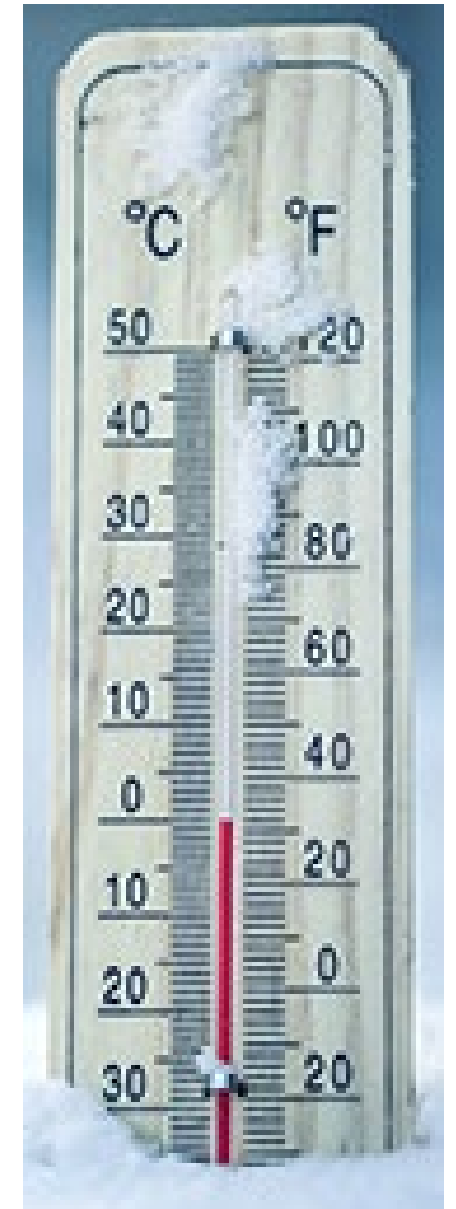
Five cold weather events in the past 11 years that resulted in substantial generation unavailability or firm load shed

Winter Storm Elliott (WSE)

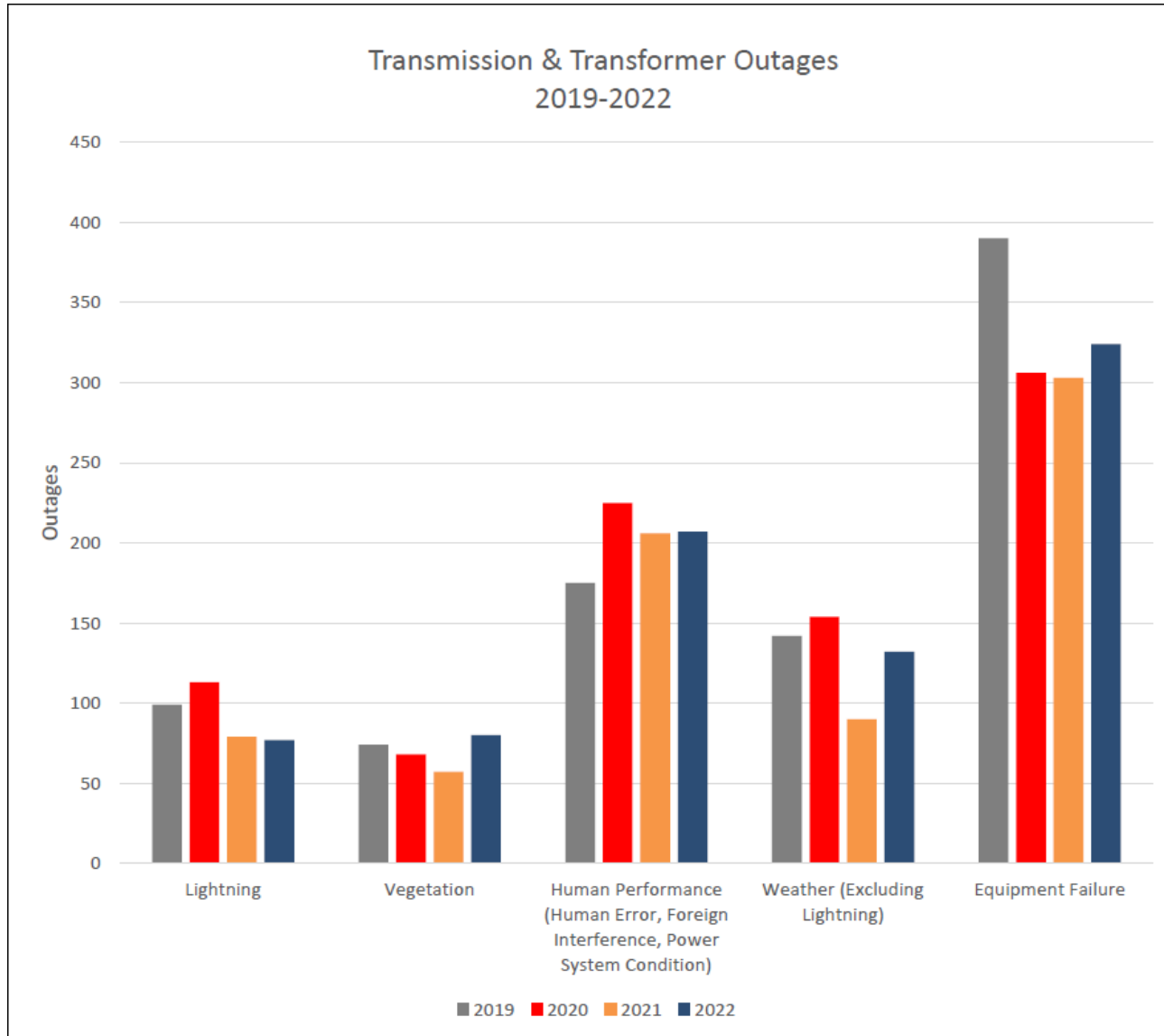
- 5 GW firm load shed (outside of RF)
- PJM/MISO simultaneously experienced 91 GW of generation unavailability

