

WELCOME TO TECHNICAL TALK WITH RF

May 18, 2026



TECHNICAL TALK WITH RF



Join the conversation at

[SLIDO.com](https://www.slido.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" with 3,970 followers, dated "2d". The post text reads: "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". Below the text are two images: one showing a group of people posing in front of a brick building, and another showing people working on a roof.

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](#):

- [2026 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 V10 was released and is on NERC's [website](#)



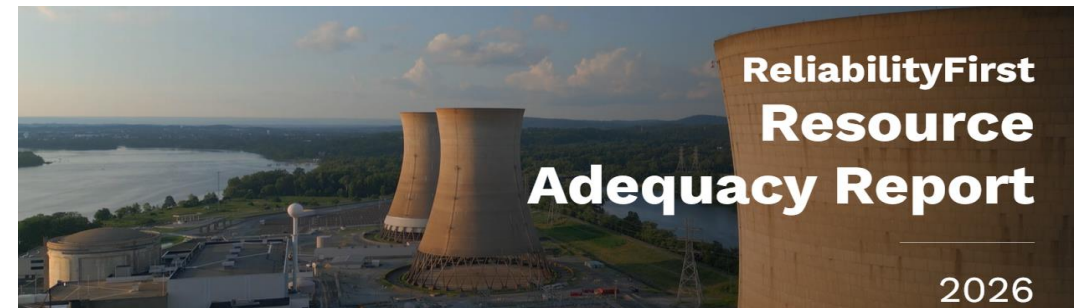
TECH TALK REMINDER

Are you getting our newsletter
First Things RFirst?

- Sign up today [here](#)

Make sure to check out our
[2025 Impact Report](#) and [video](#)

Visit our website to read RF's
2026 Resource Adequacy Report



WELCOME TO TECHNICAL TALK WITH RF

May 18, 2026



TECH TALK ANNOUNCEMENT

NERC

Large Loads Resources



NERC Issues Level 3 Alert, Reliability Guideline Focused on Large Load Challenges

[Full Announcement](#) | [Alert](#) | [Reliability Guideline](#)

NERC has released a Level 3 Essential Action Alert, Computational Load Modeling, Studies, Instrumentation, Commissioning, Operations, Protection, and Control, outlining seven actions registered entities must implement to address immediate risks posed by computational loads interfacing with the BPS. The deadline for registered entities to submit their responses is August 3, 2026.

NERC released new voluntary guidelines to safeguard grid reliability. The [Reliability Guideline: Risk Mitigation for Emerging Large Loads](#), recommends actions for traditional utilities and grid operators, and the companies behind these large loads including equipment manufacturers. The guideline also acts as a reliability bridge while NERC updates its formal Reliability Standards to address these new challenges.

Large Loads Action Plan Q1 2026 Update

Addressing an Emerging Reliability Issue
April 2026

Strategies for Reducing Risks Associated with Large Loads

LARGE LOADS ACTION PLAN: 2026-2027 TIMELINE				
Q1	Q2	Q3	Q4	Q1-Q4
2026				2027
<ul style="list-style-type: none"> • Publish white paper 2 (March 12) • Publish report on Level 2 (March 17) • SC appoint drafting team and post SAR (March 18) • Webinar on Large Load Action Plan (March 30) • Review comments on Reliability Guideline (March) 	<ul style="list-style-type: none"> • Post registry criteria and SAR (April 1) • Publish Reliability Guideline, <i>subject to RSTC approval</i> (May) • Issue Level 3 Alert <i>subject to Board approval</i> (May) • Initiate standards drafting, <i>subject to SC authorization</i> (June 9) • Publish the Data Center Load Modeling Technical Reference, <i>subject to RSTC approval</i> (June 10) 	<ul style="list-style-type: none"> • Post registry criteria, glossary and standard(s) for comment (August 19) • Level 3 Alert responses due (August) • Organize a Data Center Load Modeling Workshop (September 15-16) 	<ul style="list-style-type: none"> • Post registry criteria, glossary and standard(s) for additional comment period (October 21, <i>if needed</i>) • Request Board approval of registry criteria, glossary and standard(s) (December 5) • File registry criteria, glossary, and standards <i>subject to Board approval</i> (December 31) 	<ul style="list-style-type: none"> • Draft and file additional applicable Reliability Standards, <i>as needed</i>

All relevant info on NERC's large loads action plan can be found here: <https://www.nerc.com/initiatives/large-loads-action-plan>

TECH TALK ANNOUNCEMENT

NERC

“Currently Compliant”

[Full Announcement | Episode 10](#)

NERC released the tenth installment of its compliance podcast, “Currently Compliant.” This episode is hosted by Davis Jelusch (NERC) along with other subject matter experts from the ERO Enterprise, including Cesar Cantu (NPCC) and Mike Kuhl (SERC).

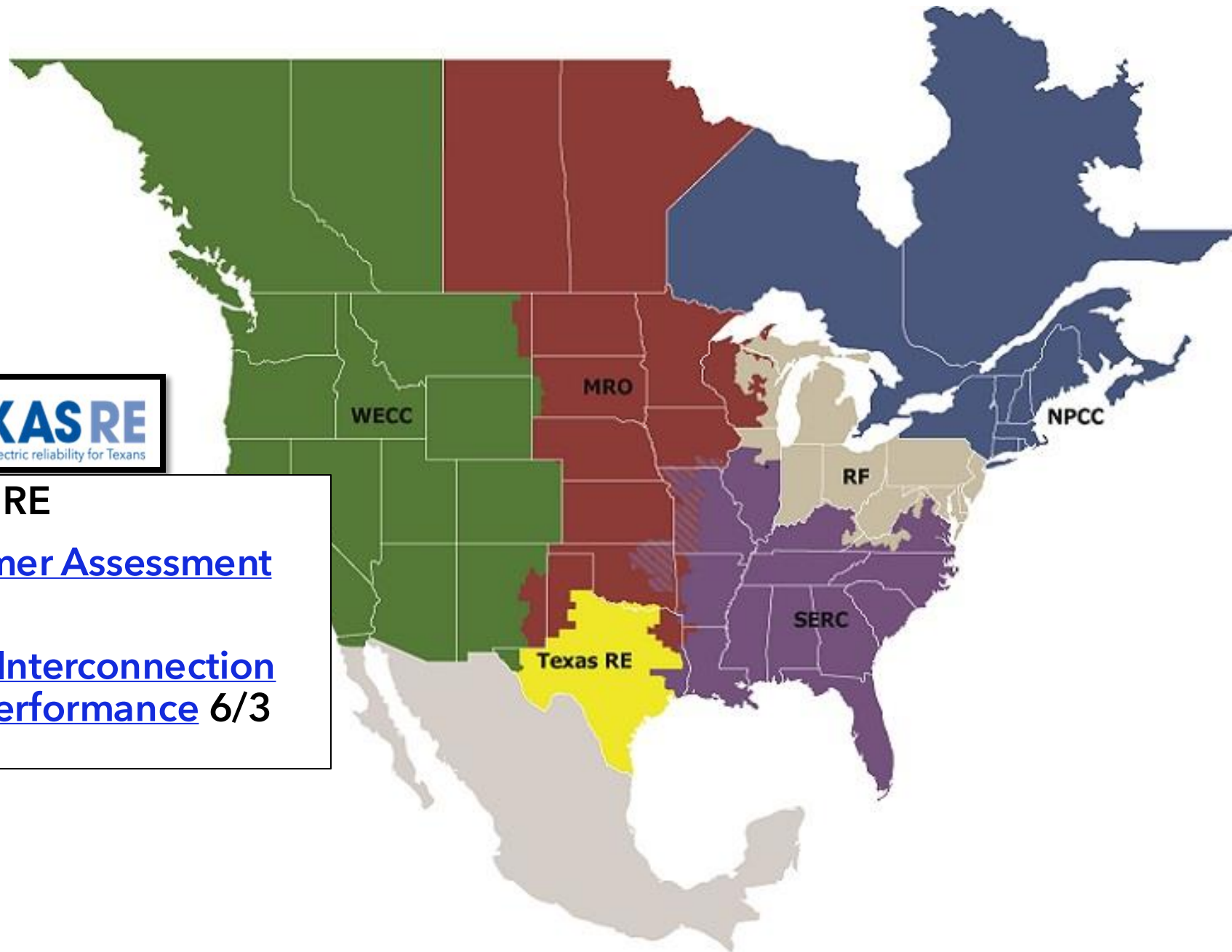
Currently Compliant: Episode 10 takes a closer look at the Coordinated Oversight Program and how it helps reduce complexity and administrative burden for multi-region entities. This episode offers an overview of the program, outlines options for organizations new to the Coordinated Oversight Program, highlights recent updates, and shares what’s ahead.





Talk with Texas RE

- [NERC Summer Assessment 5/26](#)
- [2025 Texas Interconnection Reliability Performance 6/3](#)



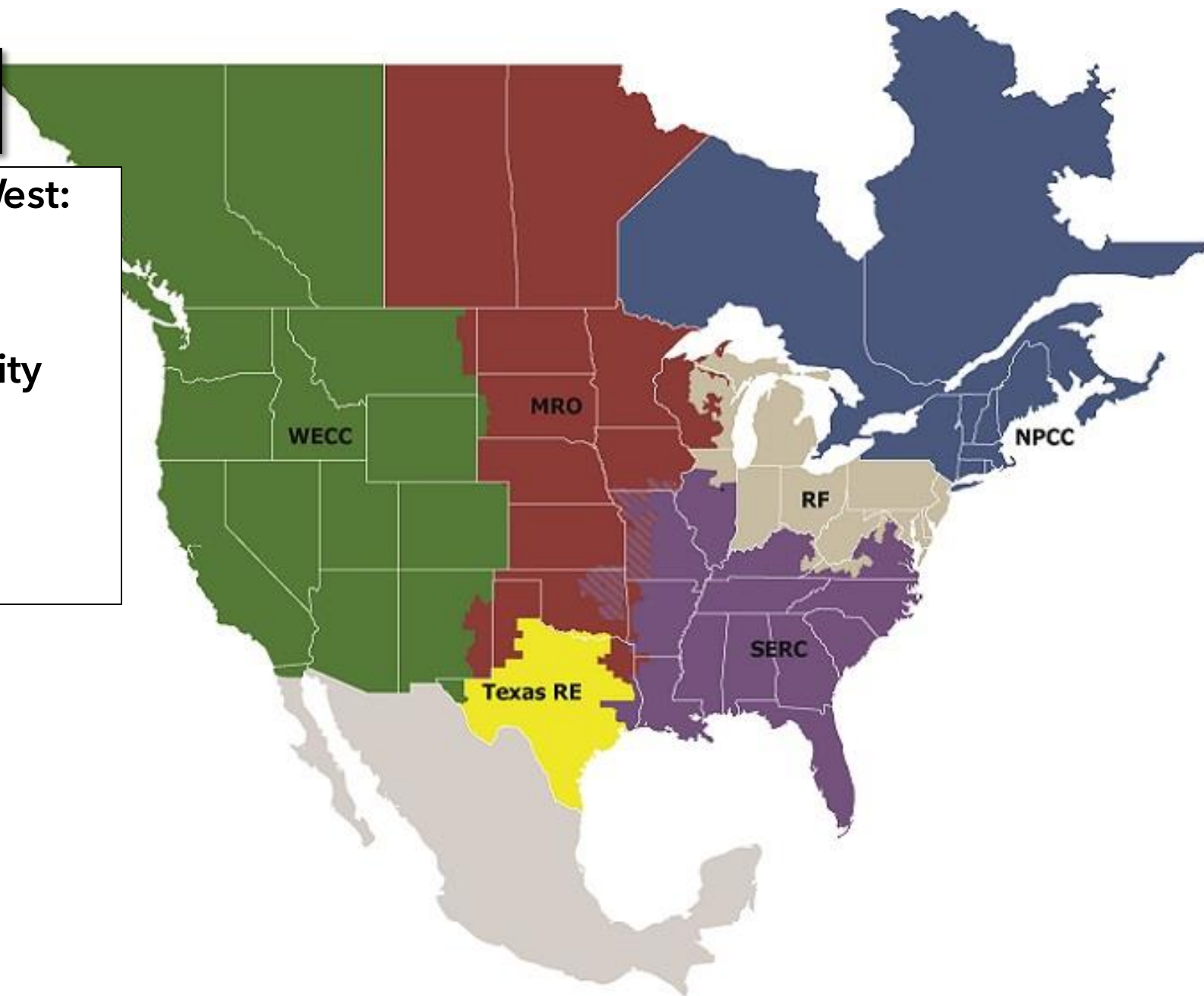


Reliability in the West: Discussion Series

- [June 3](#)

