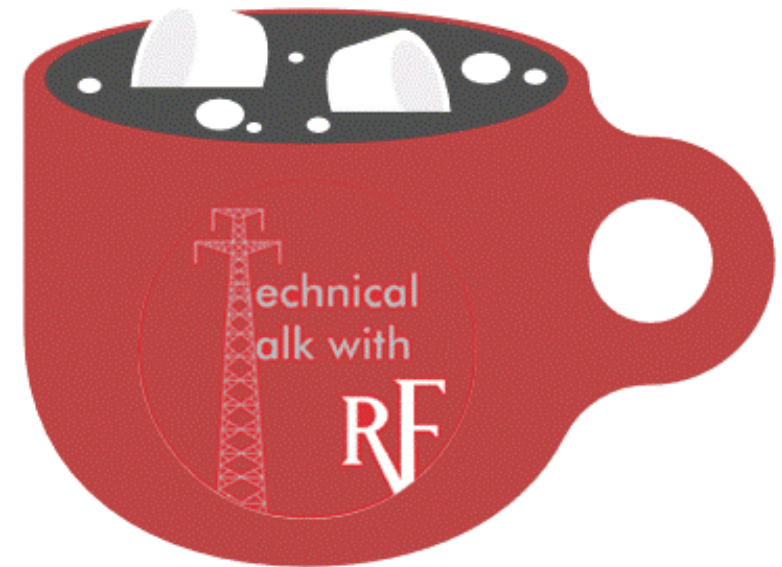


WELCOME TO TECHNICAL TALK WITH RF

January 13, 2025



TECHNICAL TALK WITH RF

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[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 and Generation Verification Forms

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 [newsletter](#):

- [2024 ERO Periodic Data Submittal schedule](#)
- Timing of Standard effectiveness

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

- 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](#)




TECH TALK REMINDER

Are you getting our newsletter
First Things RFirst?

- Sign up today [here](#)

Also, make sure to check out
our [2023 Impact Report](#)




First Things RFirst
Expert analysis for a more reliable, secure and resilient electric grid, plus news and updates for RF stakeholders.

June 2024

Insights & Analysis


ReliabilityFirst 2024 Summer Reliability Assessment



RF's Summer Reliability Assessment projects the PJM and MISO areas to have adequate resources under normal demand, but if demand or resource outages are experienced beyond those projections, there is an increased likelihood that corrective actions would be needed. This risk is low in the PJM area, but it is elevated in the MISO area.

[Click here to read more](#)

The Lighthouse: The challenges of Operational Technology cyber security



Our modern civilization relies on Operational Technology (OT) to keep essential services working. The electric grid, pipelines, water treatment plants, transportation systems, and many more all depend on OT to deliver reliable services. Operating these systems securely comes with a host of cyber security challenges.

[Click here to read more](#)

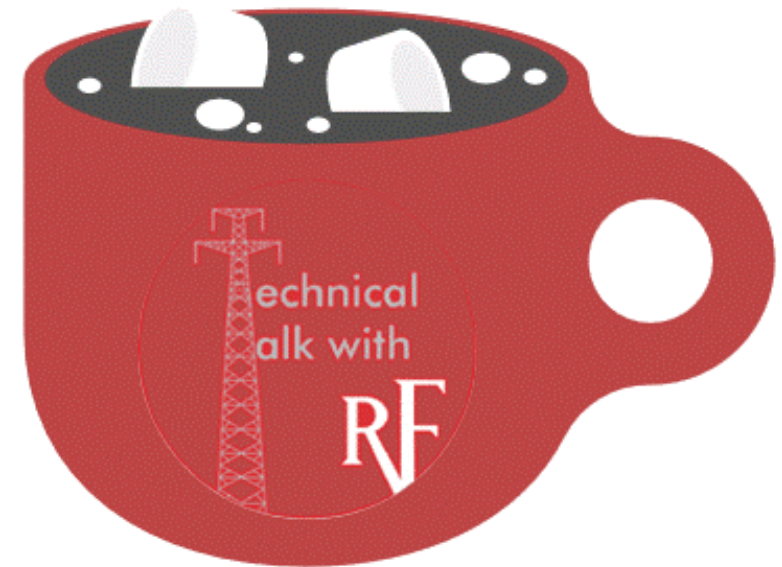


FORWARD TOGETHER.

2023 IMPACT REPORT

WELCOME TO TECHNICAL TALK WITH RF

January 13, 2025



TECH TALK ANNOUNCEMENT



2024 Long Term Reliability Assessment

[LTRA Report](#) | [LTRA Video](#)

2024 Long-Term Reliability Assessment

Read here: [Link](#)

NERC has released the 2024 Long-Term Reliability Assessment (LTRA), which annually assesses the adequacy of the Bulk Electric System in the United States and Canada over a 10-year period. The LTRA projects electricity supply and demand, evaluates transmission system adequacy, and discusses key issues and trends that could affect reliability.

This reliability assessment was developed through a comprehensive and transparent peer-review process that leverages the knowledge and experience of system planners, RAS members, NERC staff, and other subject matter experts. This assessment was also reviewed by the RSTC, and the NERC Board of Trustees subsequently accepted this assessment and endorsed the key findings.

This report is intended to inform industry, policymakers, and regulators as well as to aid NERC in achieving its mission to ensure the reliability of the North American BPS.



TECH TALK ANNOUNCEMENT



Save the Date: Industry Engagement Workshop

Reliable IBR Integration and Milestone 3 of FERC Order No.901

January 15-16, 2025 8:30 - 4:30 MT | [Virtual](#) & [In-Person Phoenix, AZ](#)

NERC's Engineering and Standards Development teams will host a technical workshop focused on the reliable integration of Inverter-Based Resources (IBR) and FERC Order No. 901 **Milestone 3**.

On January 15, NERC's Engineering staff and industry experts will discuss the changing characteristics of the grid due to shifts in the resource mix. Key topics will include system strength, data validation for models, and performance issues related to inverter-based resources (IBRs).

On January 16, discussions will cover the directives of Order No. 901 Milestone 3 and NERC's Standards Development team's strategies for meeting these requirements. The Milestone 3 drafting teams will provide updates on their respective projects and outline their approach.

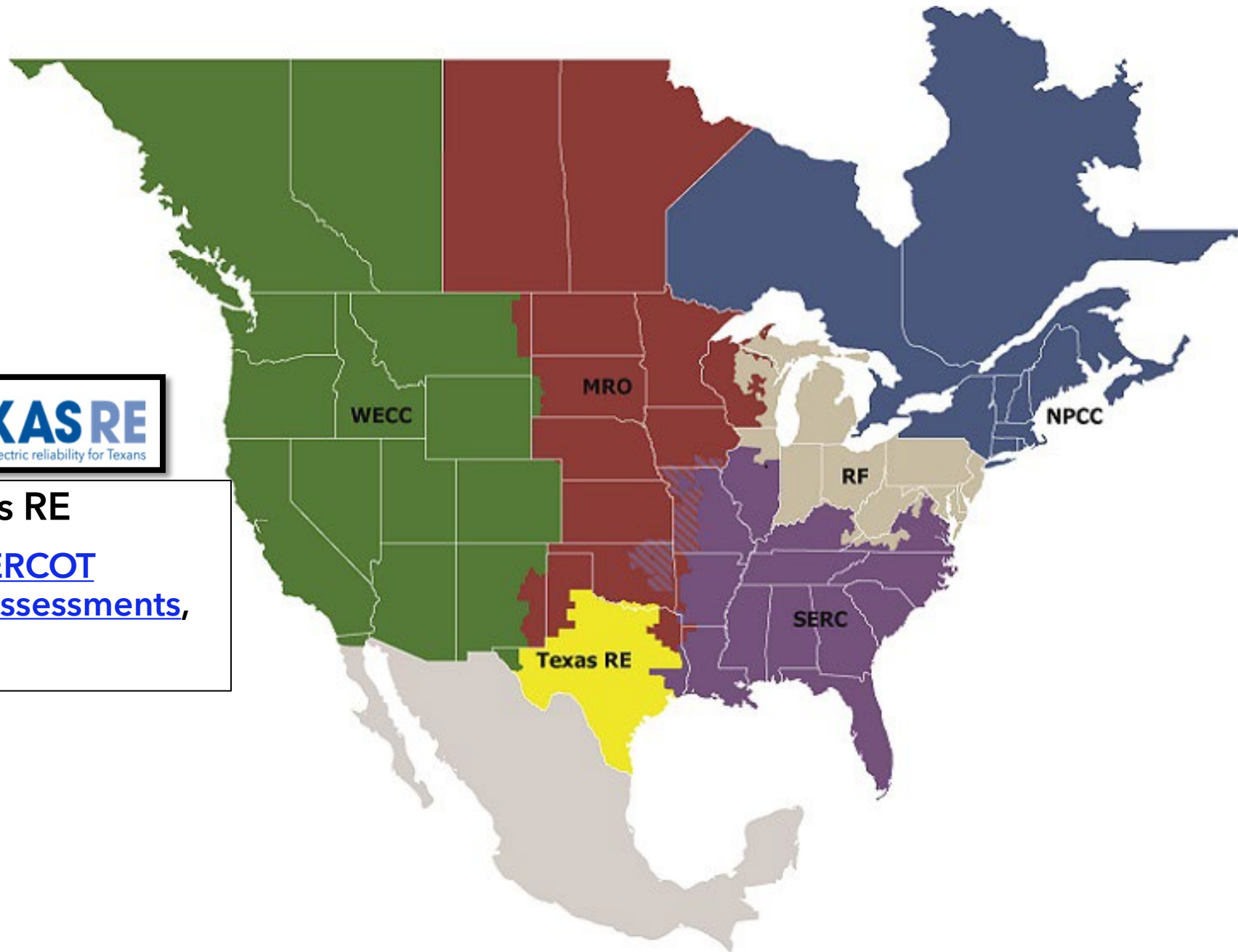
In-person registration will be available in the coming weeks.





Talk with Texas RE

- [NERC and ERCOT Reliability Assessments, 1/21](#)





Reliability & Security Oversight Update

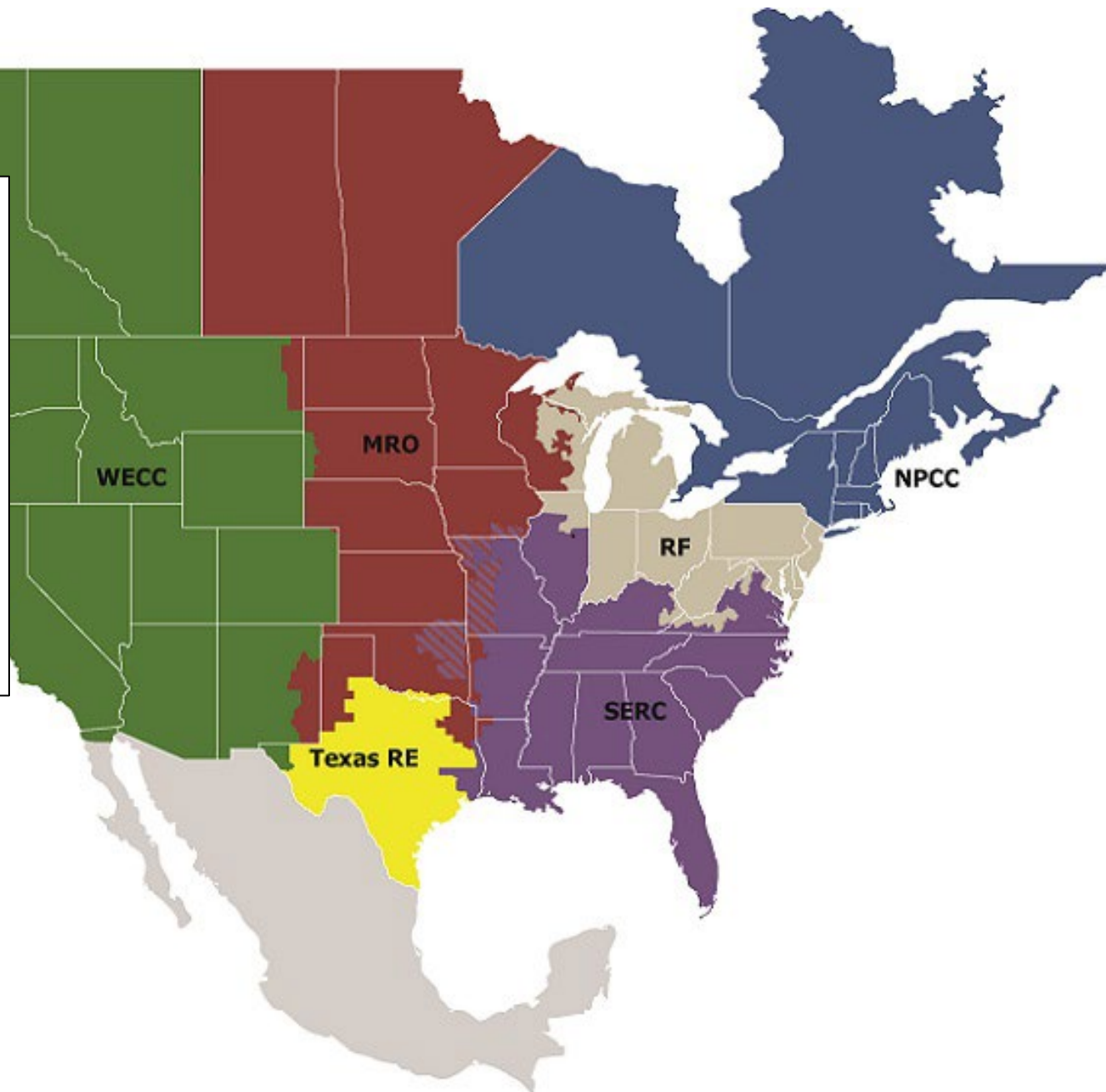
- [January 16](#)