Monitoring/Management of Risk

- WSE FERC and NERC joint inquiry report - 11 recommendations
- NERC 2023/24 Winter Reliability Assessment - PJM/MISO elevated risk
- Reliability Standards: EOP-011, EOP-013, IRO-010, TOP-003, TOP-005
- NERC Level 3 Essential Actions Alert focused on cold weather prep
- RF Plant Winterization Visits



ENVIRONMENTAL FACTORS



Transmission Impact

Overall decrease in weather-related outages since 2019

Uptick in weather-related outages in 2022 (one event that resulted in end-use customer load loss)

94% of vegetation outages were on 100-199 kV facilities

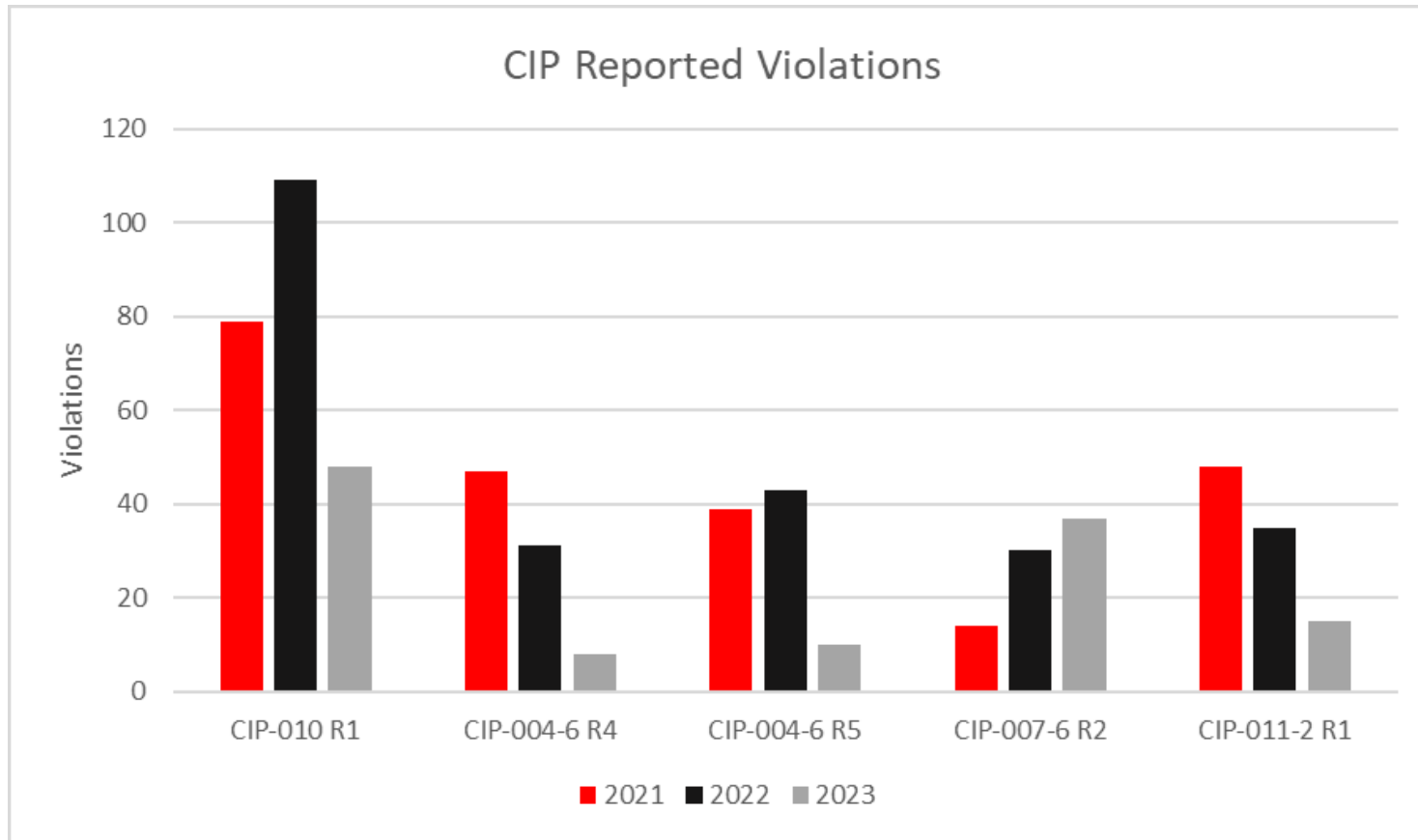
Outage frequency and severity have decreased since 2019

Monitoring/Management of Risk

RF Vegetation Management Community of Practice

CYBER SECURITY

Compromise of information technology systems that monitor and control the electric grid