Reliability & Security Oversight Update

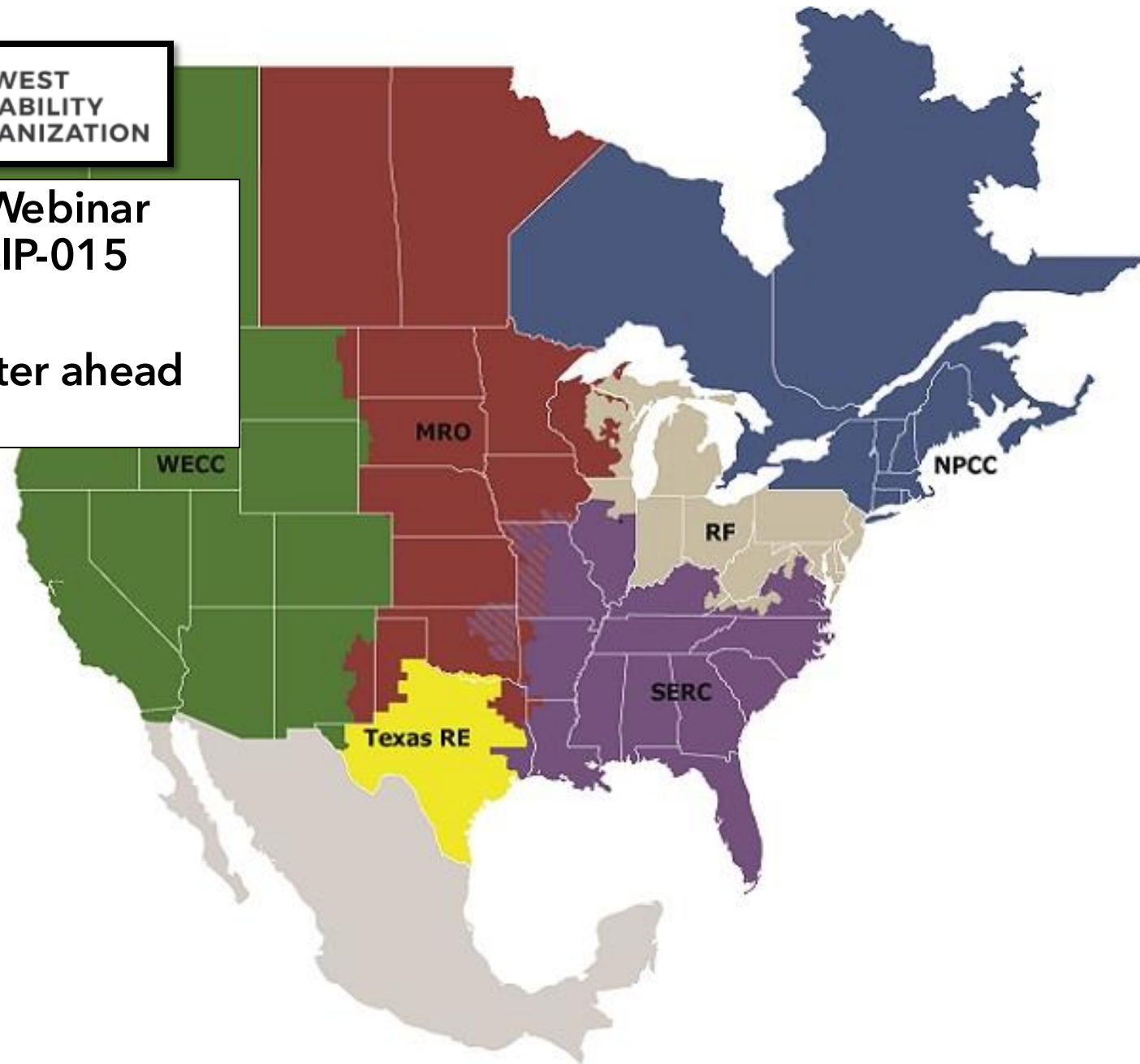
- [May 21](#)
- [June 18](#)

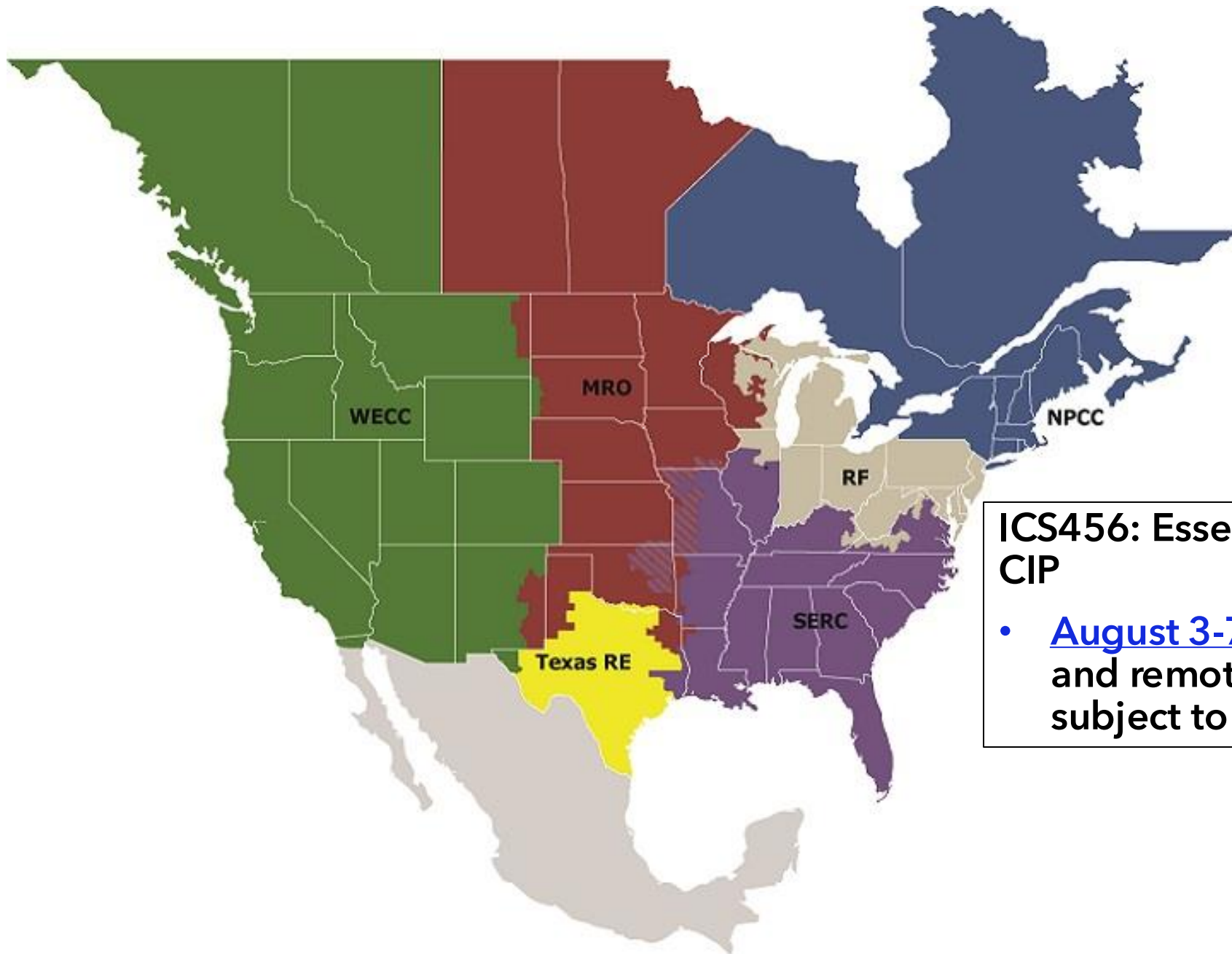




MRO Case Files Webinar Series: A NERC CIP-015 Investigation

- [June 22](#), register ahead





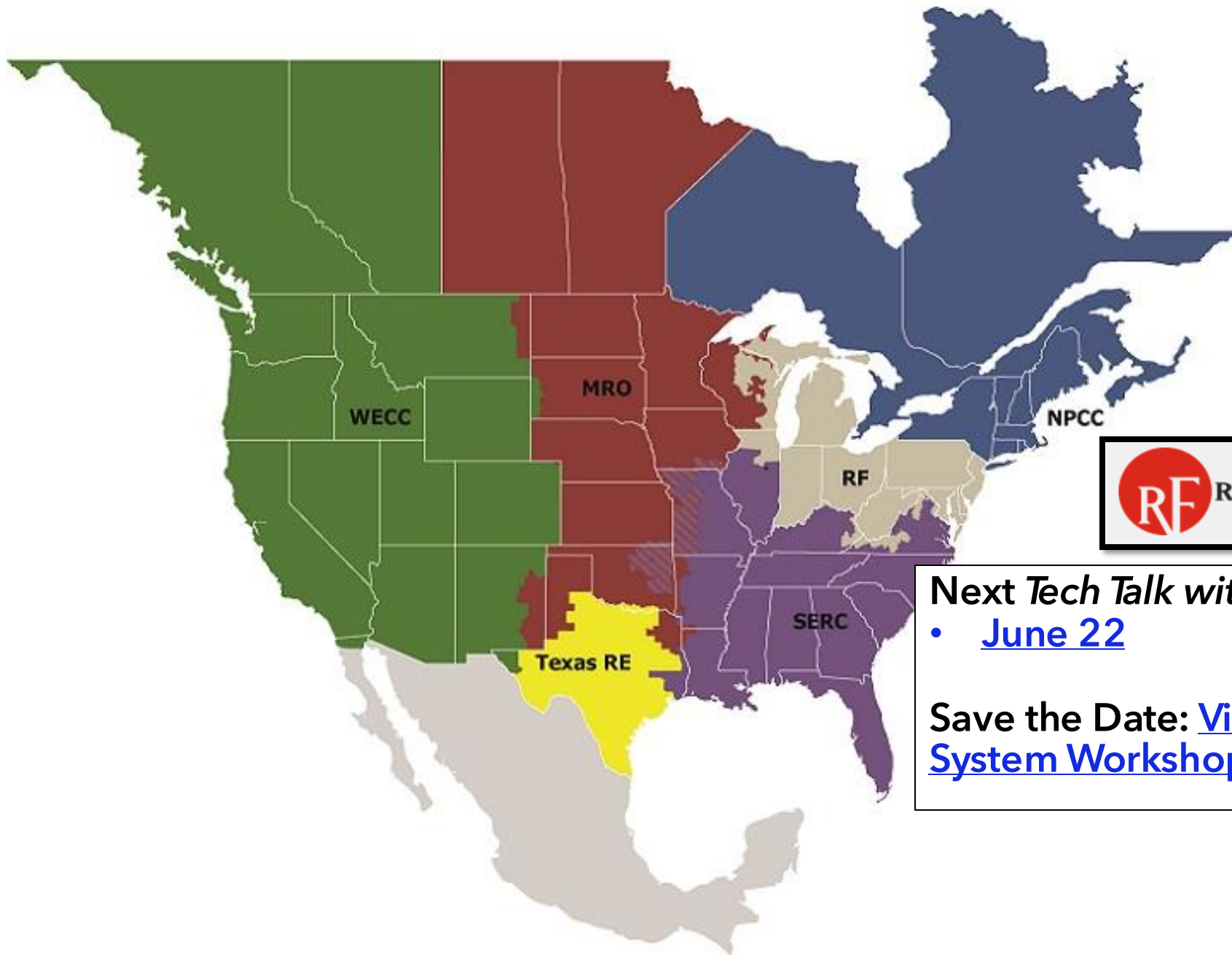
ICS456: Essentials for NERC CIP

- [August 3-7](#), in-person and remote, registration subject to approval



**NPCC 2026 Spring
Compliance and
Reliability Webinar**

- [May 20](#)



Next *Tech Talk* with RF

- [June 22](#)

Save the Date: [Virtual Protection System Workshop, August 5](#)

TECH TALK REMINDER

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

May 2026

MON
18

May 18, 2026 @ 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

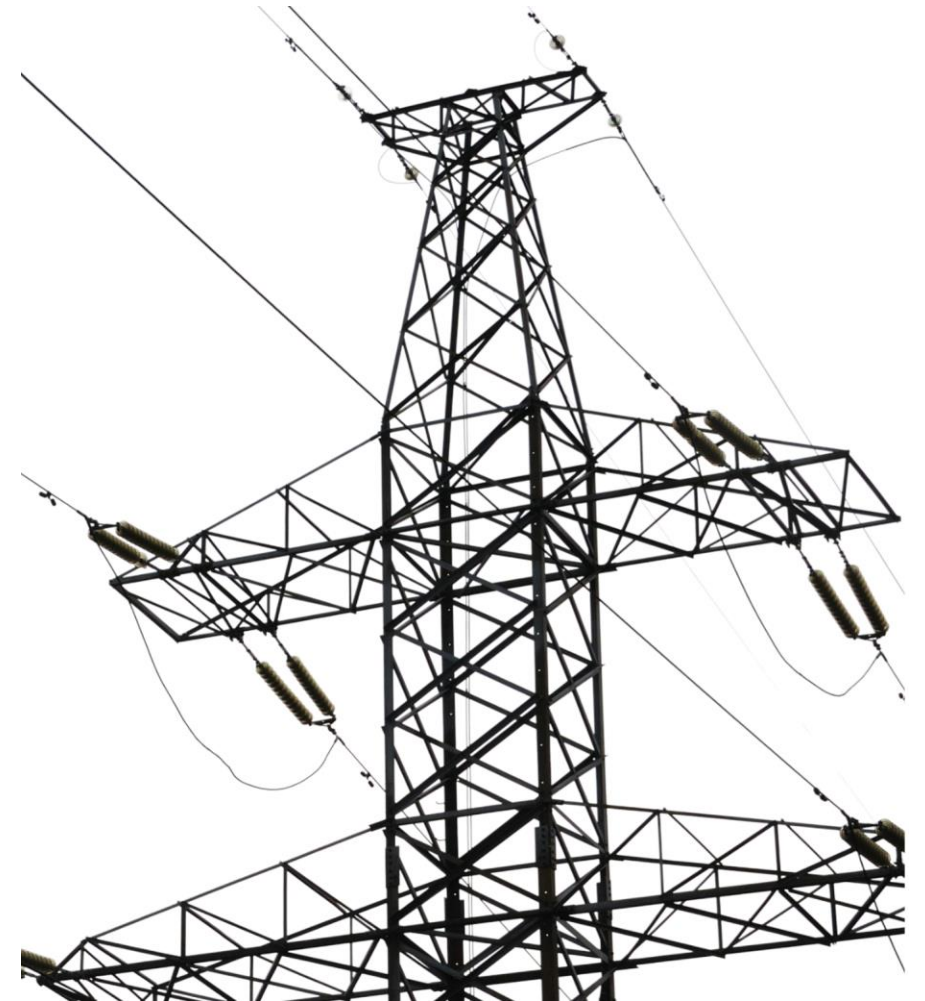
[SLIDO.com](https://www.slido.com)