Enforcement Fundamentals (in-person, Irwindale, CA)

- [January 28-29](#)

Grid Fundamentals (virtual)

- [February 25-26](#)





**Your Epidermis Is Showing:
Open-Source
Reconnaissance in the
Electricity Sector Webinar**

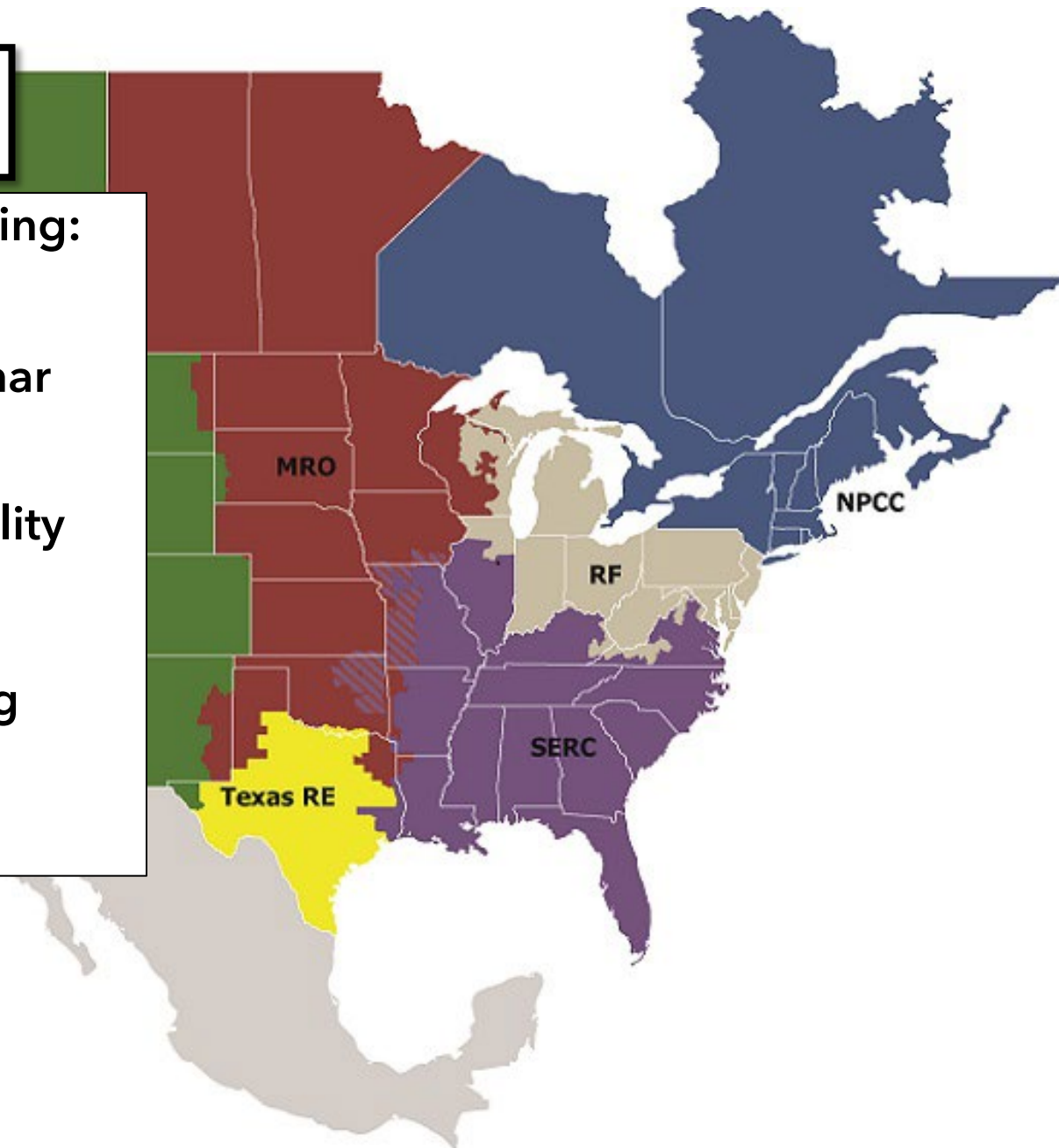
- [January 22](#)

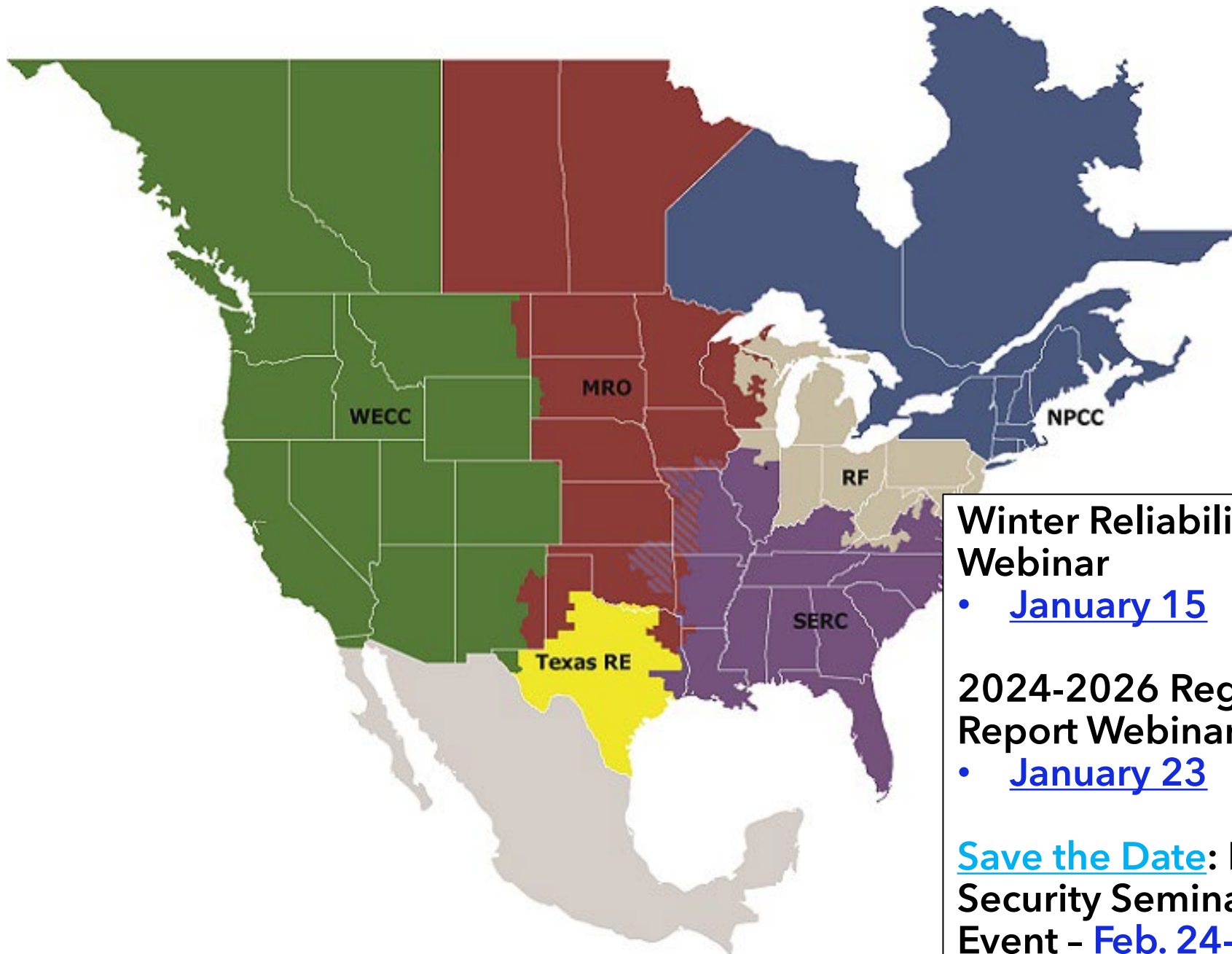
**2024 Long-Term Reliability
Assessment Webinar**

- [January 23](#)

**Penetration (Pen) Testing
Webinar**

- [February 4](#)





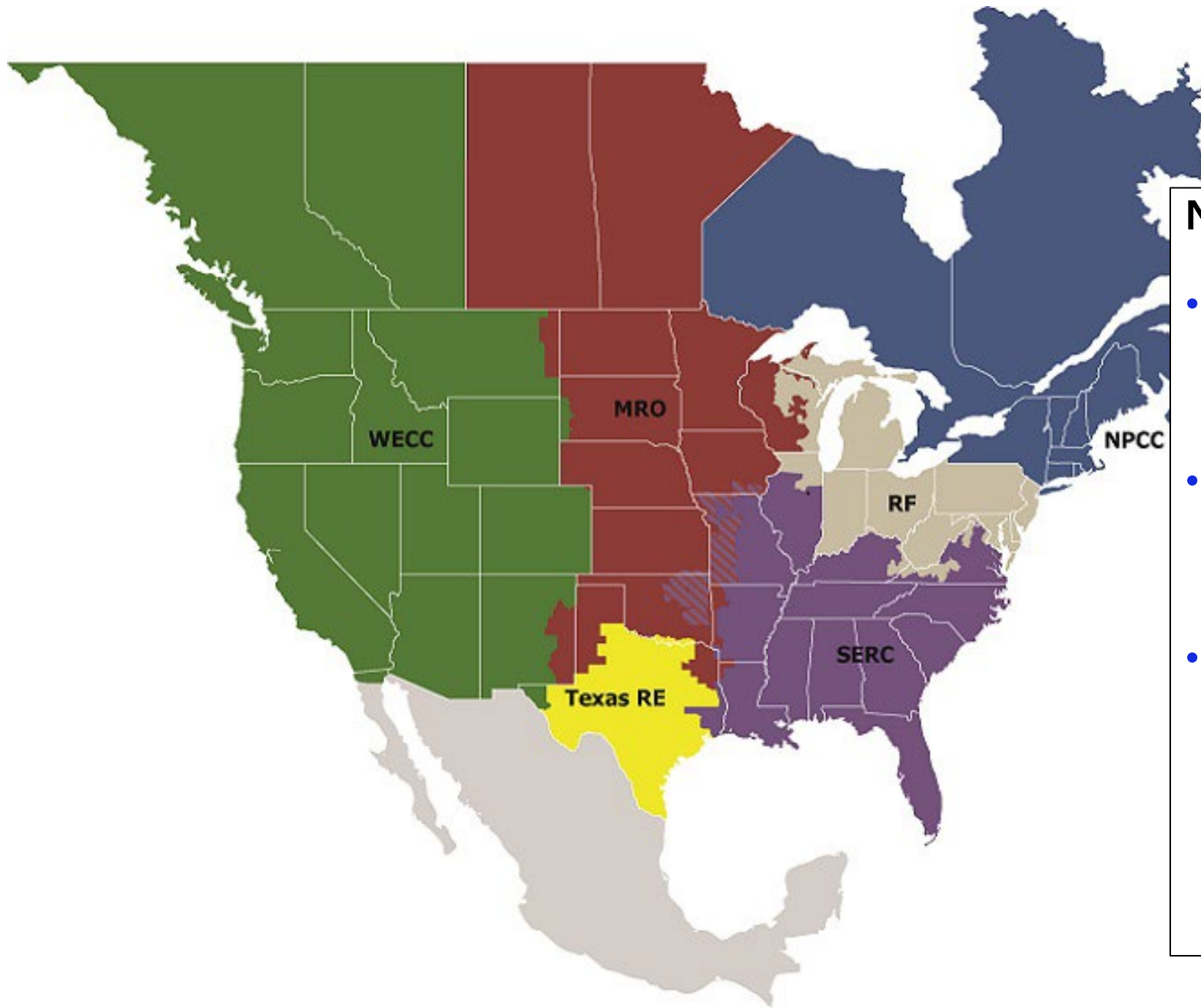
Winter Reliability Assessment Webinar

- [January 15](#)