Security Patches

- CIP-007-6 R2 is trending upward in violations
- Increased risk identified prior to a vendor releasing a fix/patch

Monitoring/Management of Risk

- Continuously review compliance metrics
- Emergent risks
- Patch management outreach
- Cyber Resilience Assessment

CHANGING RESOURCE MIX

Addresses the fact that public inputs along with the influence of regulatory and socio-economic policies, are continuing to drive a significant evolution in the mix of power resources

State Policy Changes

State	Clean Energy Goal*	Policy
Delaware	40% by 2035	RPS (Updated 2021)
Maryland	60% below 2005 baseline by 2031, net-zero by 2045	Climate Solutions Now Act of 2022
Washington, D.C.	100% clean energy by 2032	Clean Energy Act of 2018
Illinois	50% by 2040, 100% by 2050	Climate and Equitable Jobs Act of 2021
Michigan	100% carbon-free by 2040	SB 271
Wisconsin	100% carbon-free by 2050	EO 38
Pennsylvania	80% below 2005 by 2050**	AEPS
New Jersey	100% clean energy by 2050***	EO 28

*clean energy initiatives could include nuclear and natural gas, plus the purchase of clean energy (not solely construction of clean energy resources)

**recent proposed change in HB1467

***recent proposed change with the Clean Energy Act of 2023

Federal Policy Changes

- Environmental Protection Agency (EPA) has the authority to regulate air pollutants
- Recent changes in court rulings and legislation impacts the EPA's ability to regulate

Monitoring/Management of Risk

- RF tracking these initiatives and engaged with state commissions and policy makers
- RF plans to incorporate this information into various power-flow assessments to identify risks

CHANGING RESOURCE MIX

Existing Resources

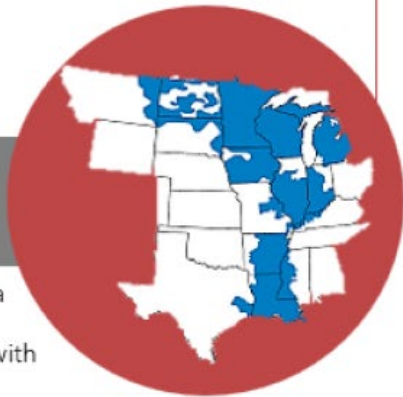
- Most coal, nuclear, and petroleum resources are 40-60 years old
- Natural gas is less than 30 years old
- All resources have demonstrated an increase in forced outage rate since 2020

Planned Resources

Natural Gas	Coal	Nuclear	Renewables
Reduction of 6,000 MW	Reduction of 17,000 MW	No change	Increase of 14,000 MW

Natural Gas	Coal	Nuclear	Renewables
Increase of 7,700 MW	Reduction of 1,700 MW	No change	Increase of 13,400 MW

MISO



The MISO region predicts a sharp decline in more conventional fuel sources with an increase in renewables which will pose new challenges to the day-to-day operations and planning



PJM

The PJM region relies heavily on natural gas as the largest fuel source and therefore more susceptible to cold weather events. It is important for Generation Owners to take preventative actions to increase availability

CHANGING RESOURCE MIX

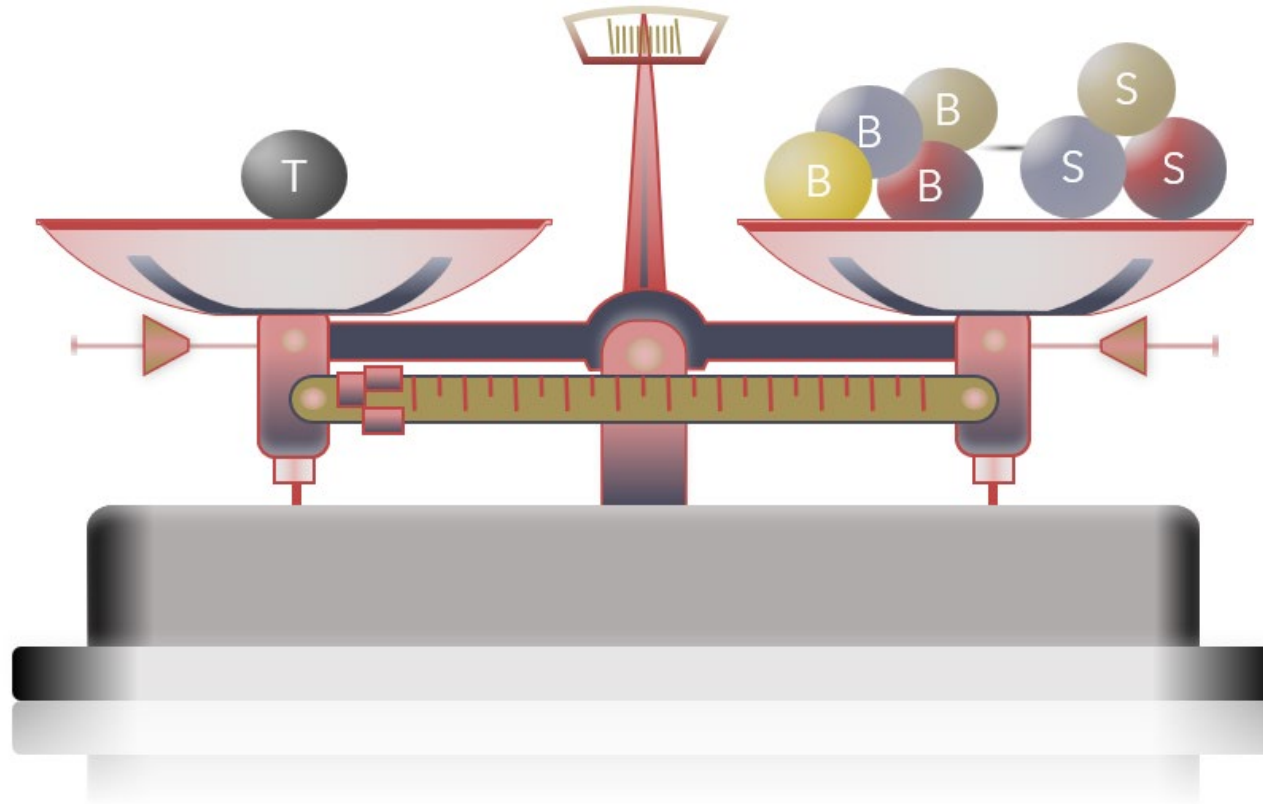
Conventional Compared to Hybrid Resources