#TechTalkRF

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

E-ISAC OVERVIEW

- **CARLY CIPOLLA**, SENIOR PARTNERSHIPS AND ENGAGEMENT COORDINATOR, E-ISAC
- **NOEL LLOYD**, SENIOR ENGAGEMENT AND OUTREACH COORDINATOR, E-ISAC

OSCILLATIONS IN THE POWER GRID

- **COURTNEY FASCA**, SENIOR RELIABILITY CONSULTANT, EXTERNAL AFFAIRS & ENTITY ENGAGEMENT, RELIABILITYFIRST
- **LEW FOLKERTH**, PRINCIPAL RELIABILITY CONSULTANT, EXTERNAL AFFAIRS, RELIABILITYFIRST
- **KELLEN PHILLIPS**, PRINCIPAL ANALYST, OPERATIONAL ANALYSIS & AWARENESS, RELIABILITYFIRST
- **PARIMAL SARAF**, PRINCIPAL ENGINEER, ENGINEERING & SYSTEM PERFORMANCE, RELIABILITYFIRST

INTERNATIONAL CASE STUDIES

- **CATHERINE LEWIS**, ENERGY POLICY ANALYST, EXTERNAL AFFAIRS, RELIABILITYFIRST



The Electricity Information Sharing and Analysis Center (E-ISAC)

Tech Talk with RF

TLP:CLEAR

Carly Cipolla, Senior Partnerships & Engagement Coordinator
Noel Lloyd, Senior Engagement and Outreach Coordinator

May 18, 2026

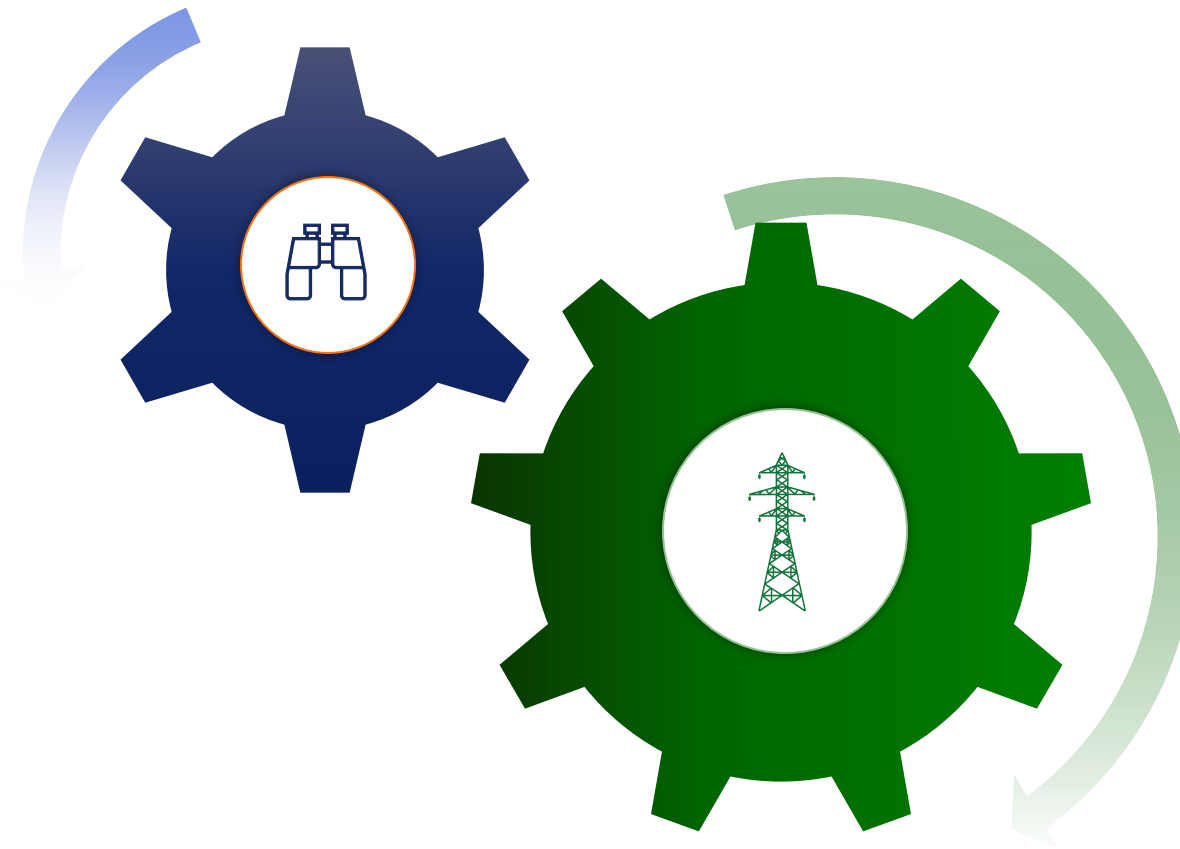


Are you an E-ISAC member?

Mission and Vision

Vision

To be a world-class, **trusted** source for **quality analysis** and **rapid sharing** of security information for the electricity industry



Mission

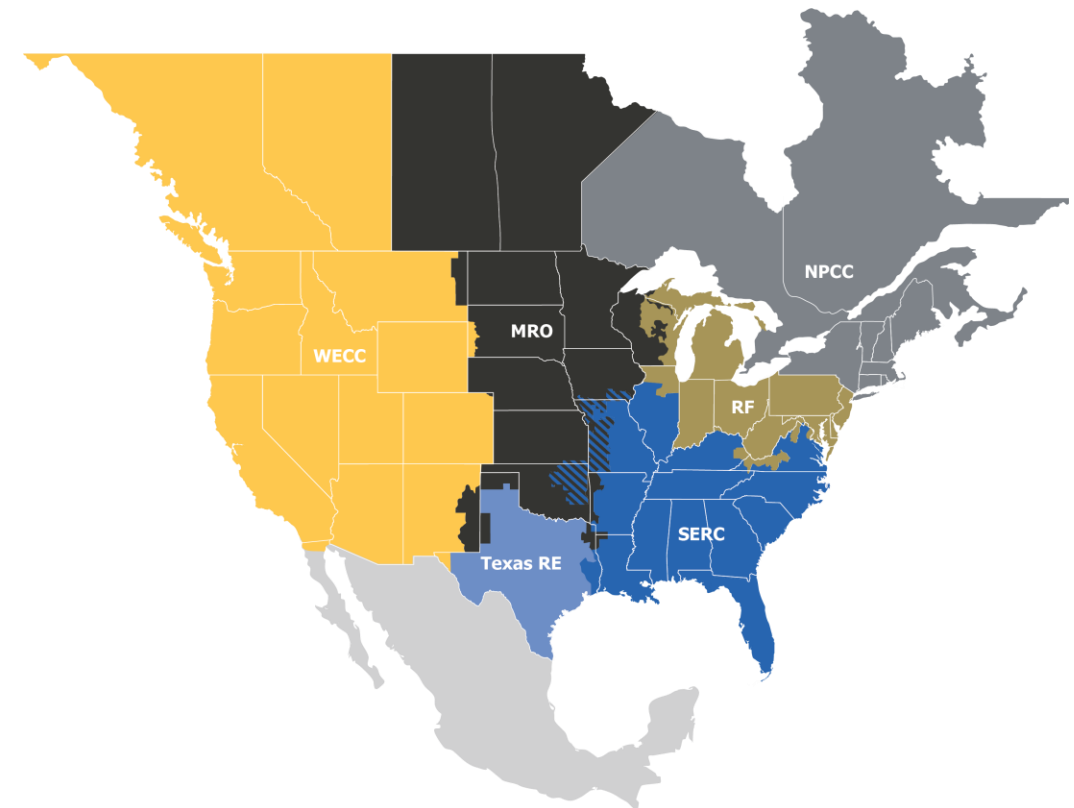
The E-ISAC reduces cyber and physical security risk to the electricity industry across North America by providing unique insights, leadership, and collaboration

Protecting the North American Power Grid

Introduction

The E-ISAC's **2,000+ Member and Partner organizations** represent the largest information sharing community in the energy sector and more than **9,000 E-ISAC Portal users** serve as the first line of defense for critical infrastructure.

The larger our community grows, the better we become in strengthening the security of the grid.



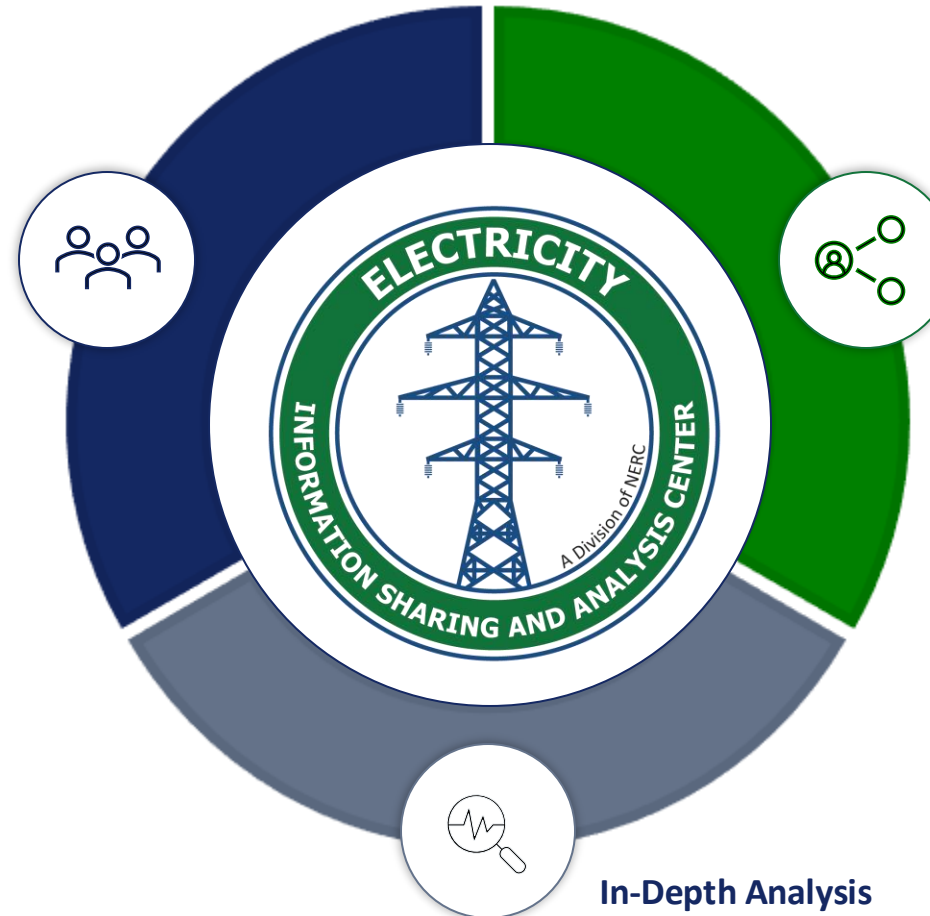
Stakeholder Value

Focus Areas

Transforming data into strategic insights so stakeholders can understand and respond to evolving security threats

Engagement

- Workshops and Programs
- Exercises and Conferences
- Monthly Briefings



Info Sharing

- Bulletins and Reports
- Dedicated Information Sharing Platforms
- Digital Communities

In-Depth Analysis

- Security Trends
- Threats
- Best Practices

Our Partners

Vendor Affiliates



U.S Government



Trade Associations



Canadian Government



International ISACs (Europe and Japan)



Other ISACs





What security concerns keep you up at night?

Five Reasons to Join the E-ISAC

1. Geopolitical analysis and how it relates to electricity security
2. Updates on the potential impacts of data centers
3. Programs focused on protecting physical infrastructure
4. Educational opportunities with our industry partners
5. It's available at no cost!



TLP:CLEAR

Offerings

Membership



Bulletins



Briefings



In-depth and Targeted Analysis



Workshops and Engagement Programs



Exercises And Conferences



CRISP



Digital Communities



Information Sharing Platforms

Engage with Us!

Engagement Opportunities

- The E-ISAC fosters valuable networking opportunities for industry leaders and partnership, such as:
 - GridSecCon, the E-ISAC's grid security conference, will take place in Orlando, Florida, from October 20-23, 2026
 - GridEx, hosted every two years, is the largest grid security exercise in North America
 - The E-ISAC hosts additional workshops, programs, and engagement opportunities for members



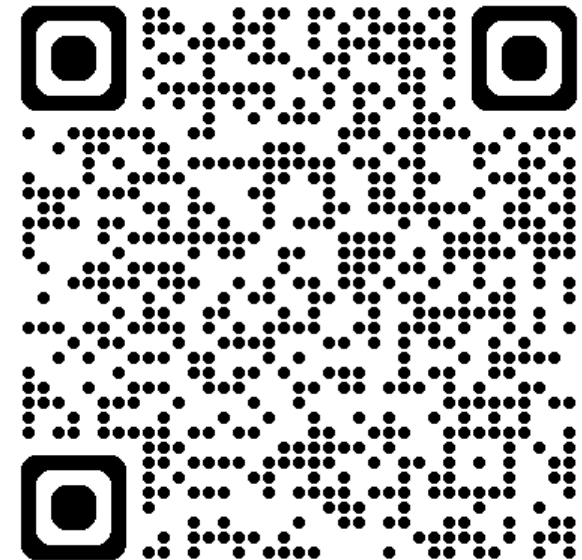
E-ISAC Membership

- All electric industry asset owners and operators and select government partners in North America
- Intended audience: security directors, cyber and physical security analysts, general managers
- CMEP roles are excluded from E-ISAC membership

The E-ISAC also offers partnerships with select organizations, including:

- U.S. and Canadian government agencies
- State, local, tribal, and territorial government agencies
- National laboratories
- Cross-sector ISACs
- Trade organizations

Apply for an Account





What E-ISAC resources would help you the most?