2024-2026 Regional Risk Report Webinar

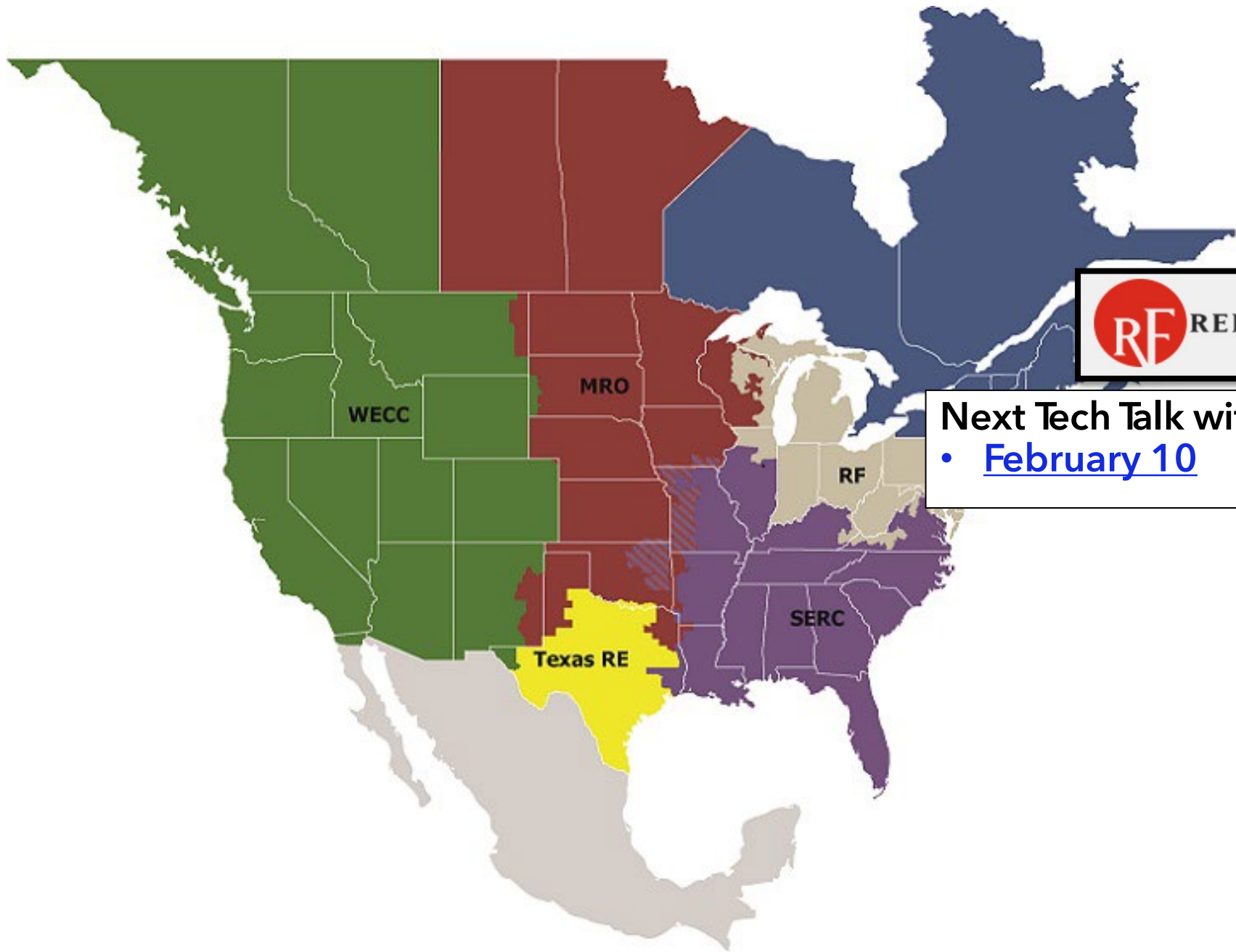
- [January 23](#)

[Save the Date](#): Reliability & Security Seminar and EPRI IBR Event - [Feb. 24-26](#)



NPCC's 2025 Reports

- [NPCC's Winter Reliability Assessment](#)
- [NPCC Northeast Gas/Electric System Study](#)
- [NPCC Common Risk and Control Questions](#)



Next Tech Talk with RF
• [February 10](#)

TECH TALK REMINDER

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

CLICK HERE

MON
13

January 13 @ 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.



TECHNICAL TALK WITH RF

Join the conversation at

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

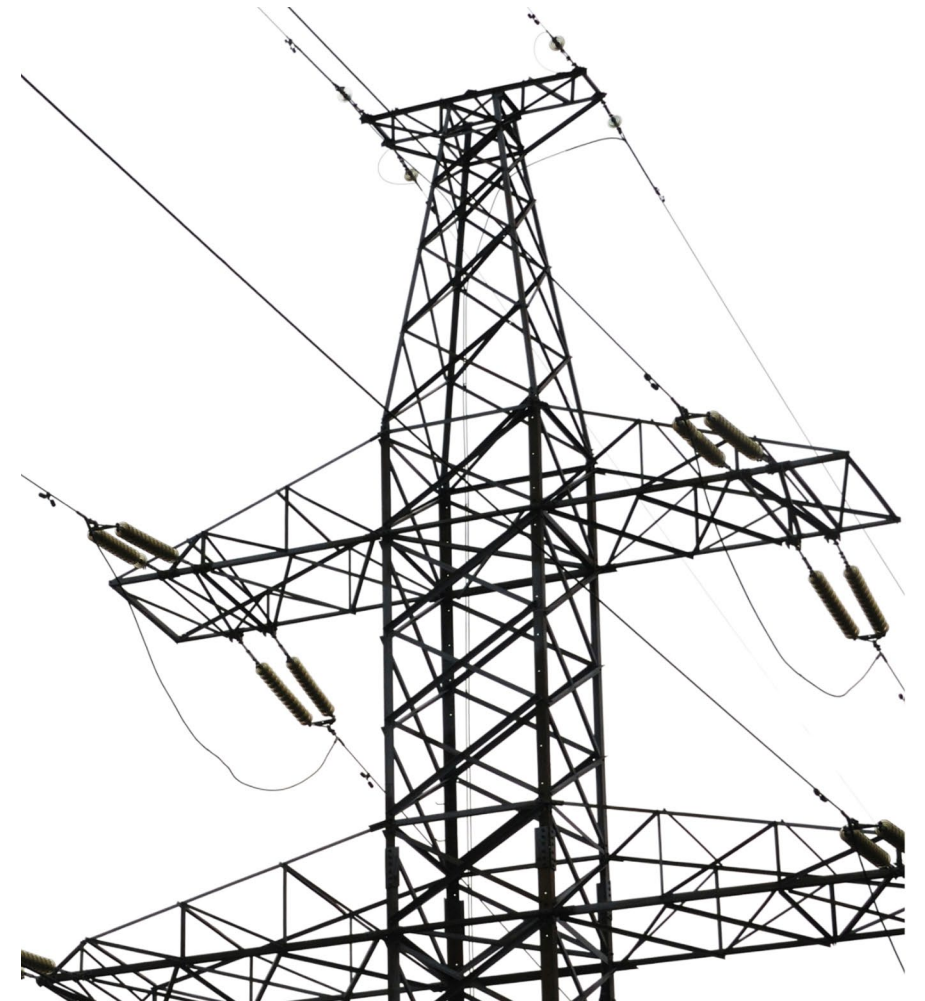
#TechTalkRF



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 DER AGGREGATOR REPORT

- **JOHN PAUL "JP" SKEATH**, SENIOR ENGINEER, ENGINEERING & SECURITY INTEGRATION, NERC

RF'S LONG-TERM RELIABILITY ASSESSMENT PROJECTIONS

- **TIM FRYFOGLE**, PRINCIPAL ENGINEER, ENGINEERING & SYSTEM PERFORMANCE, RELIABILITYFIRST



NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Special Assessment

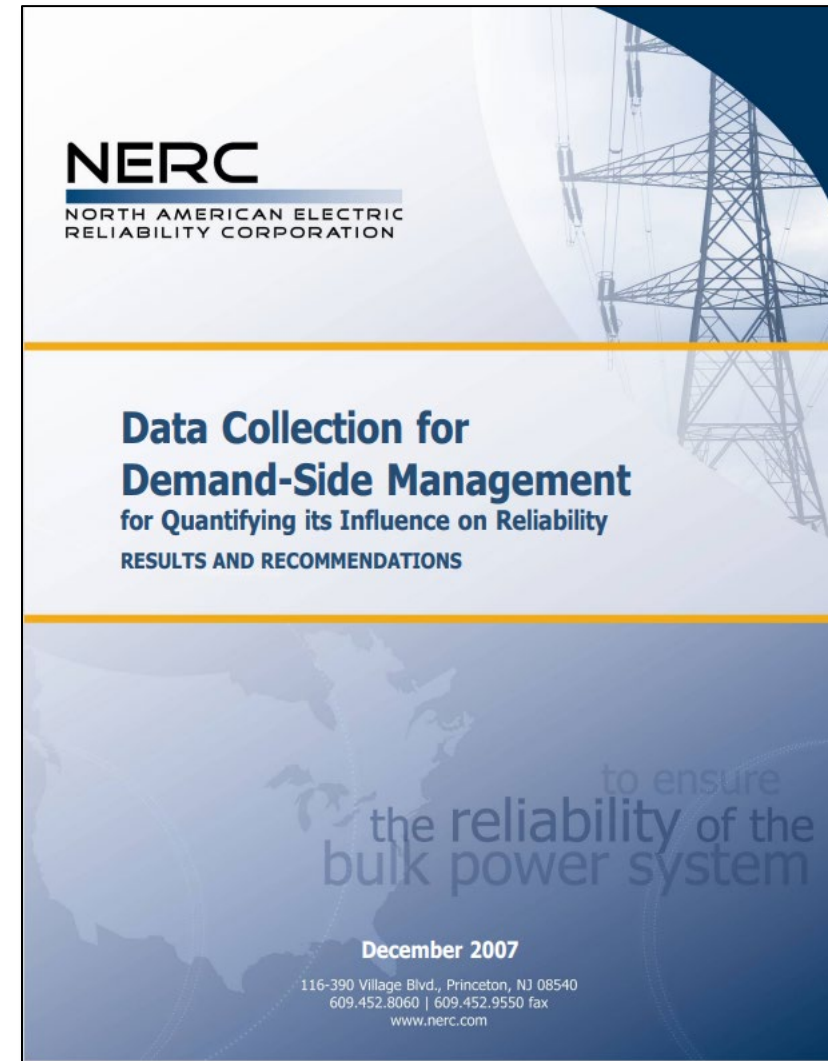
DER Aggregators, the Bulk Power System, and Recommended
Risk Mitigations

JP Skeath, Manager of Engineering and Security Integration

RF Technical Talk

January 13, 2024

- Demand Response
- Demand Response Aggregators
 - FERC 706
- Distributed Energy Resources
 - IEEE 1547-2003, -2018
 - IEEE 2030.11 (DERMS)
- Distributed Energy Resource Aggregators
 - FERC 2222
- FERC 901 - ongoing
 - FERC 901 relates to Registered IBRs, unregistered IBRs, and IBR-DERs
 - FERC 2222 includes Demand Response for DER Aggregators.