100 MW Conventional Generation

- 100 MW Traditional Base Load generates 2400 MWh

300 MW Solar + 400 MW Batteries

- Assume 8 hours of sunlight
- Assume no losses in conversion



Usage

- 100 MW solar for 8 hours (800 MWh)
- 400 MW storage for 4-hour discharge (1600 MWh)

Storage

- 200 MW solar to charge storage 8 hours (1600 MWh)

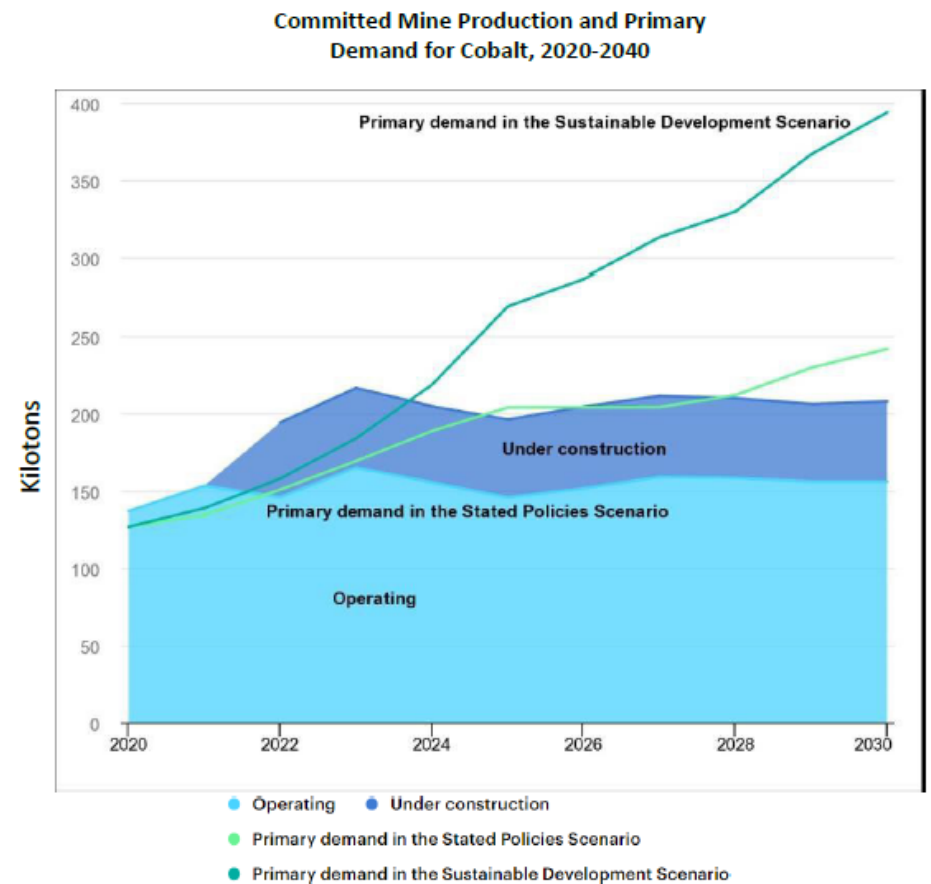
SUPPLY CHAIN

Impacts to the availability of equipment, tools, or resources that results in delay or disruption in system operations

Transition to wind/solar resources depends on implementation of energy storage technologies

Energy Storage Raw Material Availability

- Majority of U.S. utility scale energy storage systems use lithium-ion batteries
- Electric vehicles also utilize lithium-ion batteries
- Lithium/Cobalt demand outpaces existing mine production
- Need for new technologies, process improvements, and advancements in recycling technologies



SUPPLY CHAIN

Impacts to the availability of equipment, tools, or resources that results in delay or disruption in system operations.