Contact Us

24/7 Operations Center

operations@eisac.com

Membership Questions

memberservices@eisac.com

Speaker Requests

speakerrequests@eisac.com

Vendor Affiliate Program

vendorprogram@eisac.com

CRISP

crisp@eisac.com

Follow Us





Discussion

OSCILLATIONS IN THE POWER GRID

Low Folkerth
Principal Reliability Consultant
External Affairs

Kellen Phillips
Principal Analyst
Operational Analysis & Awareness

May 18, 2026

The sole purpose of this presentation is to provide technical reliability-related information based on ReliabilityFirst's expertise. This communication is not intended to be and should not be interpreted as advocating for a specific position or outcome.

Parimal Saraf
Principal Engineer
Engineering & System Performance

Courtney Fasca
Sr. Reliability Consultant
External Affairs



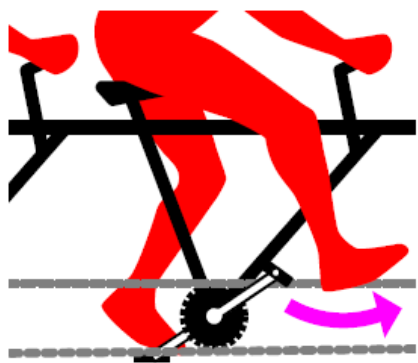
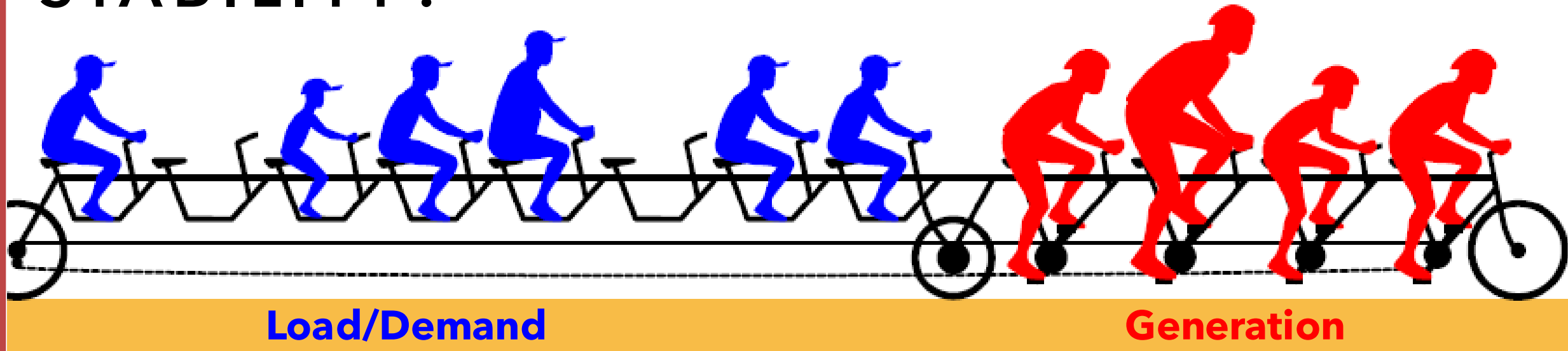
RELIABILITY FIRST

AGENDA

-
- 01** Small Signal Stability - What Is It?
 - 02** Running Small Signal Analysis
 - 03** Case Studies
 - 04** Security and PMUs
 - 05** Current/Future Impacts
 - 06** Next Steps
-

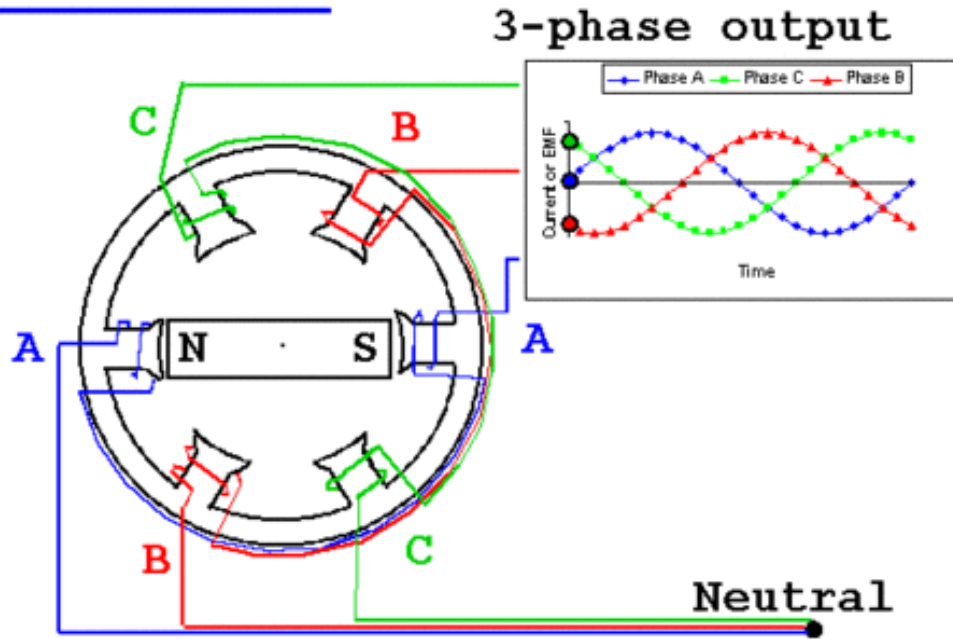


WHAT IS SMALL SIGNAL STABILITY?



Voltage /
Frequency

The Generator



Damping Torque-

- Function of inertia and damping parameters
- Rotational force that helps stabilize after a disturbance

Conventional machines exhibit oscillations by physically rotating IBRs influenced by electronic control algorithms

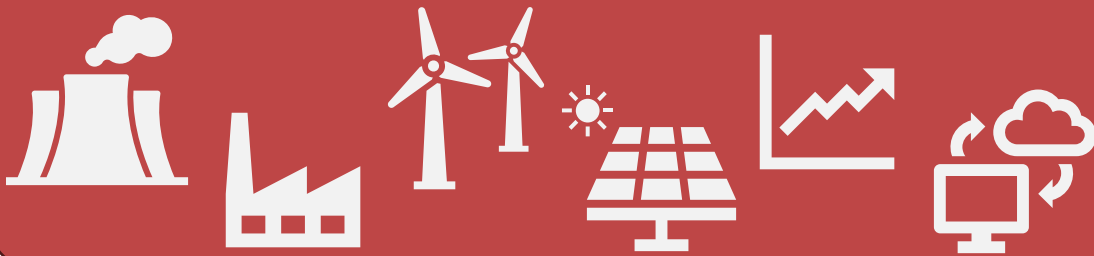


2003 Blackout Oscillations Example

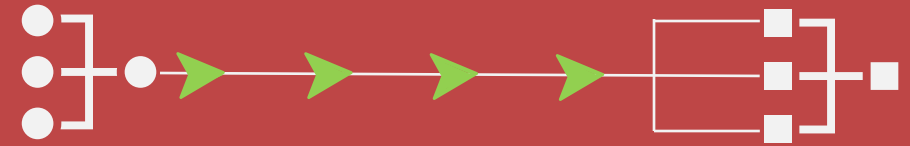
<https://www.youtube.com/watch?v=eBucg1tX2Q4>

WHAT'S NEEDED TO DO A SMALL SIGNAL ANALYSIS?

Dynamic Model



Power Flow Case



Damping

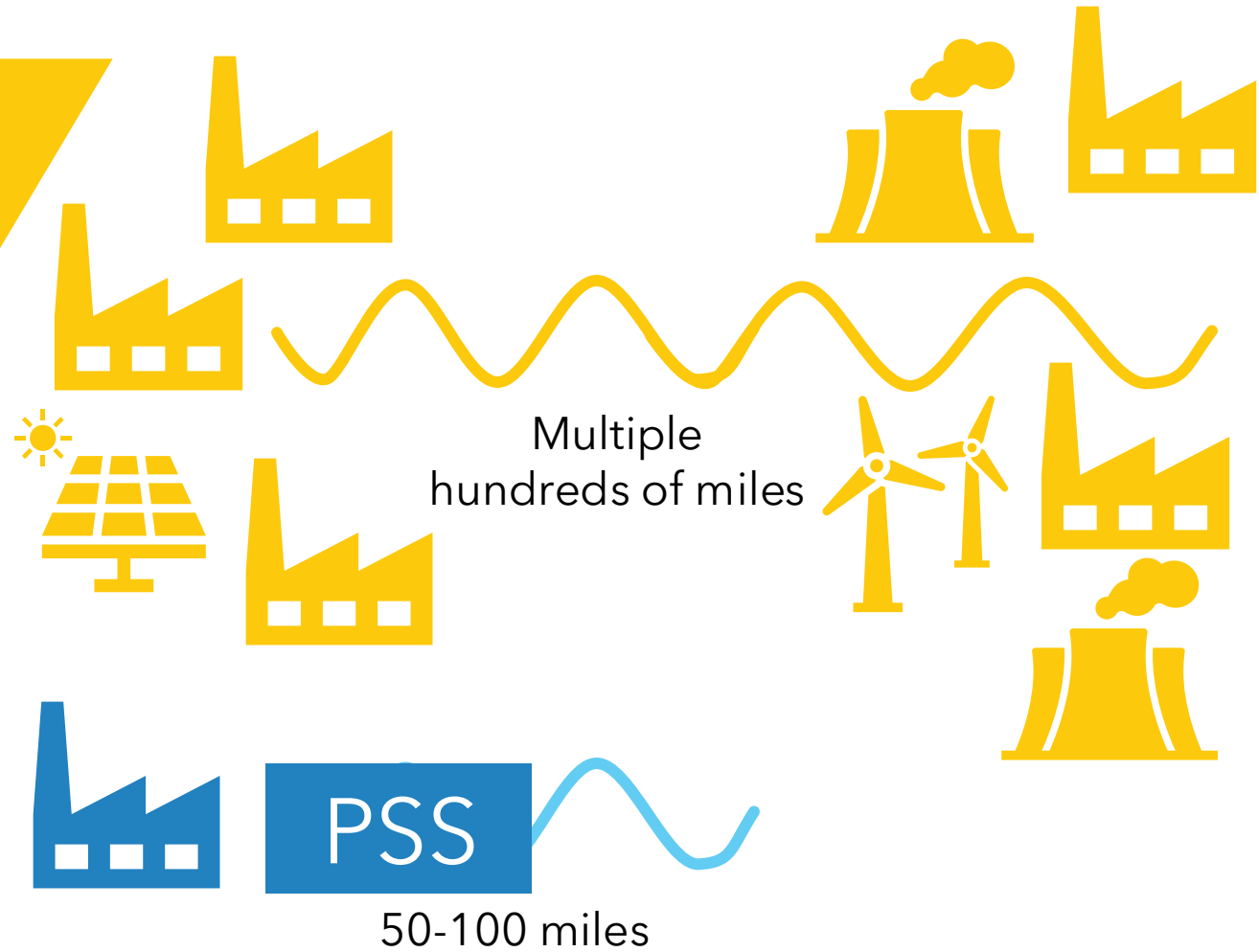
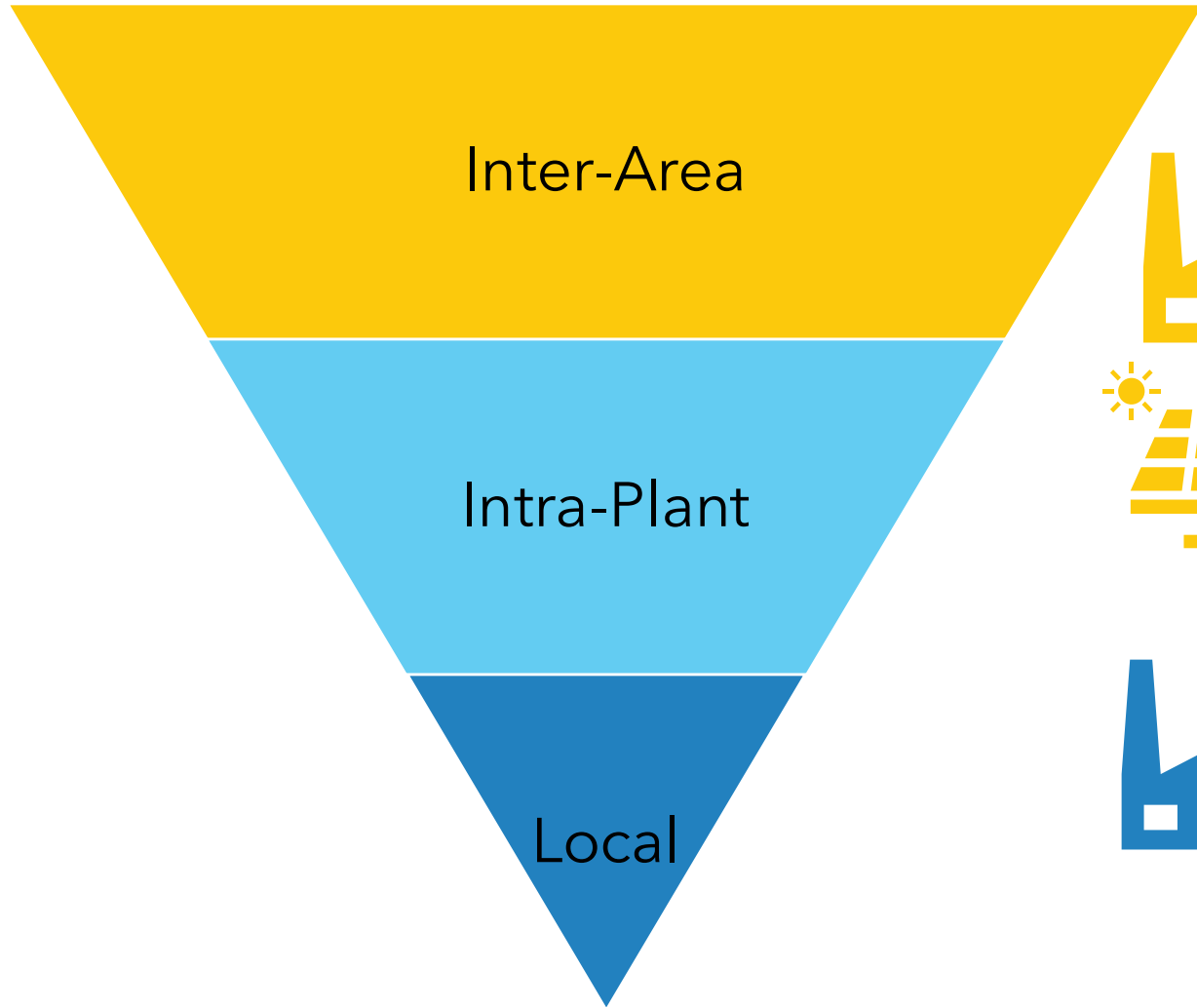
Inertia