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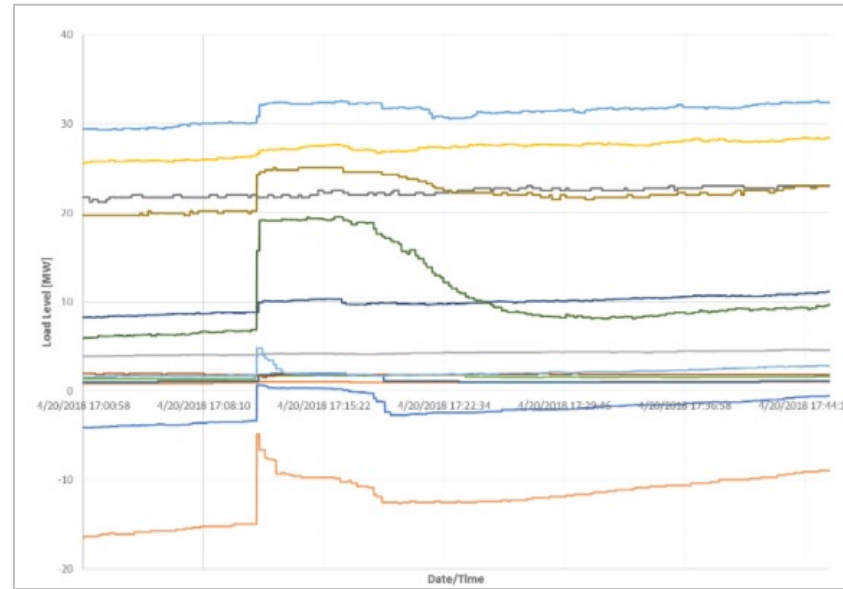
April and May 2018 Fault Induced Solar Photovoltaic Resource Interruption Disturbances Report

Southern California Events: April 20, 2018 and May 11, 2018
Joint NERC and WECC Staff Report

January 2019

RELIABILITY | ACCOUNTABILITY

3353 Peachtree Road NE
Suite 600, North Tower
Atlanta, GA 30326
404-446-2560 | www.nerc.com



- DER Trips due to Bulk Power System Faults
- In aggregate, attributes to 100-200 MW net load jump
- Follows ~ 300 second (5 minute) reconnection logic
- These are currently “independent” – **what happens under one entity control?**

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RELIABILITY CORPORATION

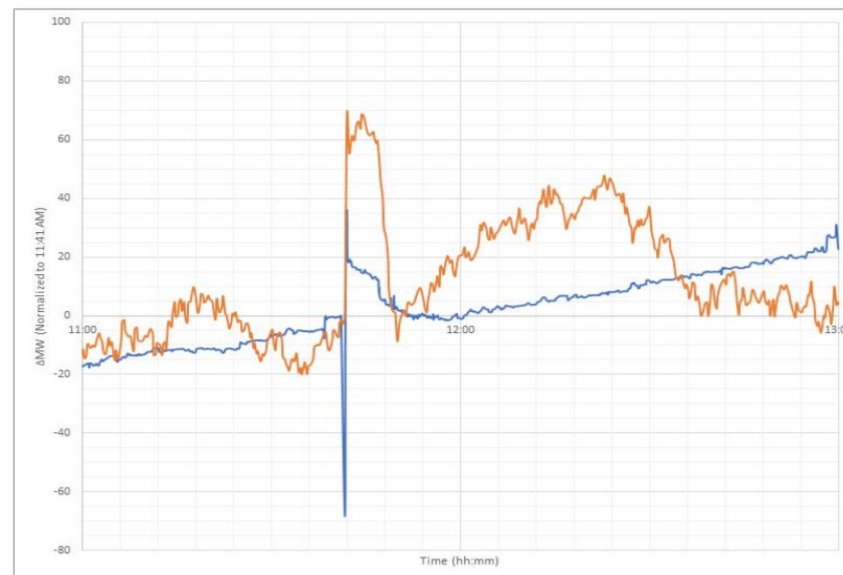
San Fernando Disturbance

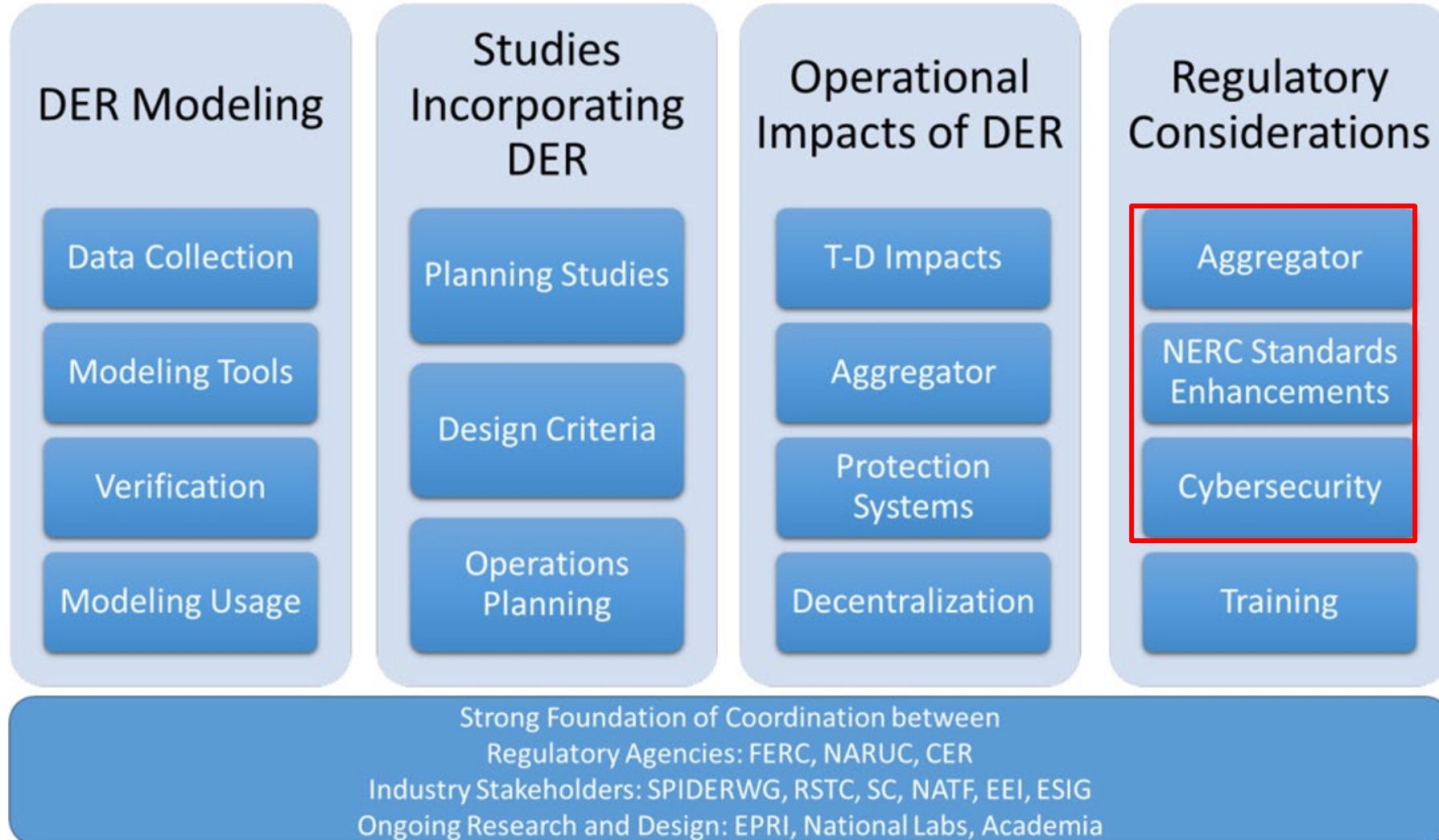
Southern California Event: July 7, 2020
Joint NERC and WECC Staff Report