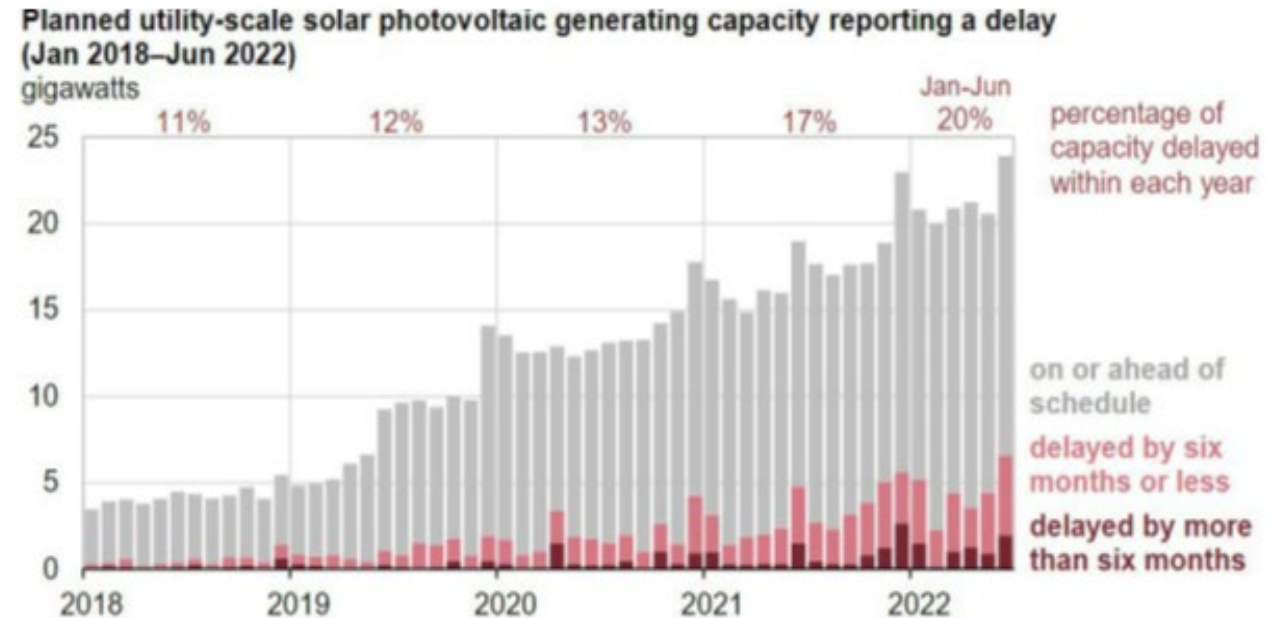
Solar Panel

Raw Material Availability

- Solar photovoltaics is dependent on China (97% of silicon wafer production)
- Incentives are needed for U.S. manufacturing to pivot toward solar component production
- Solar experiencing a delay in delivery of panels (20% delayed in 2022 from January to June)

Monitoring/Management of Risk

- Gather additional data and perform analysis related to supply chain risks



Source: U.S. Energy Information Administration (August 2022)

PHYSICAL SECURITY

Compromise of the intended operation or purpose of assets like substations, transformers, generating facilities, and control centers.

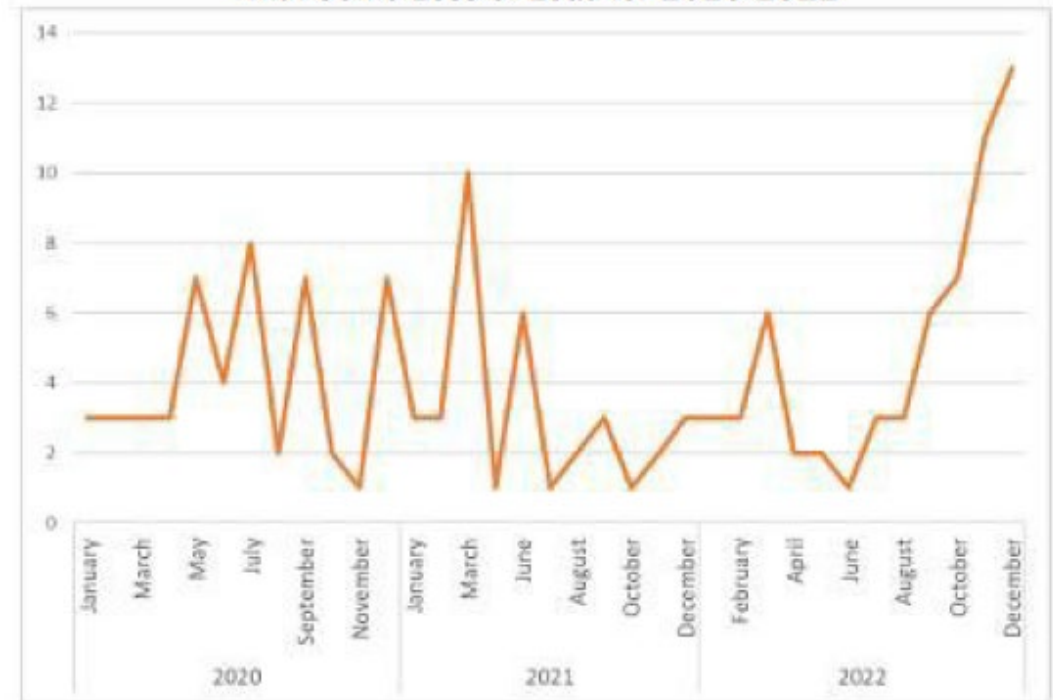
Physical Security Events

- Per E-ISAC, attacks on Bulk Power System (BPS) assets have increased in 2022
- No physical attacks in the RF footprint have led to loss in customer load
- RF experienced uptick in 2022 in facility threats, vandalism, and drone activity