State Matrix

Eigenvalues

Eigenvectors

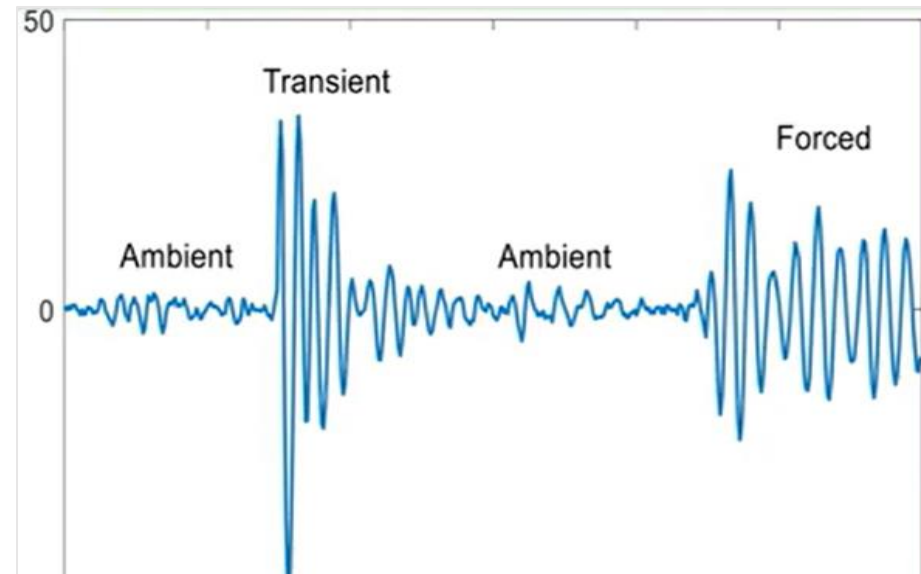
OSCILLATORY MODES



ANALYZING SMALL SIGNAL STABILITY

Ambient Data-Based Oscillation Detection

- Small random changes within the system
 - Small load changes
 - Line switching
 - Generator controls

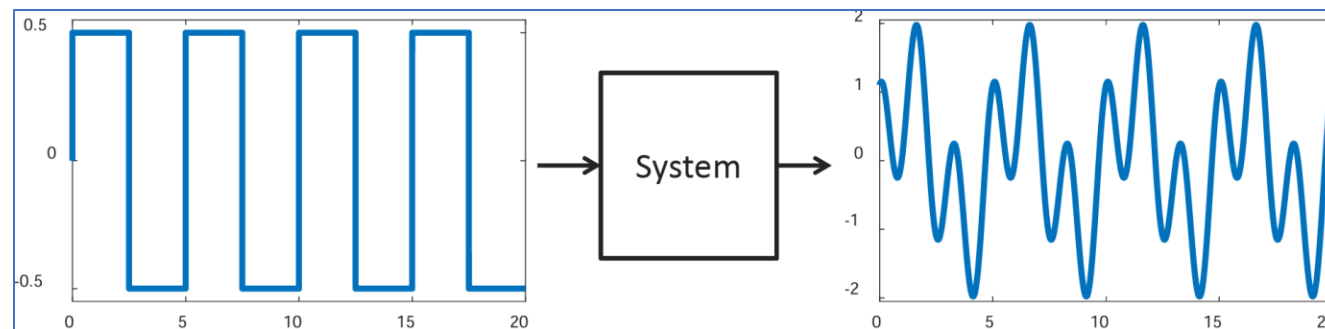


Transient Oscillation Detection

- Immediately after a sudden, major disturbance
 - Large load switching
 - Generator trips
 - Line outages
- May include nonlinear system behavior
- Colloquial term is "Ringdown"

FORCED OSCILLATIONS

- Forced response of a system to a periodic input
 - Visible in power, frequency and voltage measurements
- Sources can be conventional or IBR based generation; cyclical loads such as AI loads, aluminum smelting etc.; or malfunctioning controls
- Detection techniques solely based on measurement data
- Appropriate mitigation measures are either to detect the source and disable the input or adjust system operation to improve stability



Planning: Model-Based Assessment

- Predictive Capability
- Root Cause Identification
- Satisfies planning study requirements per TPL-001-5
- ⊗ Model Accuracy Dependency
- ⊗ Computational Intensity
- ⊗ Model Validation Challenge
- ⊗ Parameter Uncertainty
- ⊗ Doesn't Capture Real Operation

Detection

Identification

Classification

Localization

Delay

Reliability

Selectivity

Robustness

Operations: Measurement- Based Assessment

- Model-Independent
- Real-Time Monitoring
- Validation Tool
- Early Warning System
- ⊗ Historical Nature
- ⊗ Measurement Dependency (extensive PMU infrastructure)
- ⊗ Control Design Challenges



Real Events

We will cover three events on the North American power grid, including a timeline breakdown of each event



Lessons Learned

We will share some of the lessons learned from the events and include the after-effects from each case



Audience Participation

Be sure to pay attention! We will include several Slido questions for the audience to answer

CASE STUDIES



#TechTalkRF

First line fails in Hillsboro, Oregon

High temperatures and high demand day

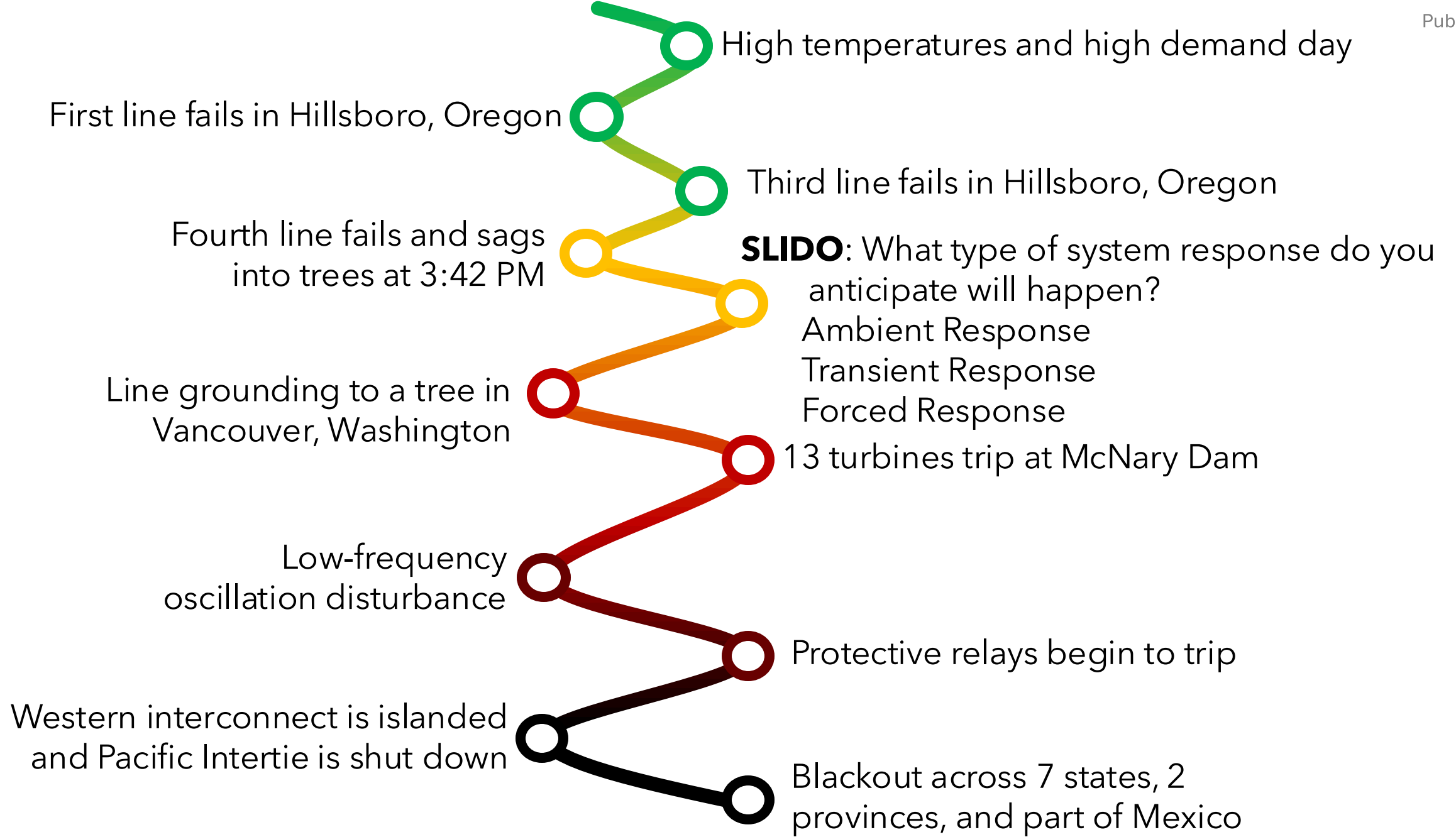
Third line fails in Hillsboro, Oregon

Fourth line fails and sags into trees at 3:42 PM

SLIDO: What type of system response do you anticipate will happen?
Ambient Response
Transient Response
Forced Response

Line grounding to a tree in Vancouver, Washington

13 turbines trip at McNary Dam





12:15 PM: Inaccurate input data renders state estimator tool ineffective

Hotter temperatures and high demand day

1:31 PM: Eastlake Unit 5 generator trips offline and shuts down automatically

2:14 PM: Utility's control room alarm and logging system failed

3:05 PM: Several 345 kV lines trip due to overgrown trees in the ROW areas

3:46 PM: Loss of the 345 kV lines leads to overloading and tripping of several 138 kV lines

SLIDO: What mode does this sound like?

Local mode
Inter-Plant
Inter-Area

BONUS: Can you name this impending blackout?

12:15 PM: Inaccurate input data renders state estimator tool ineffective

Hotter temperatures and high demand day

2:14 PM: Utility's control room alarm and logging system failed

1:31 PM: Eastlake Unit 5 generator trips offline and shuts down automatically

3:05 PM: Several 345 kV lines trip due to overgrown trees in the ROW areas

3:46 PM: Loss of the 345 kV lines leads to overloading and tripping of several 138 kV lines

SLIDO: What mode does this sound like?