November 2020

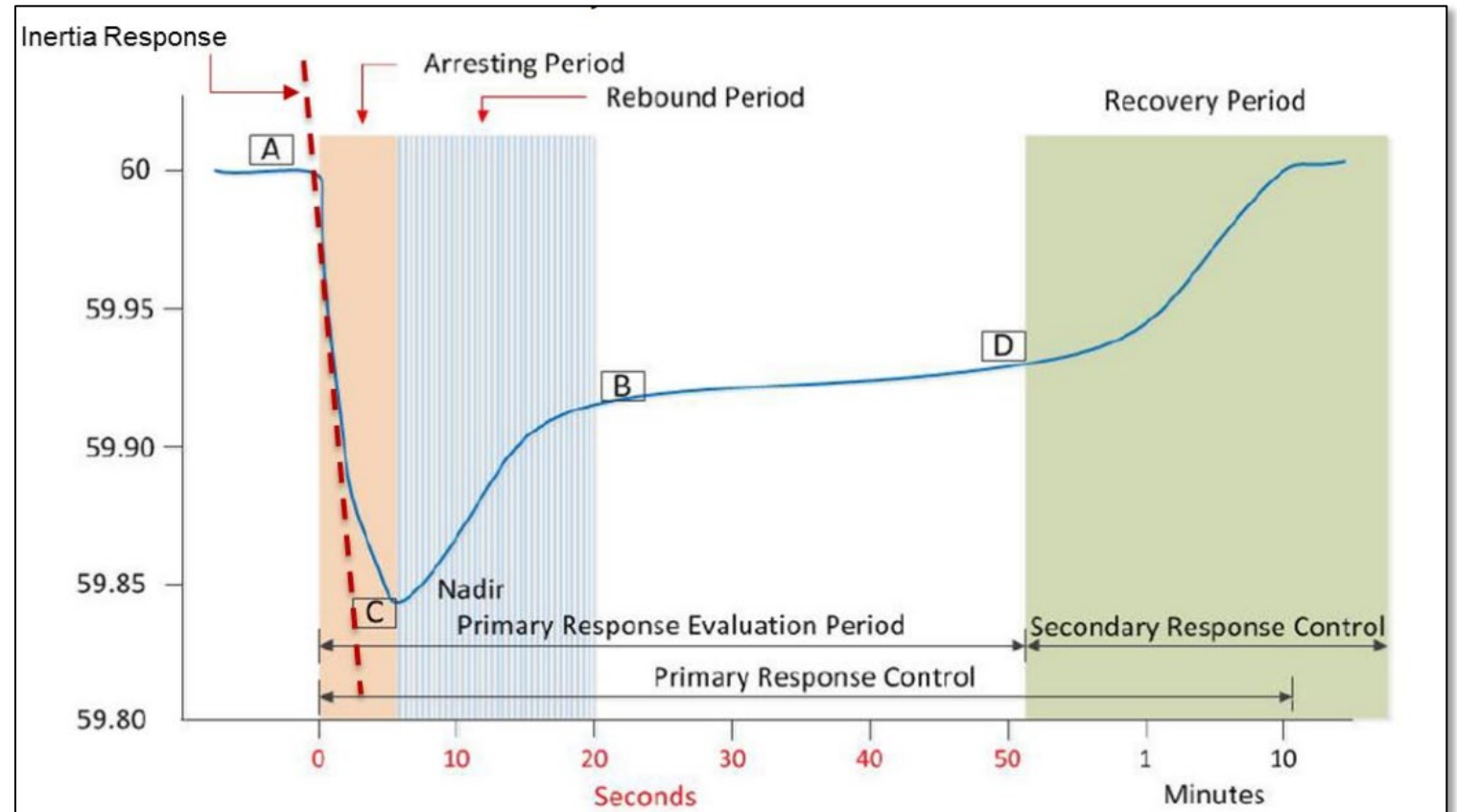
RELIABILITY | RESILIENCE | SECURITY

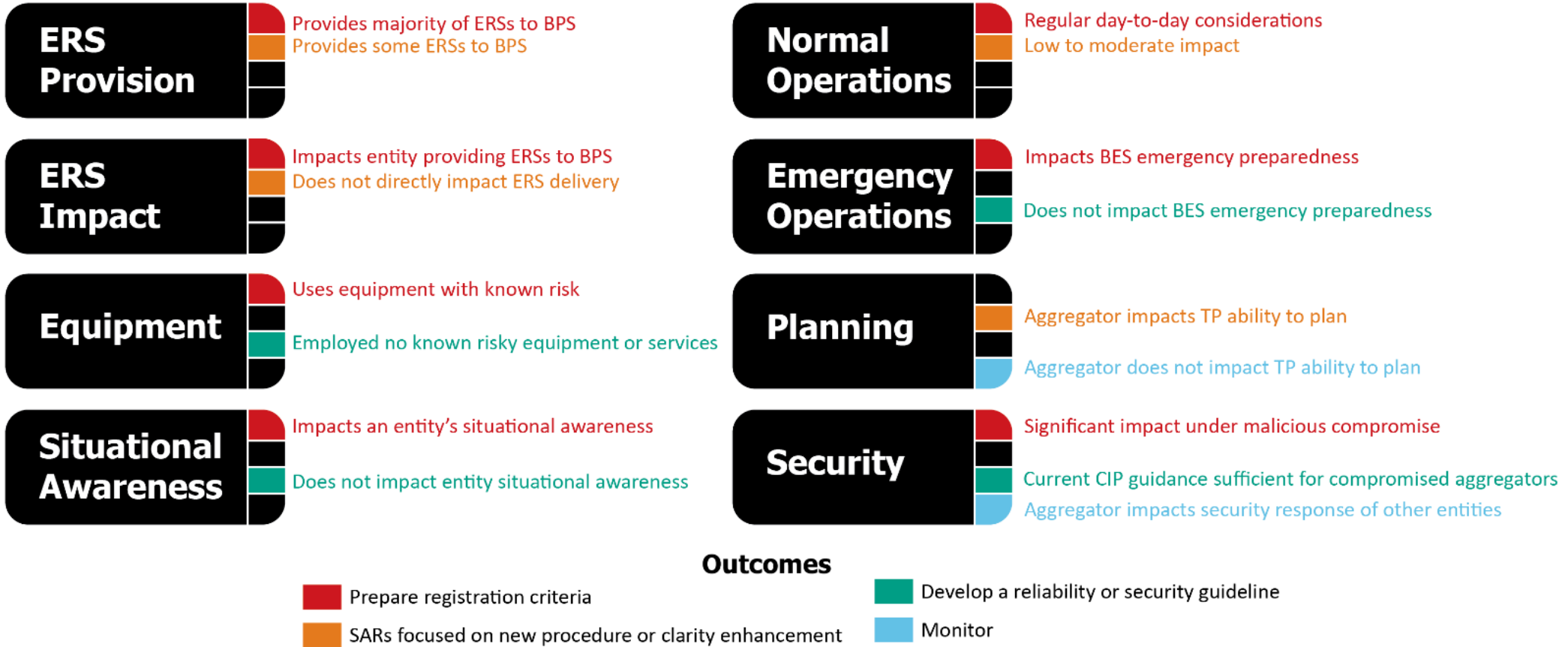
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- Essential Reliability Services
 - Voltage Support
 - Net Demand Ramping
 - Frequency Response
- BPS Operations
 - Situational Awareness
 - Normal operations
 - Emergency Operations
- BPS Planning
- Physical and Cyber Security





All results from Identify, validate, prioritizing risk, the outcome is the recommended risk mitigation

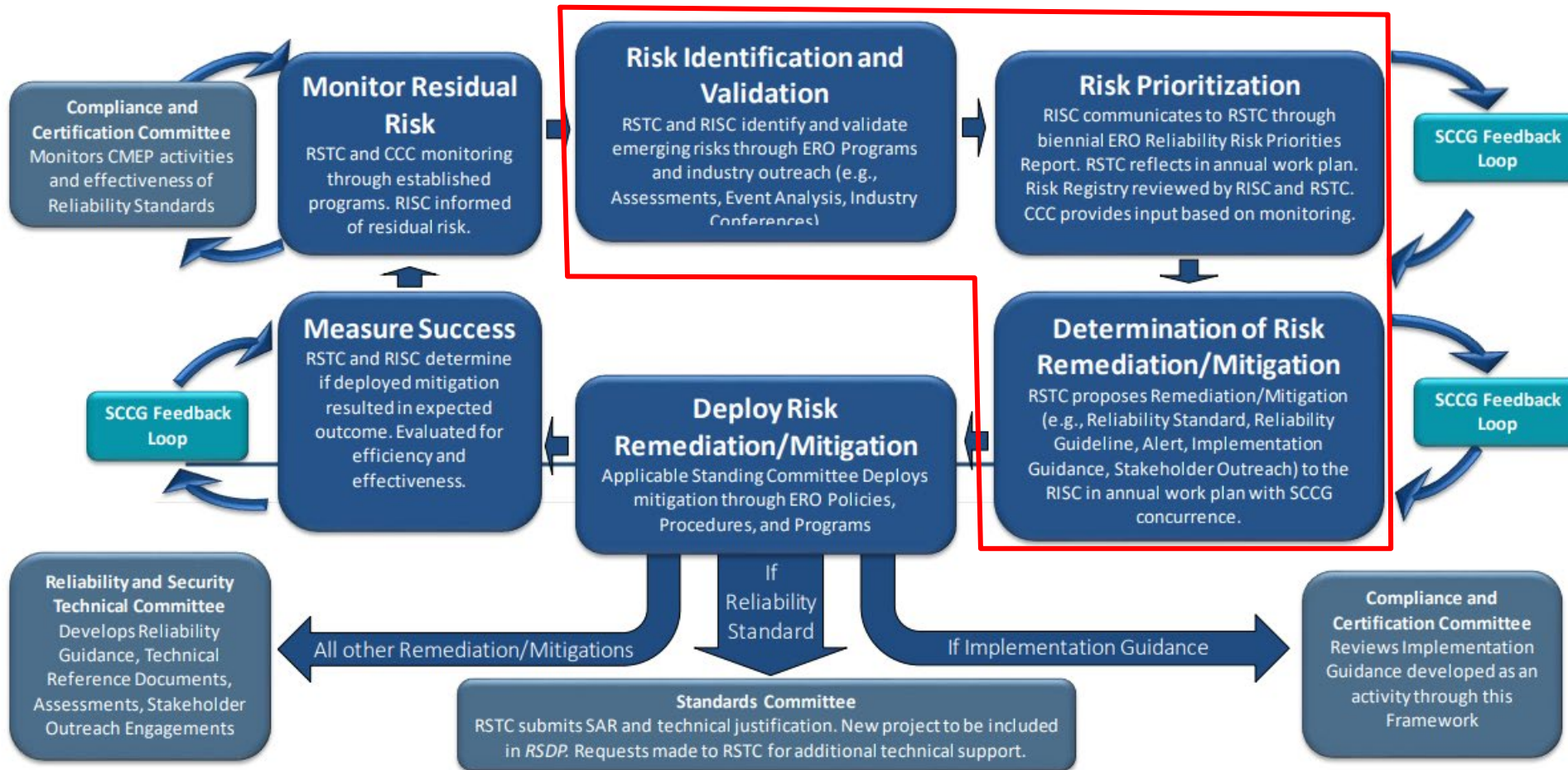
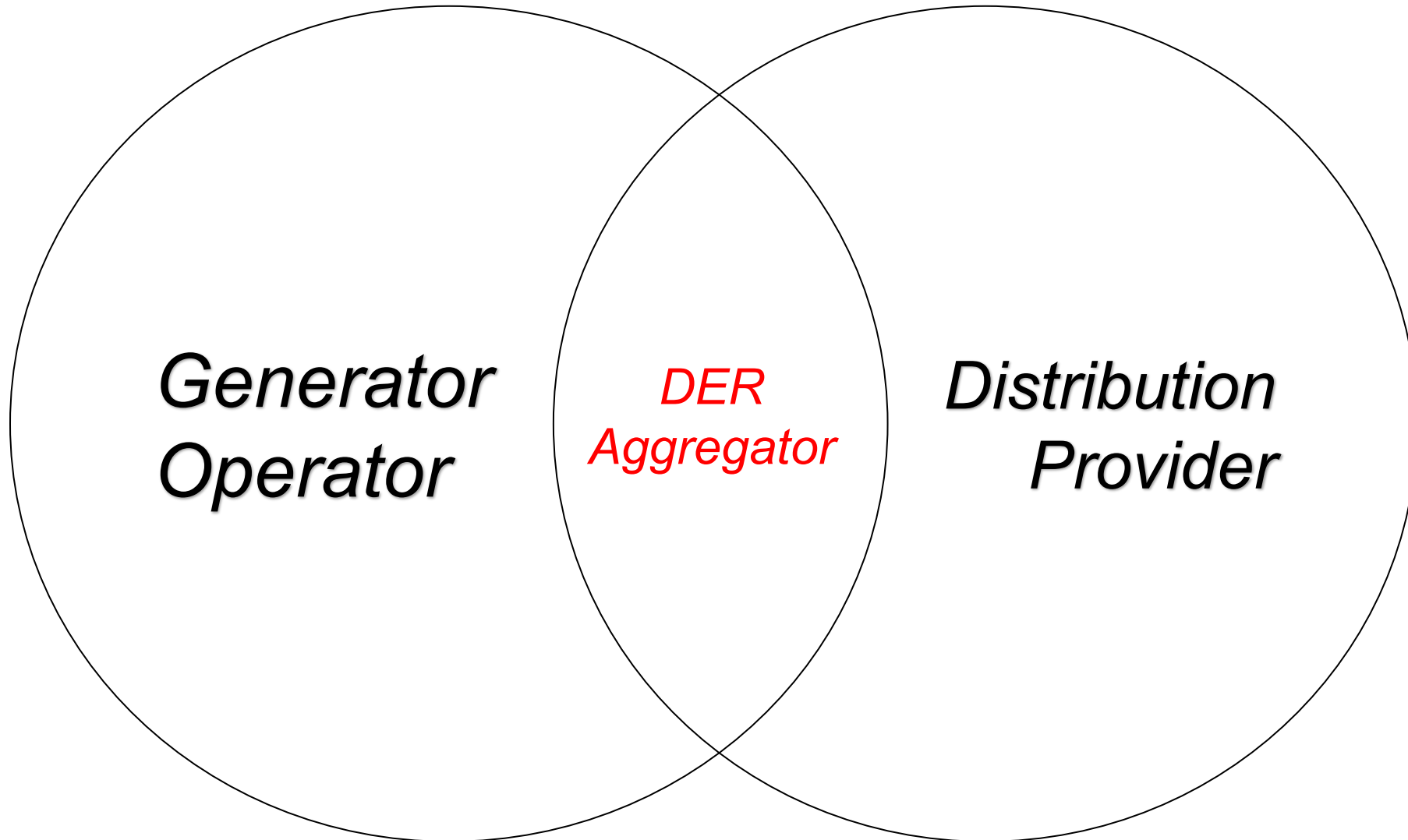


Figure 2: RSTC, RISC, SC, and CCC Coordination within the Risk Framework

- BES Reliability Operating Services (BROS)

***Generator
Operator***

***Distribution
Provider***



- Surveyed all ISO/RTOs for implementation of FERC 2222
 - Voluntary
 - Received all ISO/RTOs (including Canadian)

- What is the best contact for your individuals/teams developing rules for the market/tariff/operational updates related to FERC order 2222?
- Can you describe your current schedule for tariff updates, and operational procedures to follow, for FERC order 2222 and DER Aggregators in wholesale market participation?
- What is your current status within that effort?
- Can you describe plans for telemetry requirements?
 - Do these plans include requirements on monitoring versus operational control?
- Can you provide the list of energy/ancillary services being evaluated?
- What kinds of resources are anticipated to be part of DER aggregation? Ex. Microgrids, Demand Response?
- How will policies from state PUCs apply to DER aggregators and impact your policies? Can you describe how the retail market policies in your area take into account your wholesale market policies?
- Can you send us a publicly available source for the number of entities seeking DER Aggregator status, their size, composition, and types of energy or ancillary services provided?
 - If not publicly available, can you share this list with us?
- Are there any other key insights you wish to be shared about this process?

- Middleware and other third parties translate commands in the command chain from DER Aggregator to DER device
- Market limits exist as high as 1 MW in individual unit for voluntary, 5-10 MW for mandatory rules
- At least one state PUC has recognized reliability impact of DERs
- Markets have various rules on composition for load assets and generation assets indicating a DP and GOP like functions in its control center.

- **Consist of Reliability Principles**

- Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
- The frequency and voltage of interconnected bulk power systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
- Information necessary for the planning and operation of interconnected bulk power systems shall be made available to those entities responsible for planning and operating the systems reliably.
- Plans for emergency operation and system restoration of interconnected bulk power systems shall be developed, coordinated, maintained, and implemented.
- Facilities for communication, monitoring, and control shall be provided, used, and maintained for the reliability of interconnected bulk power systems.
- Personnel responsible for planning and operating interconnected bulk power systems shall be trained, qualified, and have the responsibility and authority to implement actions.
- The reliability of the interconnected bulk power systems shall be assessed, monitored, and maintained on a wide-area basis.
- Bulk power systems shall be protected from malicious physical or cyber-attacks.