Monitoring/Management of Risk

- FERC Order (Dec. 2022) to review CIP-014
- RF Threat Intelligence Program

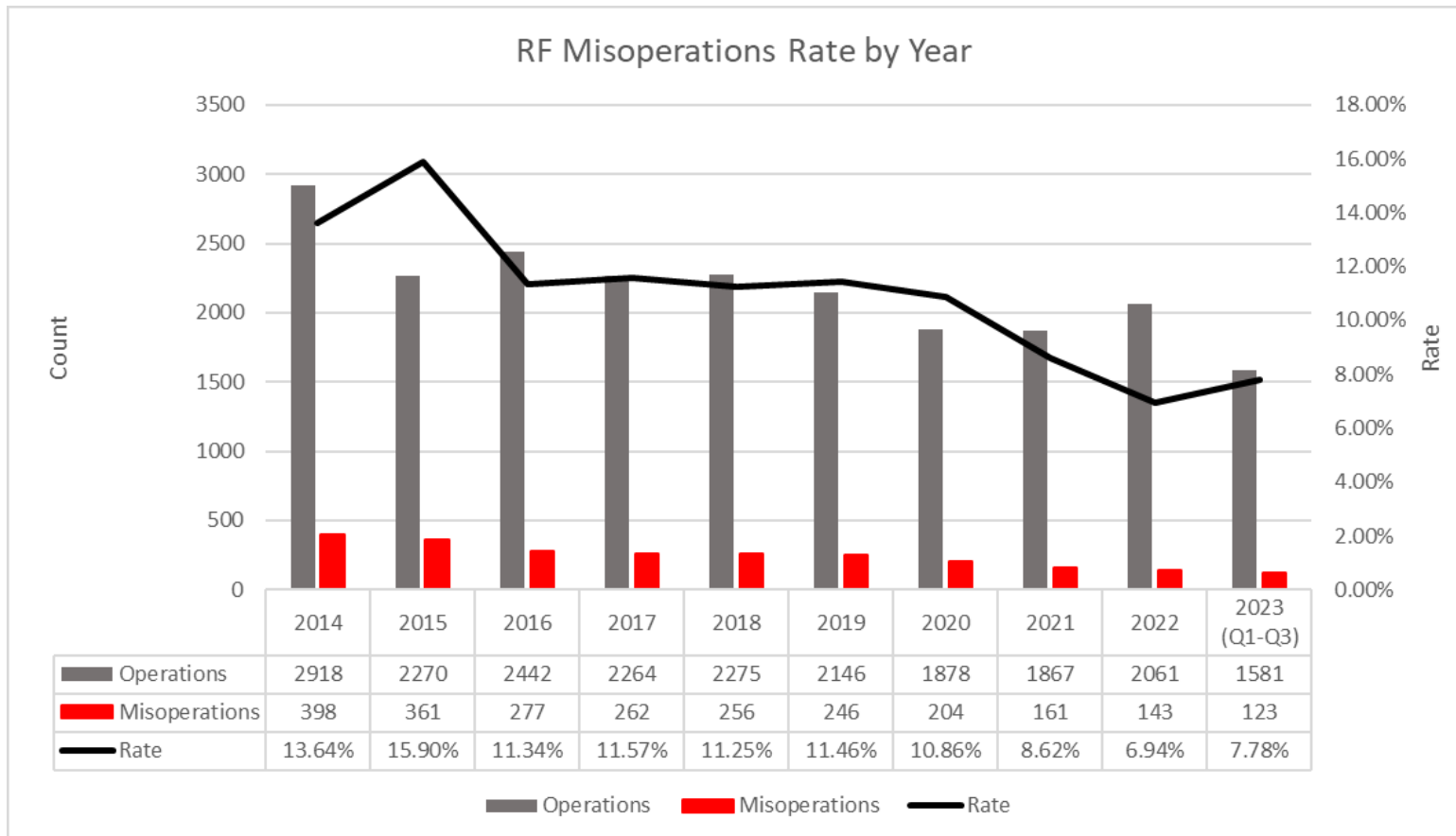
Quantity of Physical Security Events with Some Loss of Load for 2020-2022



Source: Electricity Information Sharing and Analysis Center (E-ISAC)

MISOPERATIONS

Protection system failure to operate, delay in operation, or operating when not required during either a fault or non-fault condition