Local mode
Inter-Plant
Inter-Area

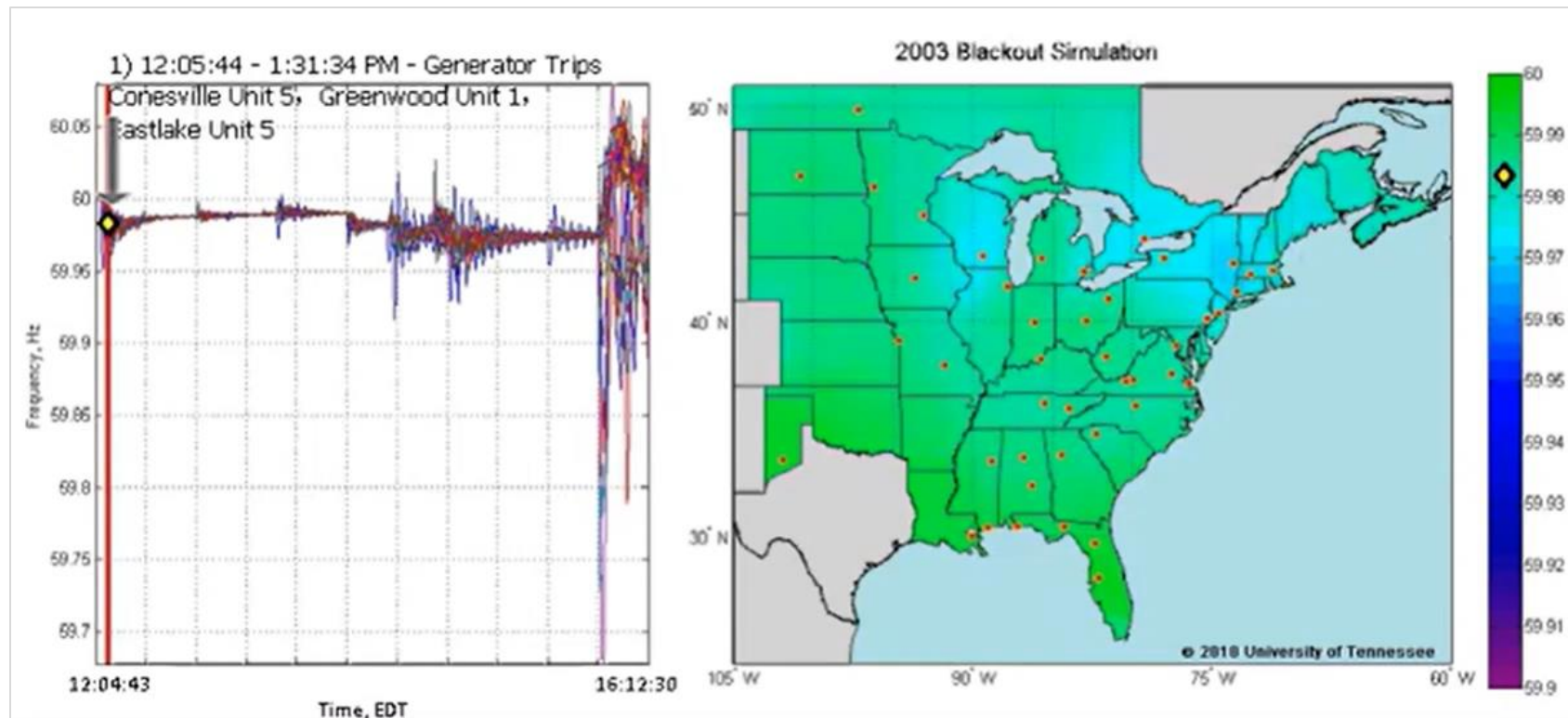
4:06 PM: FE's Sammis-Star line trips offline and begins an uncontrollable 345 kV cascade portion of the blackout

Protective relays begin to trip additional lines, turning into widespread event

Grid collapses across the Northeast and Canada

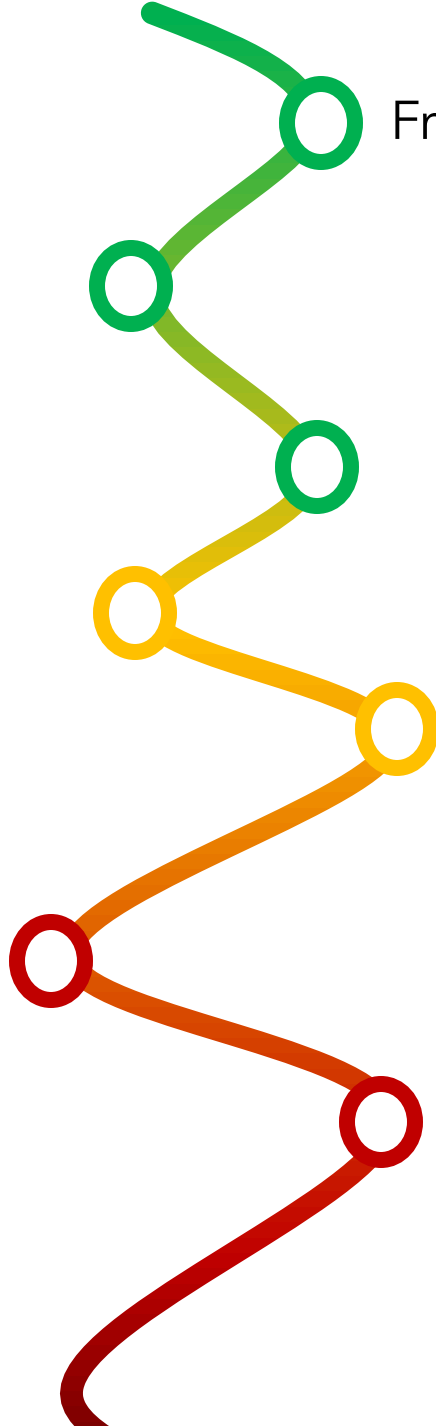
Blackout across 8 states, 1 province; 50 million without power

AUGUST 14, 2003: NORTHEAST BLACKOUT



<https://youtu.be/sKXVT0V7SQY>

Friday in January

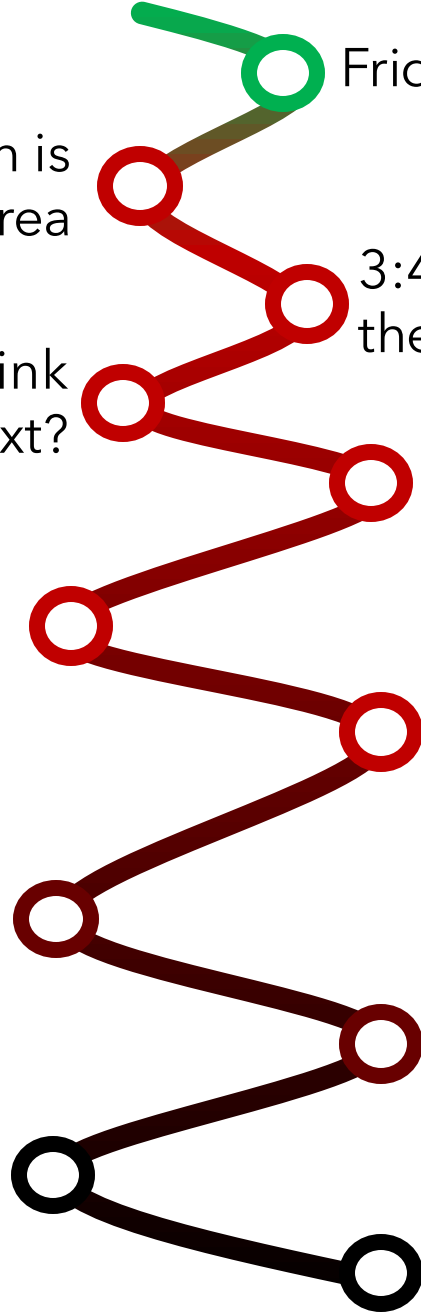


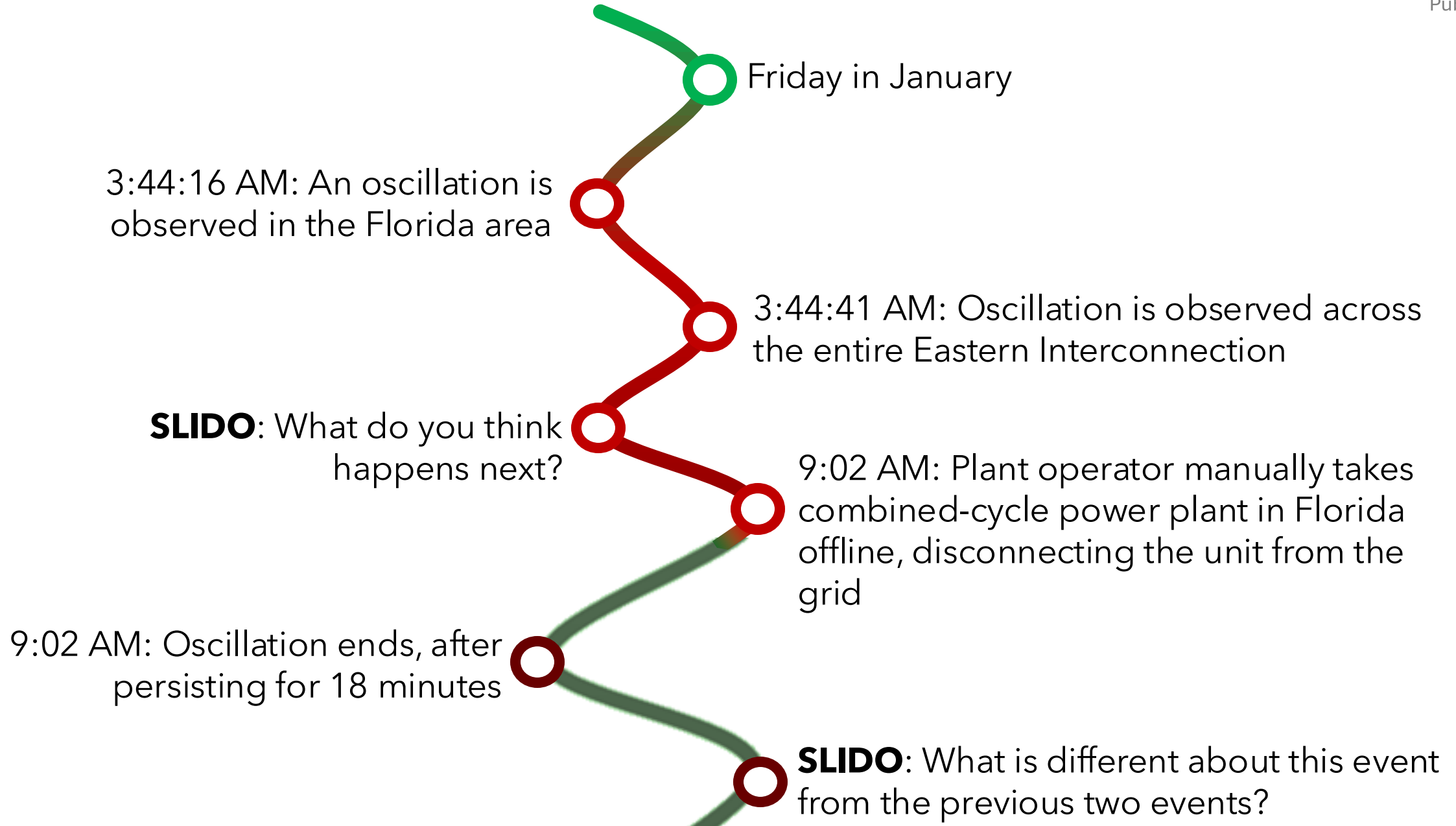
3:44:16 AM: An oscillation is observed in the Florida area

SLIDO: What do you think happens next?

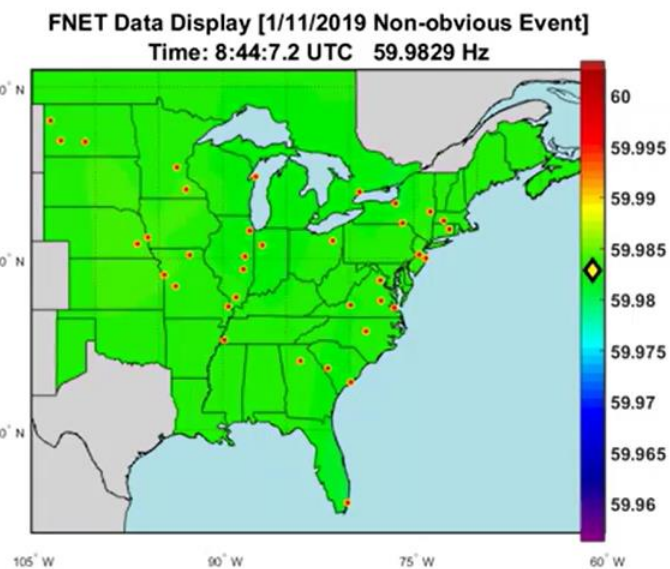
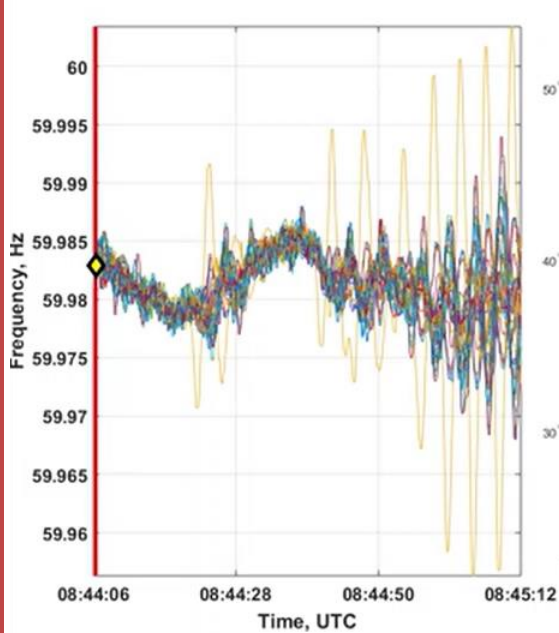
Friday in January