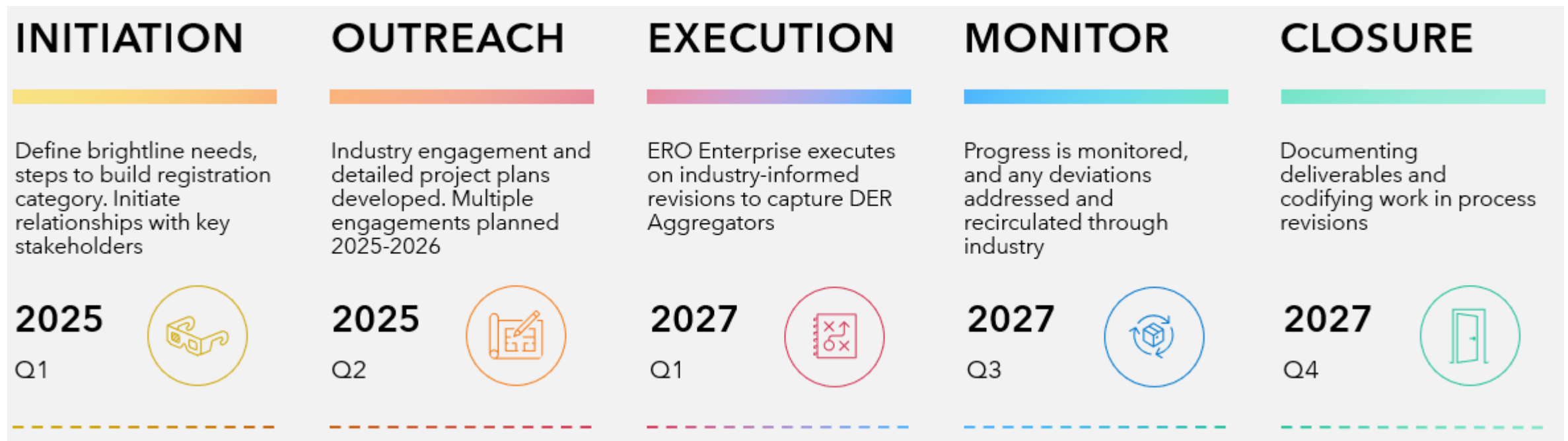
- Identified a set of standards that are impacted by DER Aggregator for
 - Performance under Operating Instructions
 - Performance under TOP Voltage Schedules
 - Performance under Normal and Emergency Operations
 - Performance under Transmission Planning Practices (data)
 - Performance under BPS Protection and Control
 - Classification in CIP

1. NERC found that the DER Aggregator's unique function reflects aspects of a GOP and a DP.
2. NERC found that the services that a DER Aggregator employs are operated from predominantly cloud-based systems without currently applicable mandatory minimum security controls.
3. NERC found that the ISO/RTOs generally started requiring telemetry on the aggregate DER under a DER Aggregator at 5–10 MW.
4. NERC found that individual ISO/RTO rules treat the DER Aggregator's composition of DER differently depending on specific fuel types as well as injection (i.e., generation) or consumption (i.e., load) of power. This finding also reinforces key point number 1.

5. NERC found that at least one state regulator has identified BPS impact (i.e., value) for DERs.
6. NERC found that DER Aggregators have an impact on standards for the planning and operation of the BPS, primarily on IRO-001, IRO-010, TOP-001, TOP-003, FAC-001, FAC-002, MOD-032, TPL-001, the CIP family of standards, the PRC family of standards, COM-001, COM-002, EOP-004, EOP-005, EOP-011, and VAR-002. These standards touch on the following impacted mechanisms in NERC’s Reliability Standards:
 - a. Performance Under Operating Instructions
 - b. Performance Under TOP Voltage Schedules
 - c. Performance Under Normal and Emergency Operations
 - d. Performance Under Transmission Planning Practices
 - e. Performance Under BPS Protection and Control
 - f. Classification in CIP
7. NERC found that the potential DER Aggregator growth is in the range of hundreds of megawatts to thousands of megawatts of program expansion.

- Begin registration process for unique DER Aggregator role.
 1. A newly registered DER Aggregator function should capture both load and generation assets as an absolute value in any capacity brightline. There should be leeway to differentiate load and generation as subclassifications of the absolute value brightline and these brightline values should apply to demand-response aggregators, especially for the load subclassification.
 2. A newly registered DER Aggregator function should capture the unique way the aggregator communicates and operates in its role that spans the transmission and distribution interface. In particular, such a function should allow for more than one BPS bus at its “virtual” point of interconnection such that data sharing and communication is clear to the success of BPS planning and operations.
 3. A newly registered DER Aggregator function should capture any cloud-based architecture employed for its integration into markets and reflect those architectures in a generalized manner to their BPS security posture.

- Draft timeline and milestone target. **Dates not firm**
 - Intended to follow major NERC Work Plan Priorities for 2025 and 2026
 - Incorporate lessons learned and build up from industry and stakeholders



- Registration of this entity will need assistance from many stakeholders
- FERC 901 does not address DER Aggregators completely
 - FERC 901 relates to Registered IBRs, unregistered IBRs, and IBR-DERs
 - FERC 2222 includes Demand Response for DER Aggregators.
- States can help by beginning a look at DER impacts on the transmission system
 - IEEE 1547-2018
- Come ready to derive bright-line thresholds in upcoming industry engagements
 - “Virtual” point of interconnection versus direct connection

- NERC System Planning Impacts of DER Working Group (SPIDERWG) guidance
 - <https://www.nerc.com/comm/Pages/Reliability-and-Security-Guidelines.aspx>
- Data, Modeling, and Verification
 - https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Reliability_Guideline_DER_Data_Collection_for_Modeling_and_Model_Verification.pdf
 - https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Reliability_Guideline_ModelingMerge_Responses_clean.pdf
 - https://www.nerc.com/comm/RSTC_Reliability_Guidelines/White_Paper_Distributed_Energy_Storage_Modeling.pdf
- Importance of 1547-2018
 - https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Guideline-IEEE_1547-2018_BPS_Perspectives_PostPubs.pdf
- DER Aggregators
 - https://www.nerc.com/comm/RSTC_Reliability_Guidelines/SPIDERWG_White_Paper_-_BPS_Perspectives_on_DER_Aggregator_docx.pdf
 - https://www.nerc.com/comm/RSTC_Reliability_Guidelines/JointWhitePaper_PrivacyAndSecurityImpactsOfDERAggregators.pdf
- IBR Quick Reference Guide - https://www.nerc.com/pa/Documents/IBR_Quick_Reference_Guide_Activities.pdf
- DER Quick Reference Guide - https://www.nerc.com/pa/Documents/DER_Quick%20Reference%20Guide.pdf



Questions and Answers

NERC/RELIABILITYFIRST 2024 LONG-TERM RELIABILITY RESOURCE RISK ASSESSMENT

January 13, 2025



RESOURCE ADEQUACY CONCERNS



01

Reserve Margin Depletion

The System can be impacted beyond planned contingencies (such as during extreme weather)

- Actions taken can include emergency purchases, economic transfers from neighboring's, demand response, voluntary curtailments or rolling blackouts.



02

Analysis Complexity

Variable generation and their weather dependency requires the study of weather patterns and a new, more probabilistic approach to planning resources

- New planning and forecasting approaches will require new tools, methods and skillsets.



03

Electrification

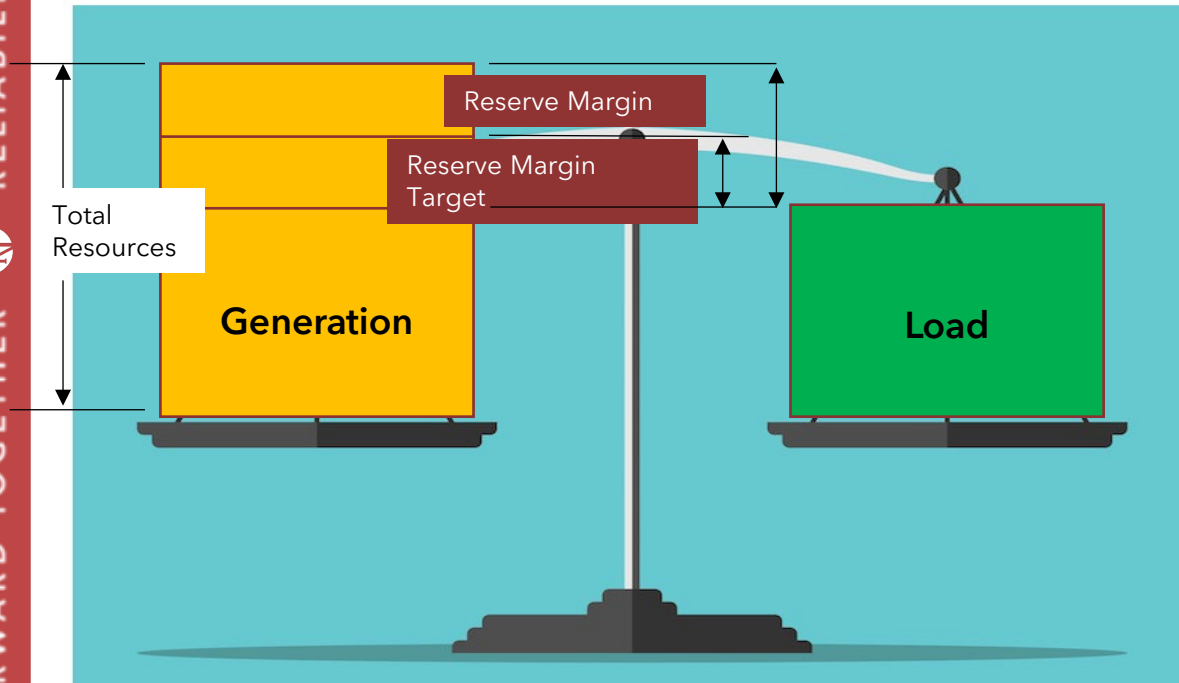
Proliferation of electrification in the transportation and other sectors

- Electrification could mean a surge in demand, and when coupled with increased reliance on variable resources and natural gas, plus retirements, balancing and forecasting is becoming more and more complex.



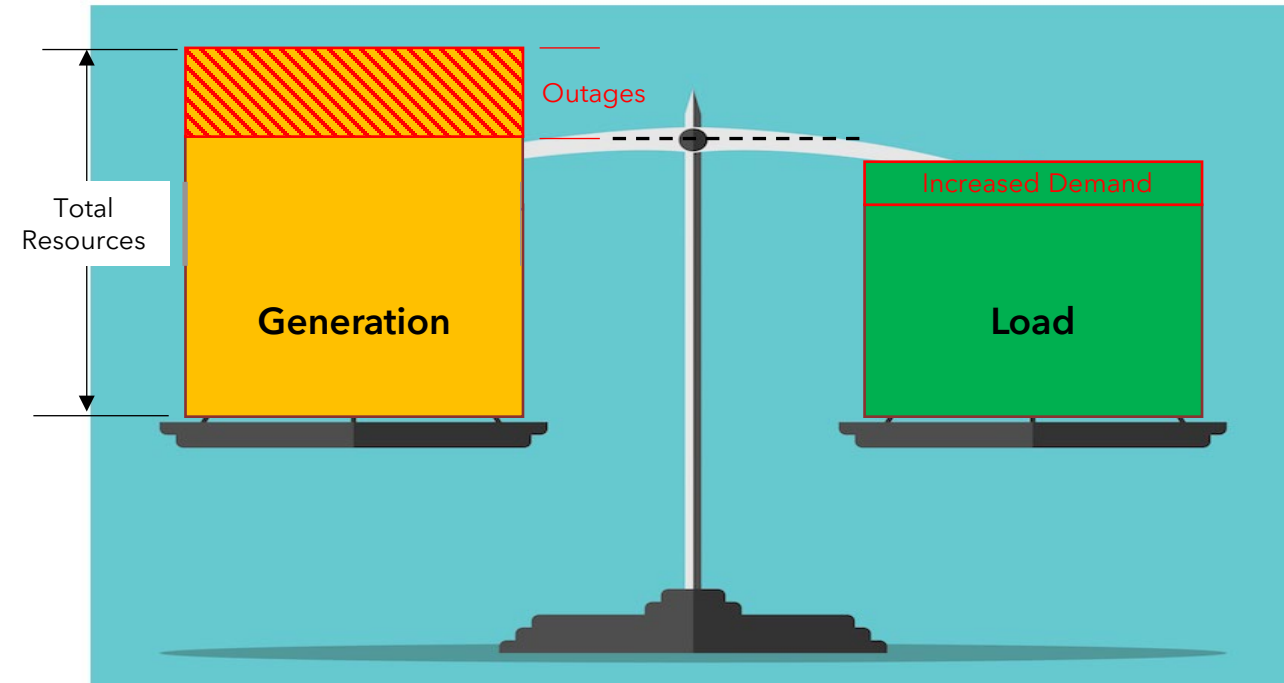
HOW TO MEASURE RISK?