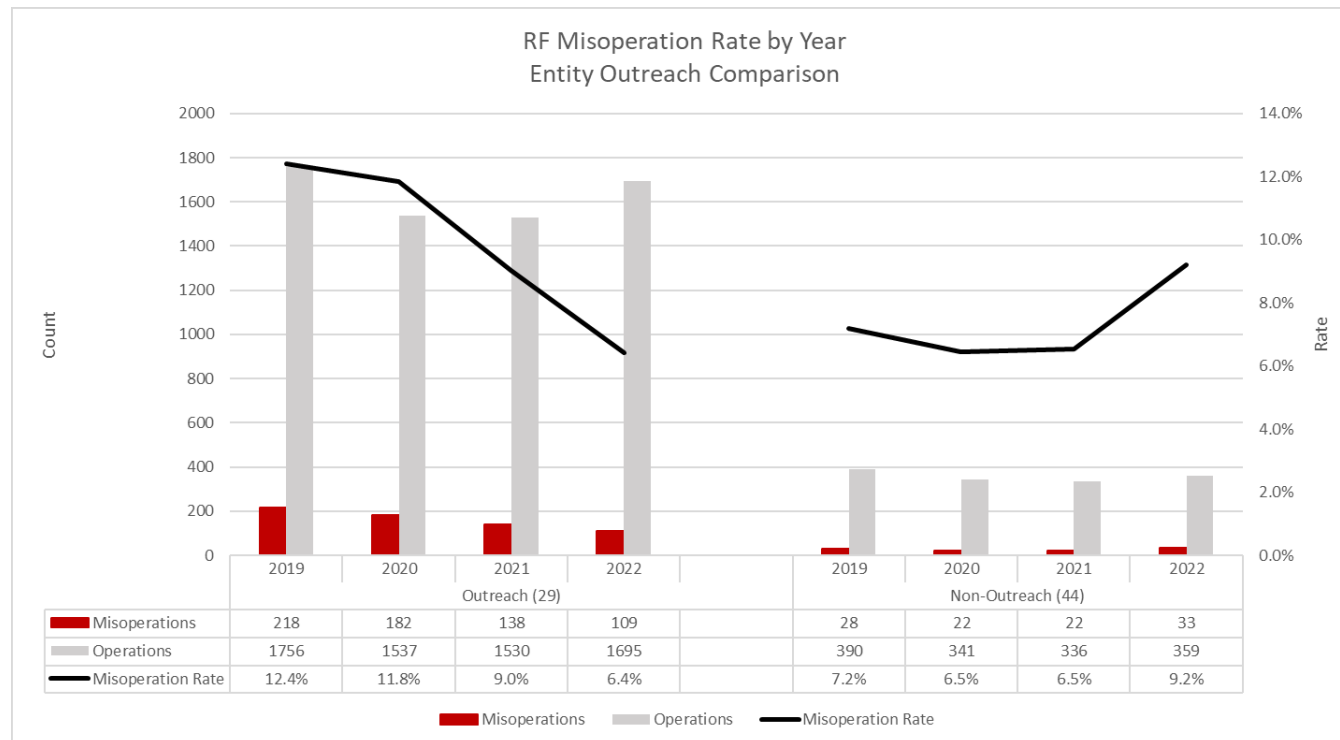
Performance

- Misoperation rate, count, and protection system operations have significantly trended downward over time since 2014
- Uptick in 2023 due to repeat misoperations and several instances where one event caused multiple misoperations
- Reduction in misoperations caused by human performance

MISOPERATIONS

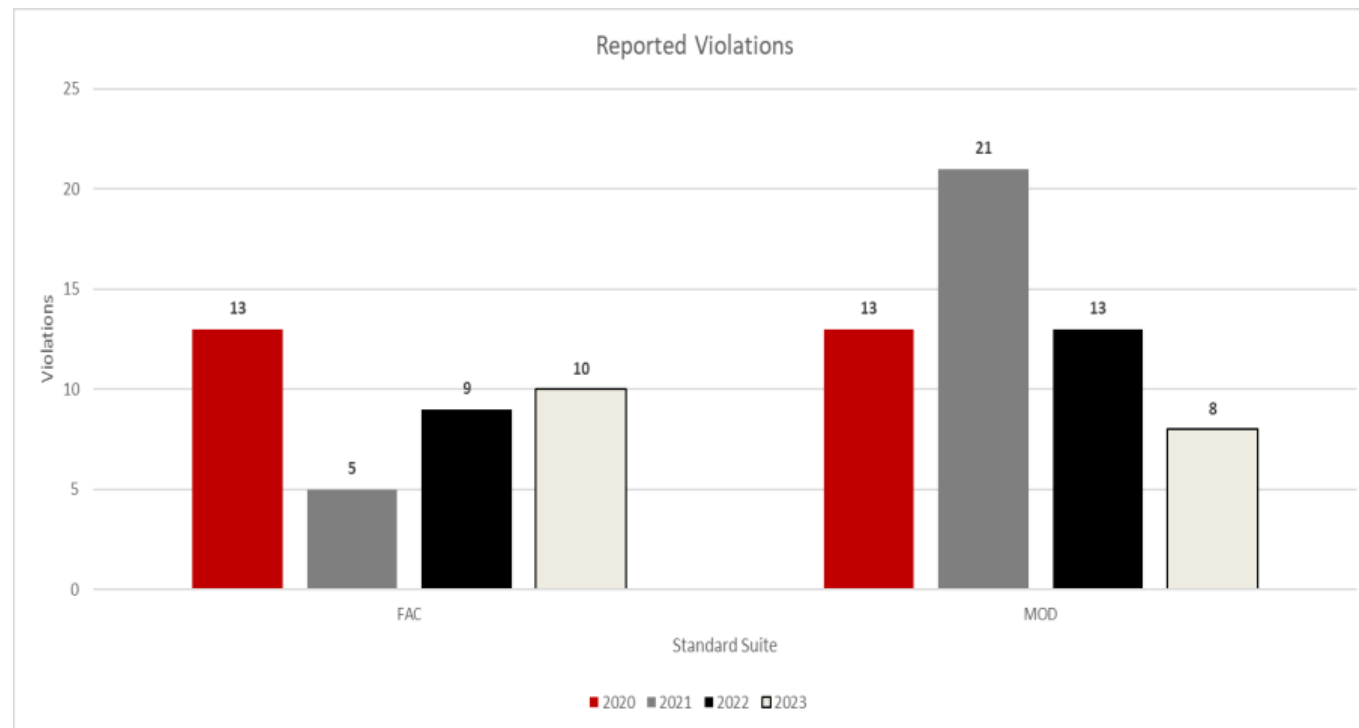
Monitoring/Management of Risk

- TPL-001-5.1 requires a more extensive review of protection systems
- Participation in extended engagements with RF
- Certain entities developed mitigation plans and dedicated significant resources
- RF Protection Subcommittee conducts quarterly peer reviews
- RF Protection System Workshop
- RF performs more detailed analysis around equipment failures