3:44:41 AM: Oscillation is observed across the entire Eastern Interconnection



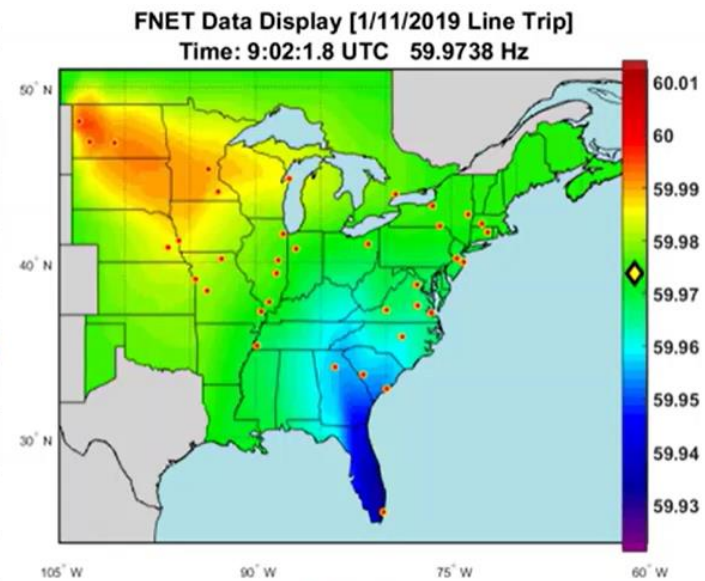
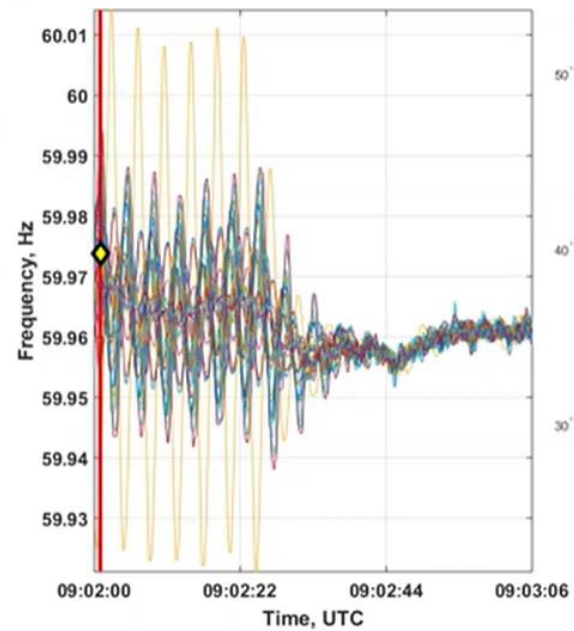


JANUARY 11, 2019: EASTERN INTERCONNECTION EVENT



OAK RIDGE
National Laboratory

THE UNIVERSITY of
TENNESSEE
KNOXVILLE

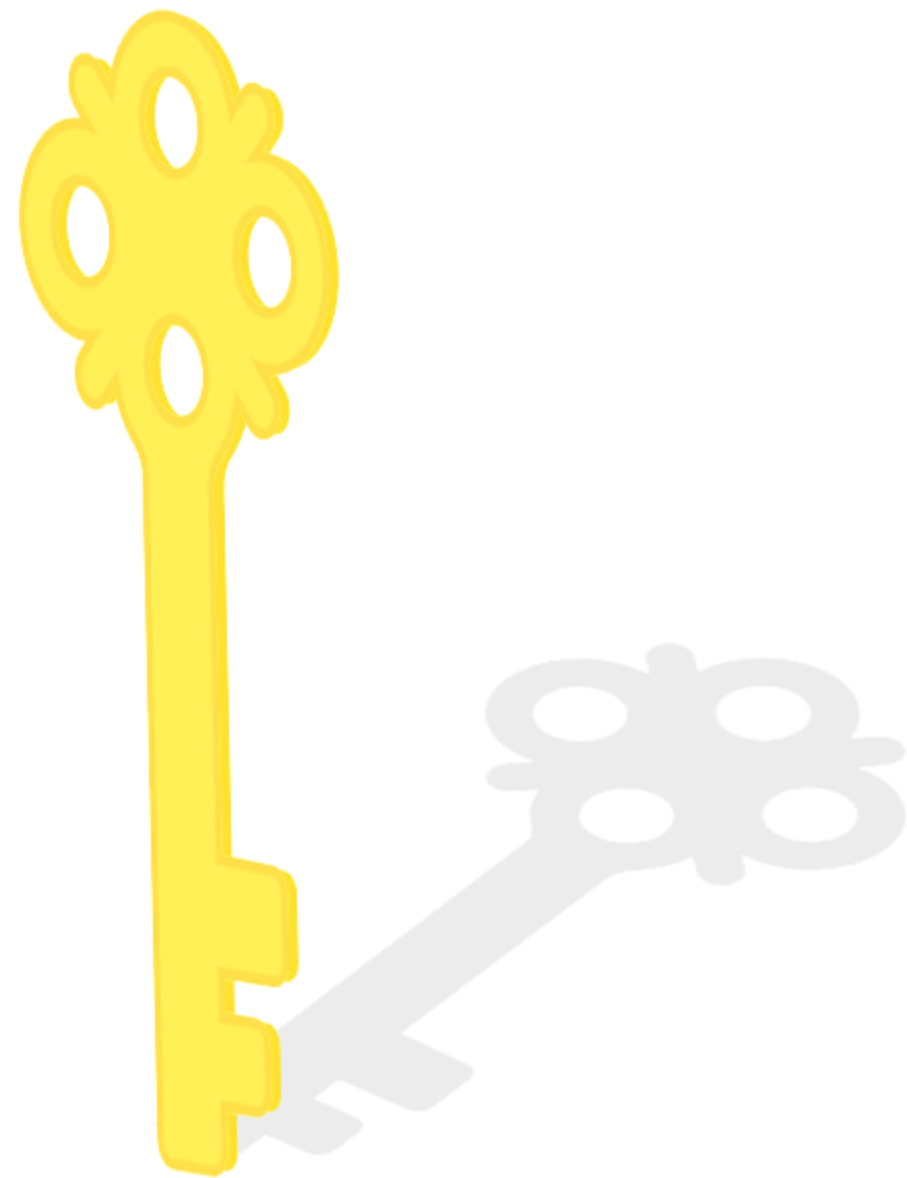


OAK RIDGE
National Laboratory

THE UNIVERSITY of
TENNESSEE
KNOXVILLE

KEY TAKEAWAY

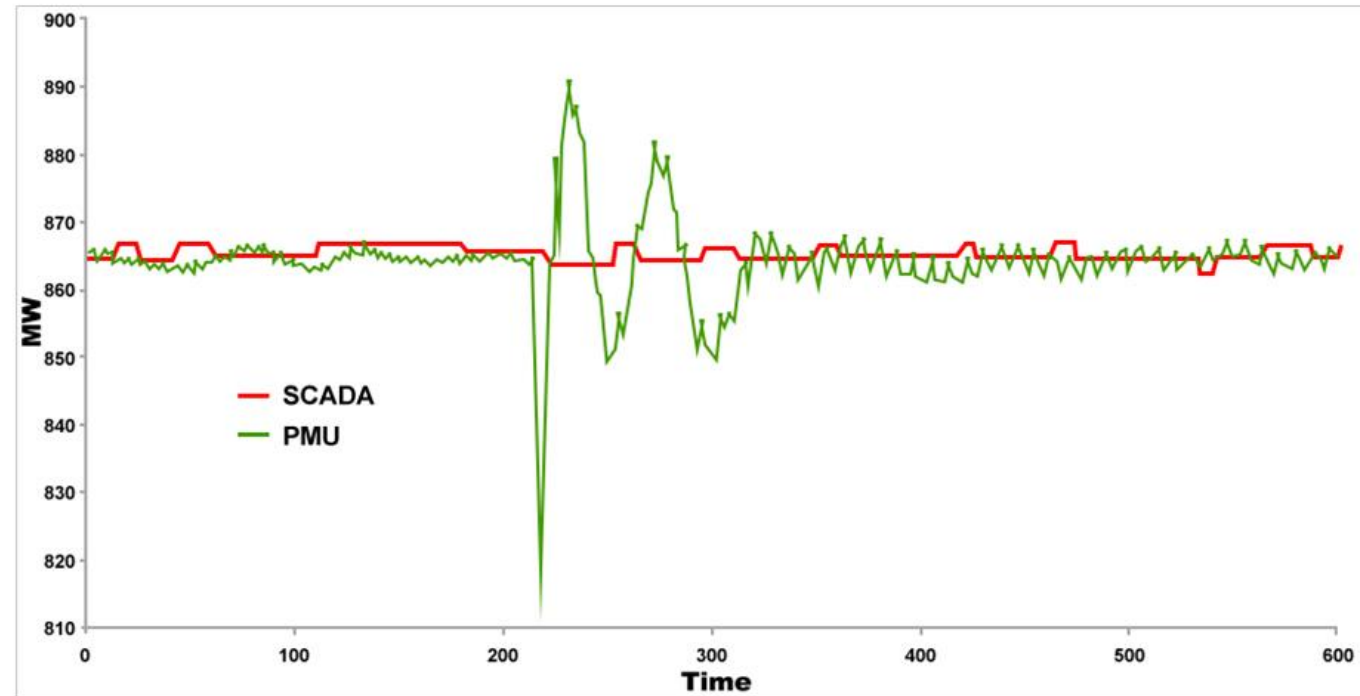
Key to all events are **monitoring and damping technologies**, like PMUs and PSS, to detect, locate, and mitigate these oscillation events in real-time



SYNCHROPHASORS

Synchrophasors are high-speed, GPS-time-synchronized measurements of electrical waves (voltage, current, phase angle, frequency, and rate of change of frequency) on power grids.

They enable real-time, wide-area monitoring, providing far greater visibility into grid stability, disturbances, and oscillations than traditional, slower SCADA systems.



- Measured by Phasor Measurement Units (PMUs) at 30 or 60 measurements per second
- By contrast, most SCADA scan rates are one sample every two or four seconds

NERC SYNCHROPHASOR ACTIVITY

Synchronized
Measurement
Working Group

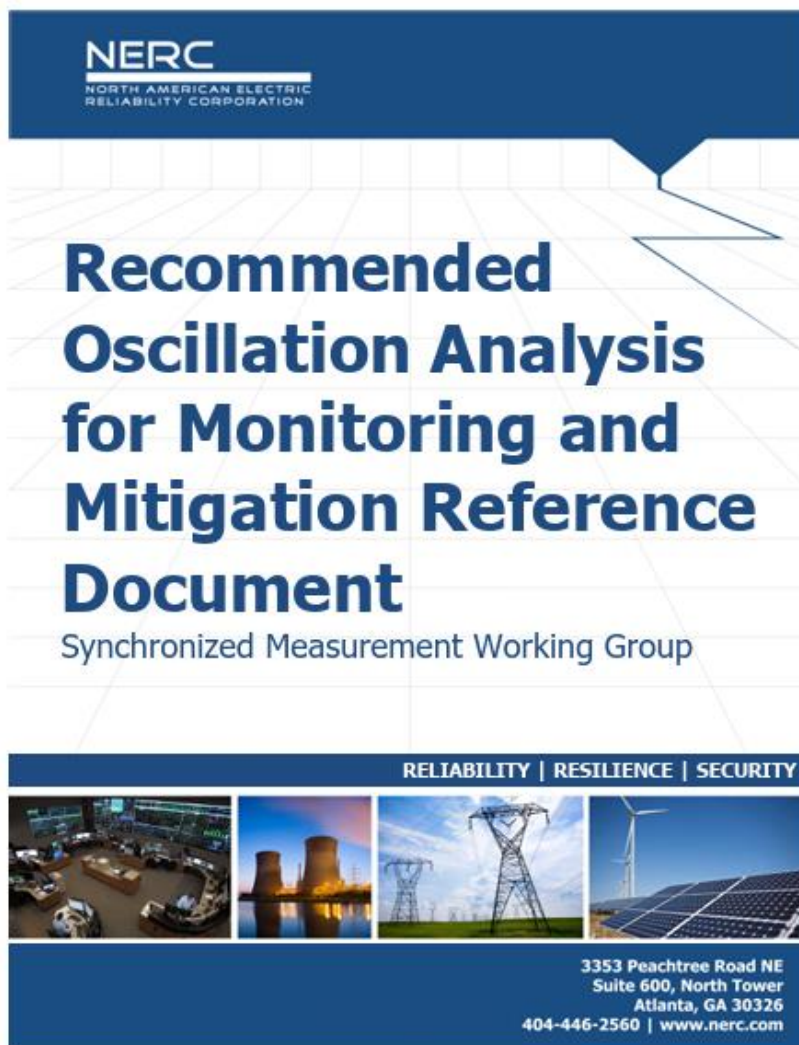
White Paper
Roadmap for
Integrating
Synchrophasors into
Real-time
Operations

If synchrophasor
data is used for
real-time
operations,
it may bring the
PMU into scope
for the CIP
standards

Security Working
Group

Security
Guideline
Incorporating
Synchrophasor Data
into Real-time
Operations

PMU OSCILLATION ANALYSIS



Field PMU Units

Data Repository

PhasorPoint

Alarms & EMS

EXAMPLE REAL-TIME OSCILLATION MONITORING

- ~ 400 PMUs across Eastern Interconnection
- Oscillation Magnitude + Decay Time





Inverter-Based Resources



Large Loads & AI Datacenters



HVDC Lines

CURRENT AND FUTURE IMPACTS

IMPACT OF IBR

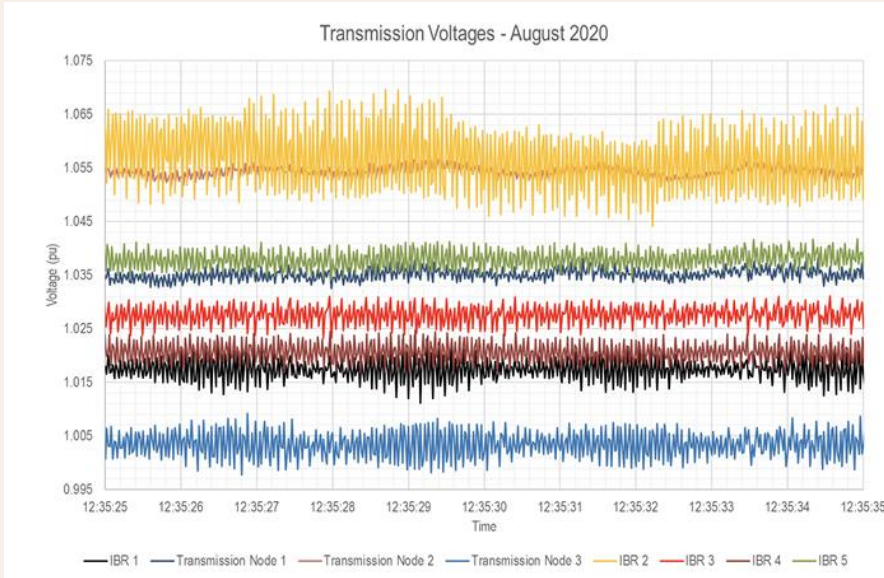
- Grid-following IBRs provide no inherent inertia
- Grid-forming IBRs provide synthetic inertia dependent on available active power headroom using controls
- Lower effective inertia results in faster frequency dynamics shifting the frequency band of inter-area oscillations