Reserve Margin



Goal: Reserve Margin greater than Reserve Margin Target

Risk Scenario

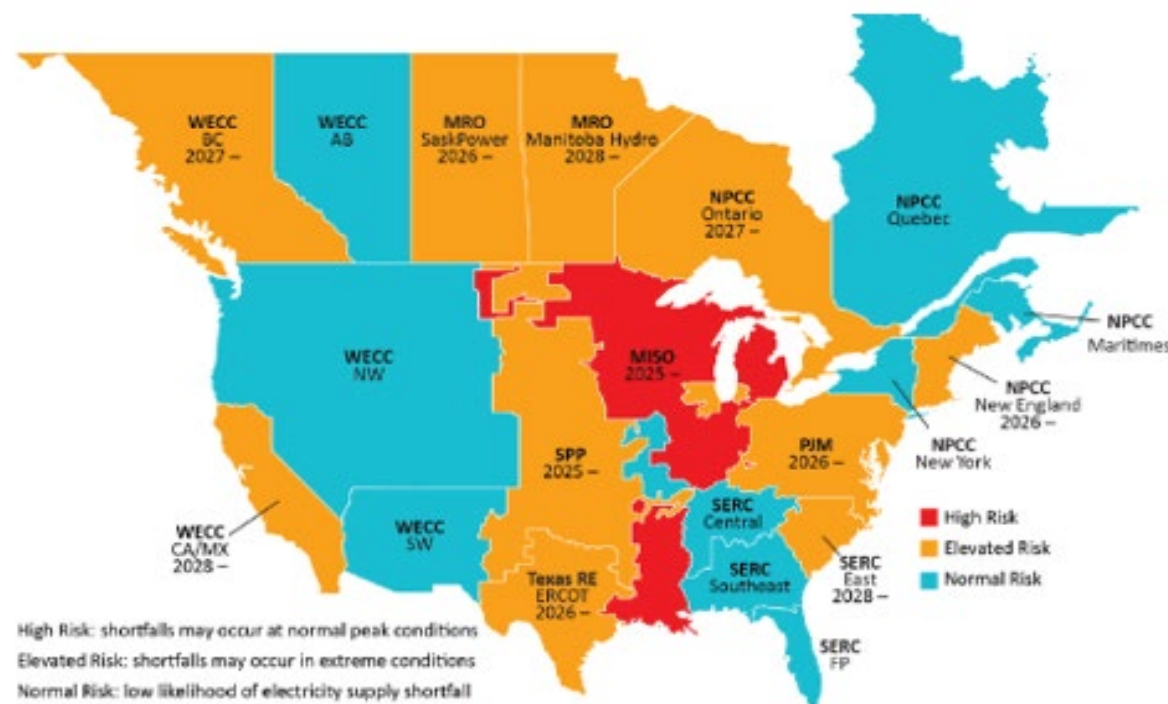


Goal: Total Resources minus Outages above Load

NERC LTRA: RISK AREA SUMMARY 2025-2029

HIGH RISK - MISO's resource additions are not keeping up with generator retirements and demand growth. Reserve margins fall below Reference Margin Levels (RML) in winter and summer.

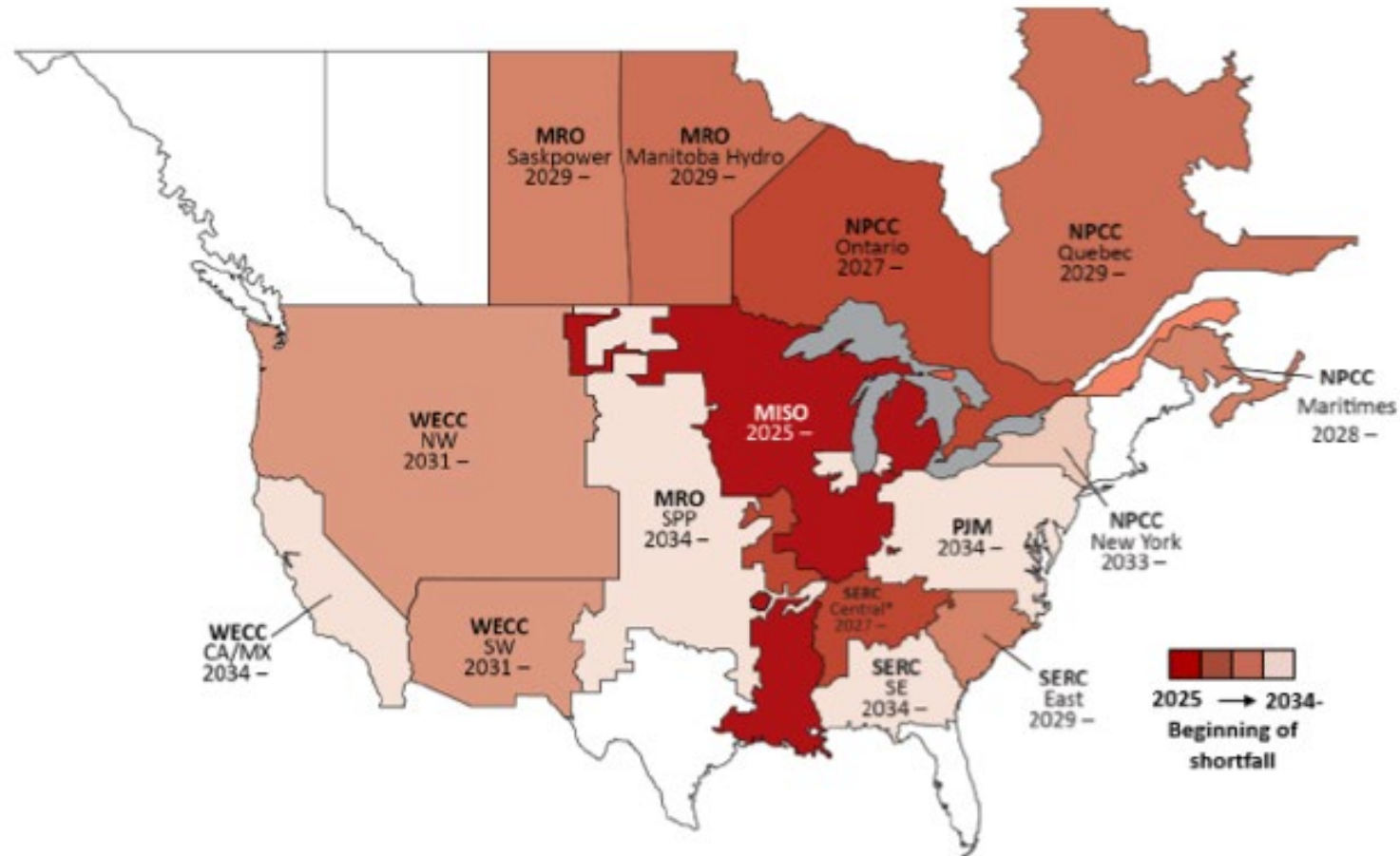
ELEVATED RISK - PJM's resource additions are not keeping up with generator retirements and demand growth. Winter seasons replace summer as the higher-risk periods due to generator performance and fuel supply issues.



Risk Area Summary 2025-2029

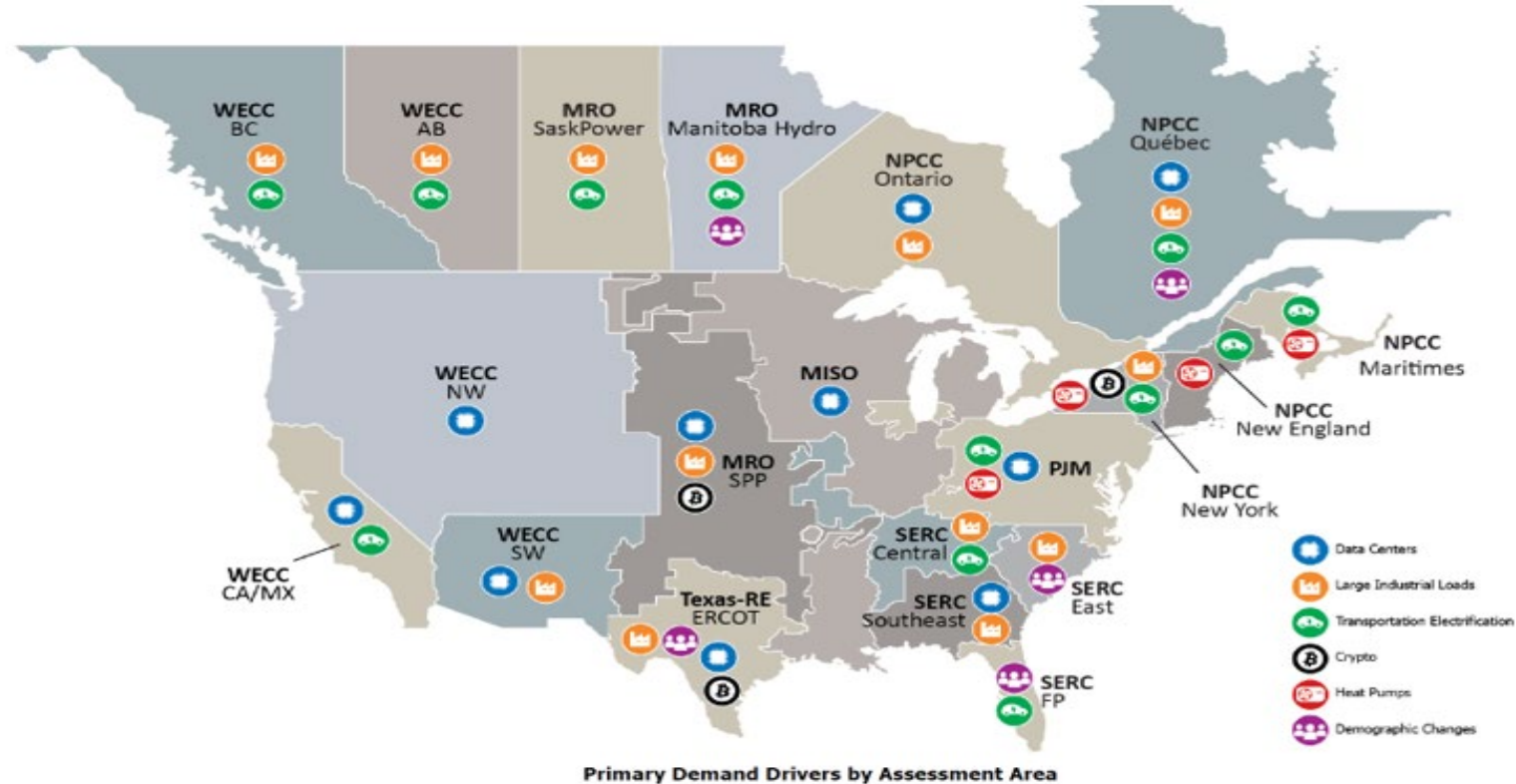
NERC LTRA: PROJECTED RESERVE MARGIN SHORTFALLS

Economic, policy, and regulatory factors spur further fossil-fired generators to retire in the 10-year horizon. Announced retirements, which include many generators that have not begun formal deactivation processes with planning entities, total 115 GW over the 10-year period.



NERC LTRA: DEMAND DRIVERS

- Electrification of household appliances (e.g., heat pumps for household heating) and projections for electric vehicle growth over this assessment period are components of the demand and energy estimates.
- Emerging large loads, such as data centers (including crypto and AI) and hydrogen fuel plants, present unique challenges to forecasting and planning for increased demand.



NERC LTRA: EMERGING ISSUES

- **Data Centers and Large Industrial Load**

- Pose various challenges for system planners and operators, in addition to fueling rapid demand growth.