MODELING

Planning and operating the BPS requires accurate models to detect and prevent potential reliability and security issues. As the grid evolves with the integration of new technologies, it is critical to ensure that models effectively represent the behavior of equipment installed on the system.



Performance

- MOD has the 2nd highest reported violations (non-CIP)
- MOD have improved over time
- FAC has experienced an uptick since 2021

Monitoring/Management of Risk

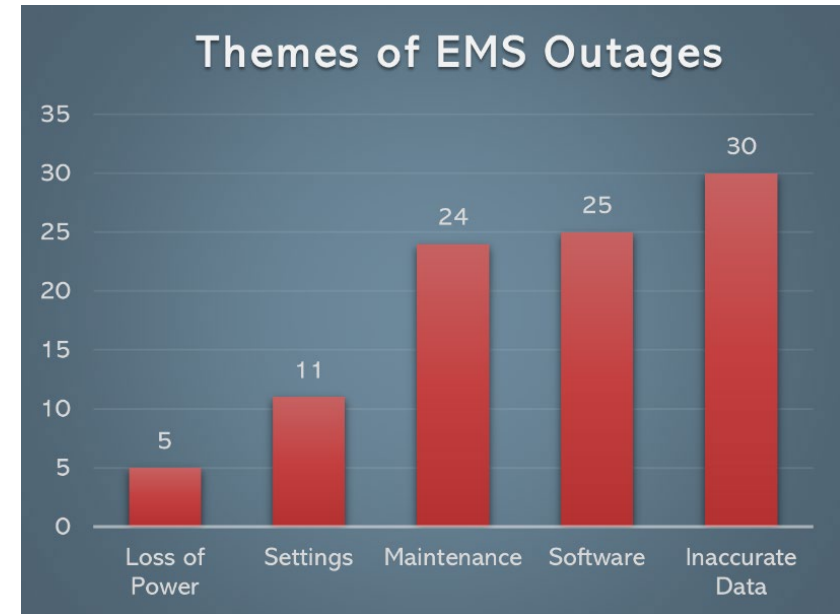
- Continuously review compliance metrics
- FERC Order No. 881
- Representation of IBRs in models: Standards and Guidelines
- RF to develop enhanced error detection

SITUATIONAL AWARENESS

Examines the availability of information needed to make informed decisions that facilitate the reliable operation of the BPS.

Performance

- EMS outages remain consistently low since 2020
- Main themes around EMS outages are around:
 - Inaccurate data
 - Software
 - Maintenance



Monitoring/Management of Risk

- Threat Intelligence Program (TI) enhances situational awareness capabilities with new partnerships, tools, and processes
- TI enabled RF to monitor, assess, and then push notifications to internal and external stakeholders
- TI raises awareness of emerging or imminent cyber, physical, and operational threats

Increasing impact of cold weather on resource availability

Extreme cold weather events in our footprint are increasing and constraining resource availability. Policy change and conventional resource retirements made natural gas a dominant fuel source, and it is extremely susceptible to cold weather events. The wind and solar that are supplementing coal retirements are also vulnerable to cold weather, increasing the impact of these events.

Monitoring

- Tracking progress on FERC/NERC joint inquiry reports (Winter Storm Uri and Elliott)
- Fuel source policy changes at the federal, state, and RTO/ISO level
- Perform studies examining extreme weather reliability impacts

Management

- Winter Readiness Program (for plants historically unavailable during extreme weather) that shares best practices and lessons learned regarding winter preparation activities
- Develop audit approach for enhanced NERC Reliability Standards

Rapid pace of change increasing resource uncertainty and supply chain issues

Aggressive federal and state policies are influencing carbon-based resource retirements. The wind and solar resources that are supplementing these retirements require energy storage to ensure improved availability. The need for storage technologies is concurrent with the prominence of electric vehicles and increasing demand. The raw materials to support both solar and lithium-ion battery storage technologies are limited, causing supply chain issues and resource uncertainty.

Monitoring

- Projected resource growth and retirements
- Federal, state and local policies related to decarbonization, the incentivization of new technologies and manufacturing
- Information on raw material availability and advancements in recycling technologies and resource connection delays
- Perform planning studies that evaluate high risk scenarios in generation and load changes

Management

- Continue education and outreach efforts to drive policy decisions, including sharing industry and RF study results
- Obtain additional outside data sources to better analyze the risks



QUESTIONS & ANSWERS

Johnny Gest

Manager - Engineering &
System Performance

johnny.gest@rfirst.org

THANK YOU

***Join us for our next Tech Talk -
April 15th***

David Batz - Managing Director
Cyber & Infrastructure Security at
EEI

[Webinar Link](#)