- **Battery Energy Storage Systems (BESS)**

- BESS are also often used for ancillary services, such as frequency response

- **Electric Vehicles and Electric Load**

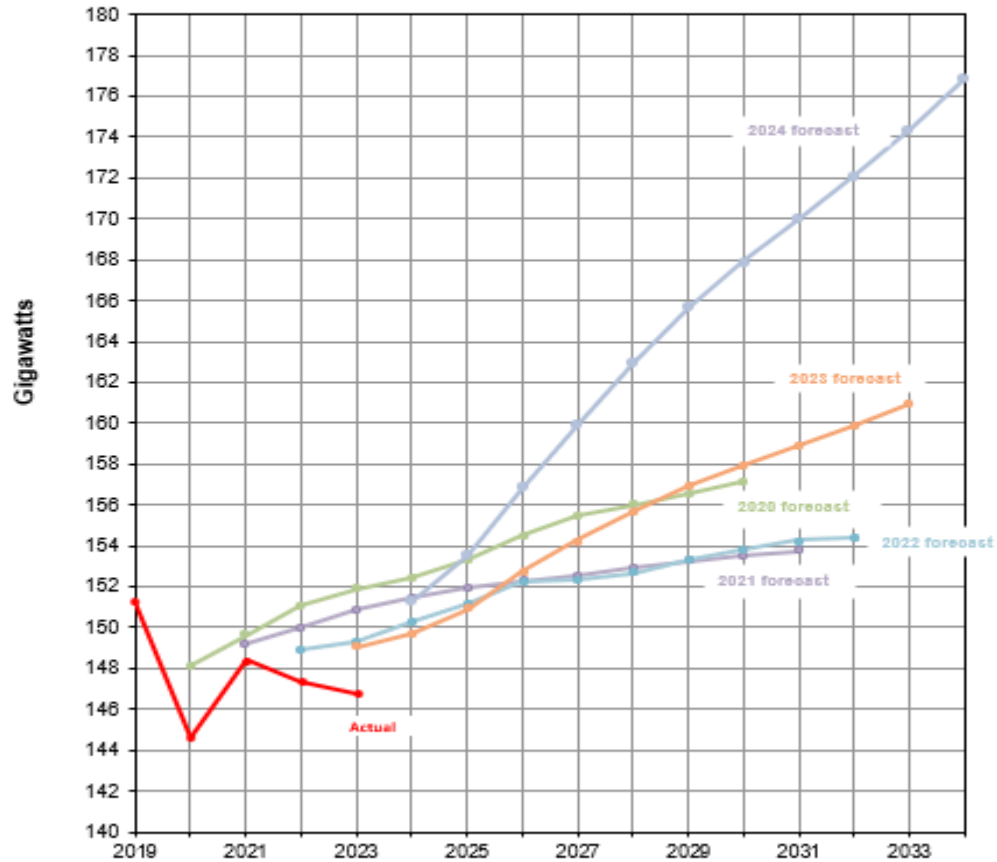
- EV forecasting is important for resource adequacy and system planning to account for changing load and load patterns.

- **Energy Drought**

- When two or more resource types are simultaneously affected by conditions that cause below-normal resource output, operators can face challenges in meeting demand.

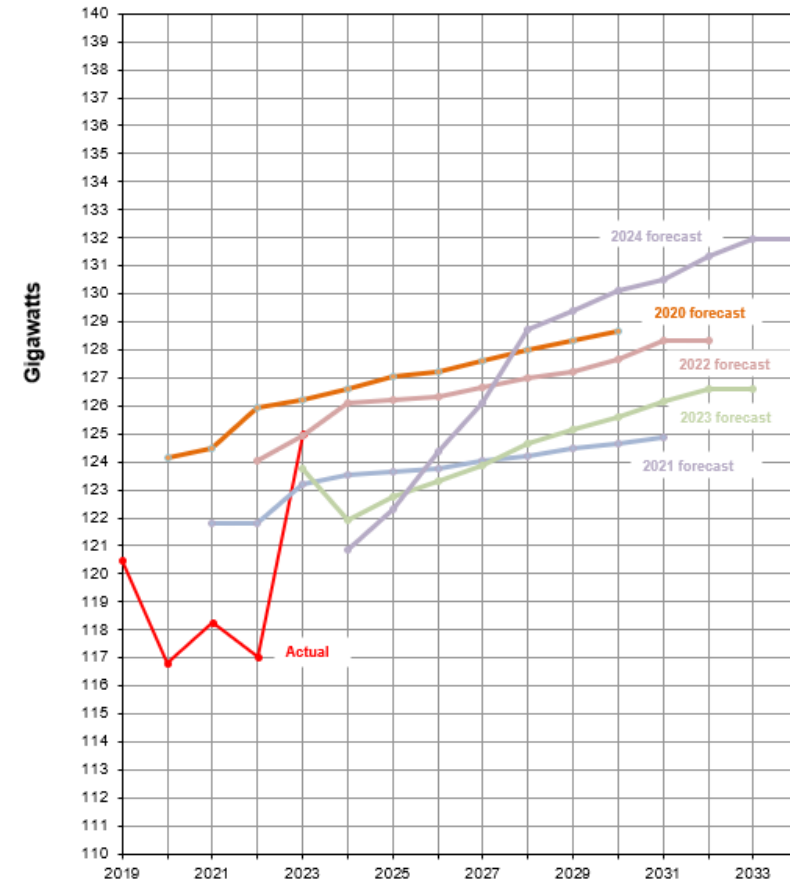
RF LTRA: FORECASTED PEAK DEMAND DATA

PJM RTO Peak Demand Data
Actual 2019 - 2023
Select 5 Year TID Forecasts Through 2034



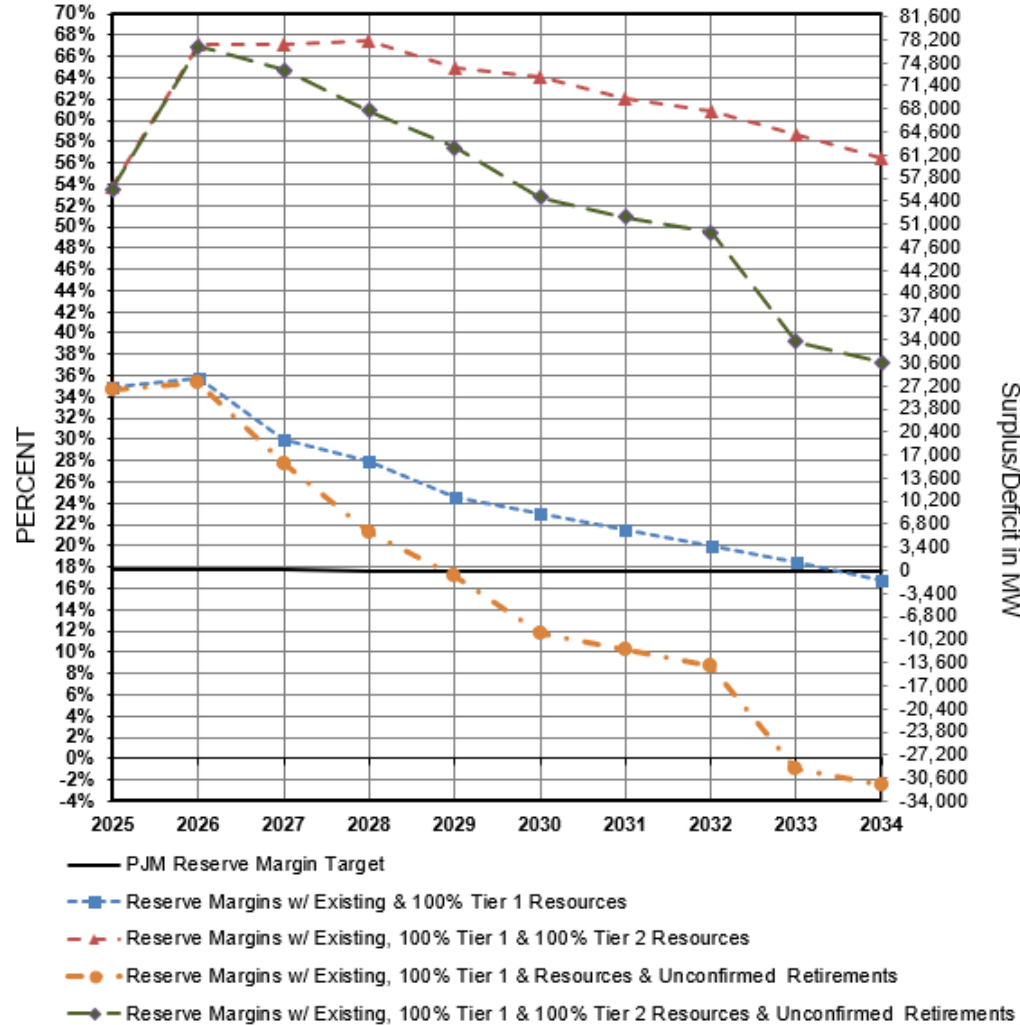
2019 includes the expansion of the PJM RTO footprint with Ohio Valley Electric Cooperative

MISO RTO Peak Demand Data
Actual 2019 - 2023
Select 5 Year TID Forecasts Through 2034

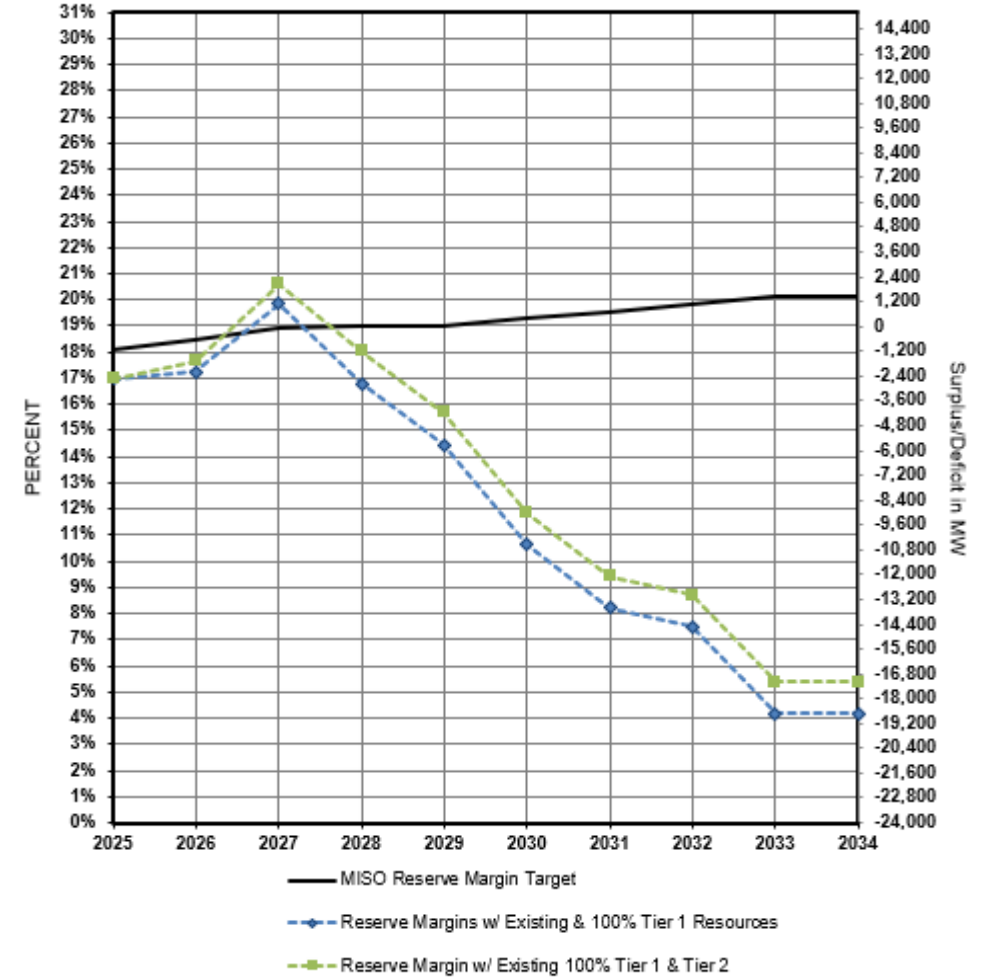


RF LTRA: RESERVE MARGIN

**PJM RTO
Summer Reserve Margin Projections
2025 - 2034**



**MISO RTO
Summer Reserve Margin Projections
2025 - 2034**



Surplus/Deficit in MW

Surplus/Deficit in MW

Leg

RF LTRA MISO RESERVE MARGIN

- Reduction in capacity of coal around 6 GW in the past year, and a projected reduction of a further 12 GW over the next 5 years.
- A growth of 1,200 MW of solar since last year's LTRA, and growth of 3,200 MW in the first year of the current LTRA cycle

RF LTRA SUMMARY

PJM

- Projected to have a 1.6% compound annual load growth rate over the next 10 years (i.e., 2025-2034)
- Meet target reserve margin requirement of approximately 18% for the first nine years and falls below by 1,400 MW in the last year

MISO

- Projected to average a 0.85% compound annual load growth rate from 2025 through 2034
- The anticipated reserve margin projected for 2028 is 2,657 MW below the reserve margin target
- The largest reserve margin deficit was identified in 2034, which was 19,000 MW below the target reserve margin

QUESTIONS & ANSWERS

Tim Fryfogle, Principal Engineer – Resources,
Engineering & System Performance

tim.fryfogle@rfirst.org



THANK YOU

***Join us for our next Tech Talk -
February 10th 2-3:30pm EST***

[Webinar Link](#)