Key Takeaway:

- High IBR penetration fundamentally changes the time constants and natural modes of the grid – classical generator-based stability assumptions no longer hold

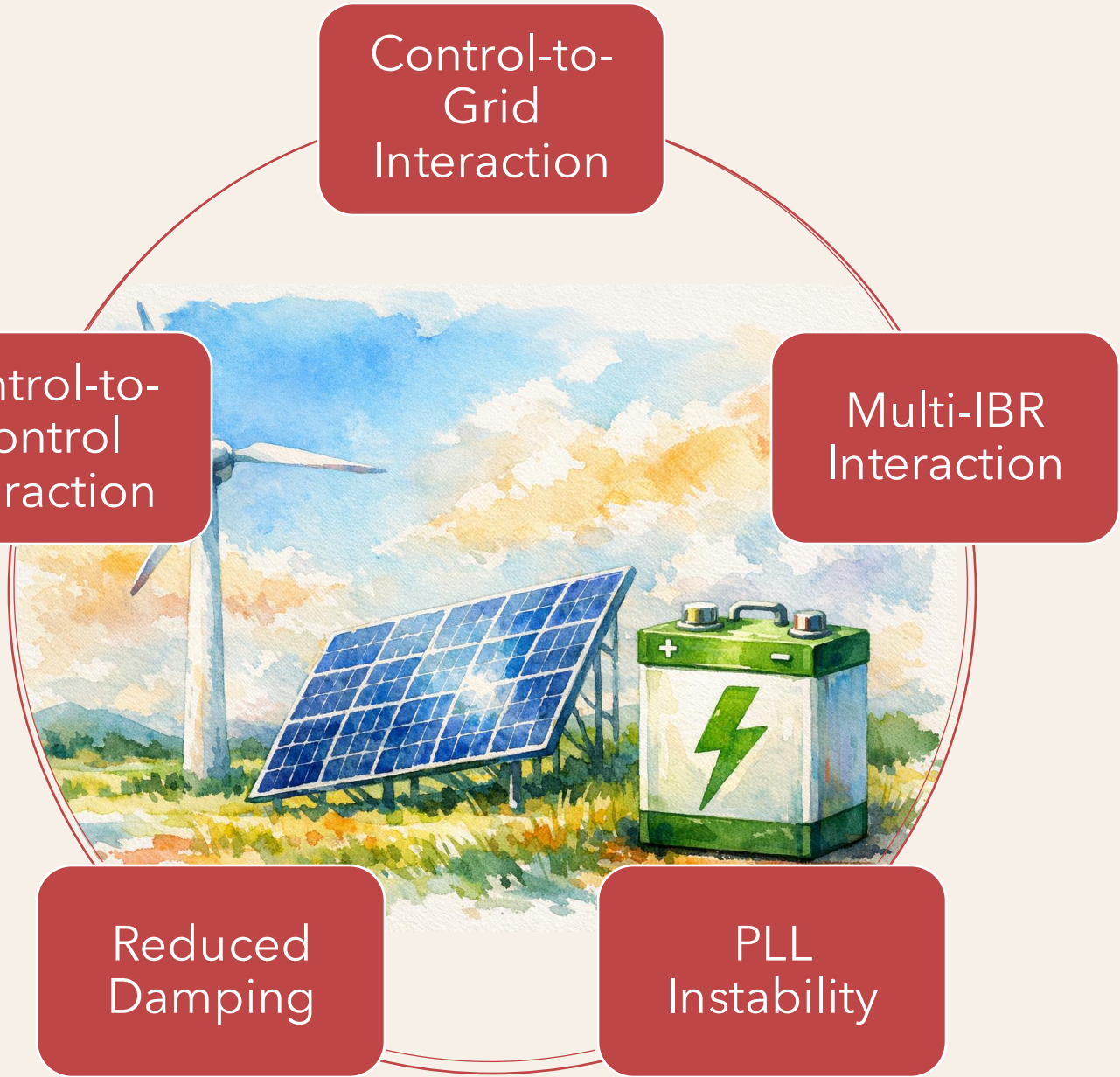


IMPACT OF IBR



$$SCR = \frac{\text{Short Circuit MVA @ POI}}{\text{IBR Plant Rated MW}}$$

where:
SCR = Short Circuit Ratio
Weak Grid when $SCR < 3$



IMPACT OF LARGE LOADS

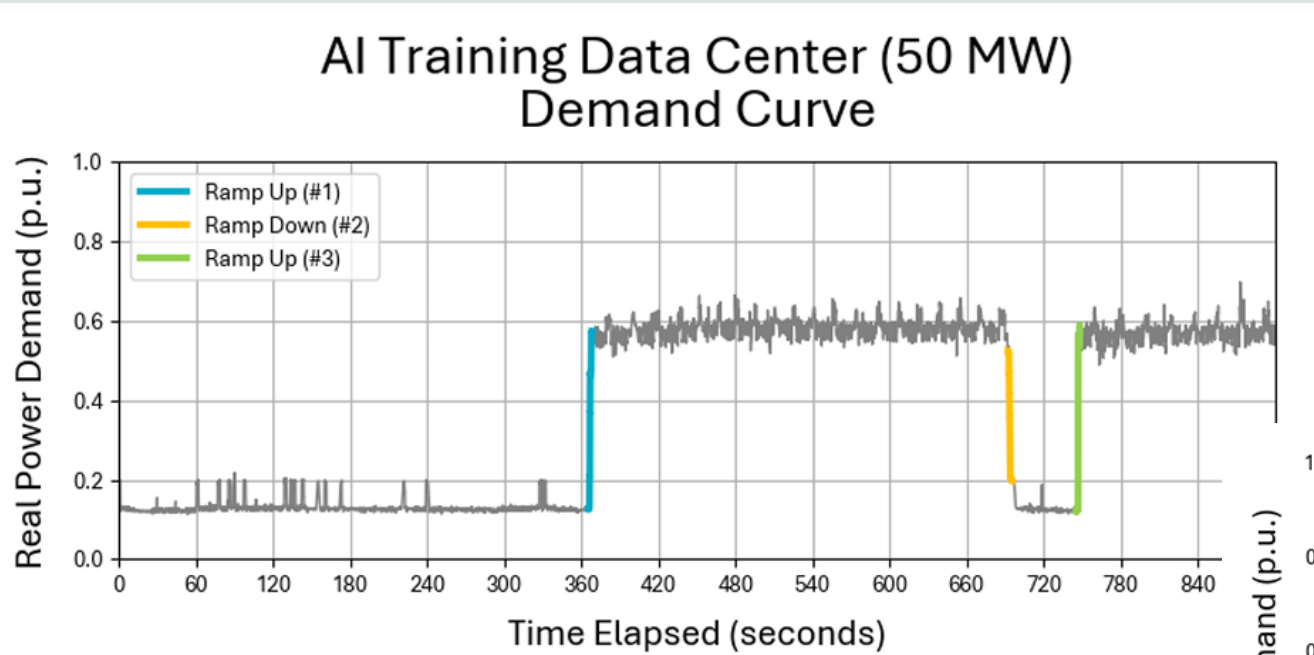


Figure 2.2: An AI Training Data Center Begins a Training Run (EdgeTunePower)

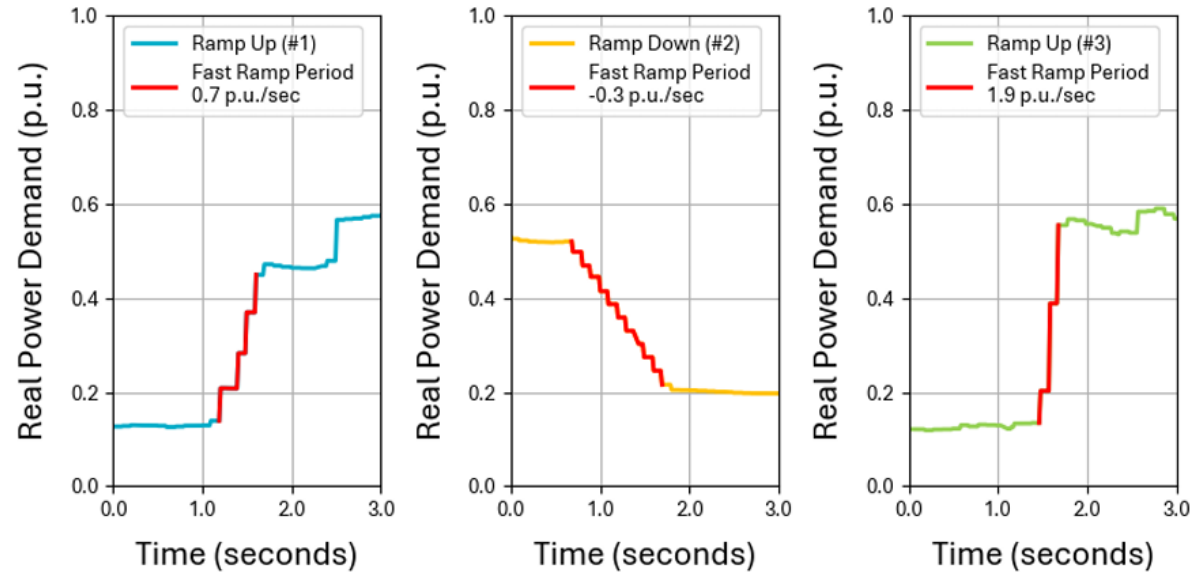


Figure 2.3: Zoomed-In Views of AI Training Data Center Ramping Up and Down Due to Transitioning Between Training and Saving Checkpoint Progress

IMPACT OF LARGE LOADS

Loads near
generators
with high
modal
participation

result in
much larger
system
responses

Large
power
swings

cause
relay
misops

Oscillation
can cover
large area,

amplifying
away from
source

IMPACT OF LARGE LOADS

- Introduction of oscillation limits for large loads
- ERCOT case:
 - PMU showed 15-20 MW at 7.5 Hz;
 - Digital Fault Recorder (DFR) waveform corrected to 50 MW at 23 Hz
- High-resolution point-on-wave measurements required

result in
much larger
system
responses

swings

cause
relay
misops

large area,

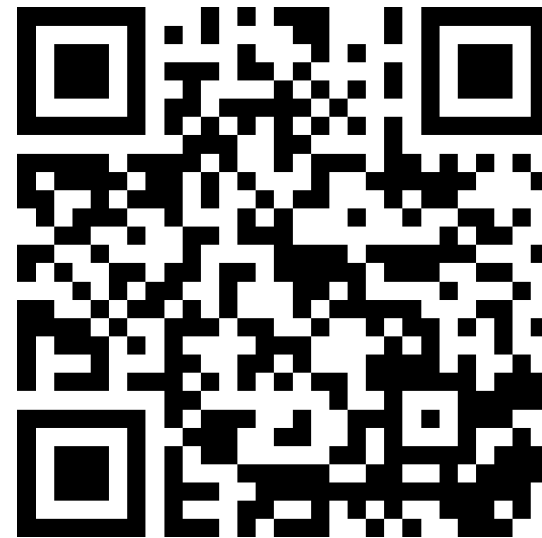
amplifying
away from
source

IMPACT OF HVDC LINES

- PLL instability in HVDC can excite low-frequency oscillations in weak-grid conditions
- HVDC converter control loops (PLL, current control, DC-voltage and power regulation) may interact with nearby IBR controls and can introduce new poorly damped modes
- Converter-grid impedance resonance in weak systems may produce harmonic or super-synchronous oscillations, as observed in offshore wind HVDC connections
- HVDC controls need to be tuned to stabilize the oscillations



Please share something new
you've learned from today's
presentation!



www.slido.com
#TechTalkRF

Or join via
[slido.com](https://www.slido.com)
#TechTalkRF

Submissions are anonymous!

See NERC's
EMTWG and
whitepaper

FUTURE Pair with EMT
analysis

FUTURE Small signal stability analysis
after weak grid analysis

PRESENT In discussions with Frequency Studies
Potential to capture and analyze historical
oscillation events and impact to frequency



FORWARD TOGETHER  RELIABILITYFIRST



Thank You

INTERNATIONAL ENERGY CASE STUDIES: *RELIABILITY LESSONS LEARNED*

Catherine Lewis
Energy Policy Analyst
External Affairs

Courtney Fasca
Sr. Reliability Consultant
External Affairs

May 18, 2026

The sole purpose of this presentation is to provide technical reliability-related information based on ReliabilityFirst's expertise. This communication is not intended to be and should not be interpreted as advocating for a specific position or outcome.



AGENDA

Iberian Peninsula Blackout (2025)

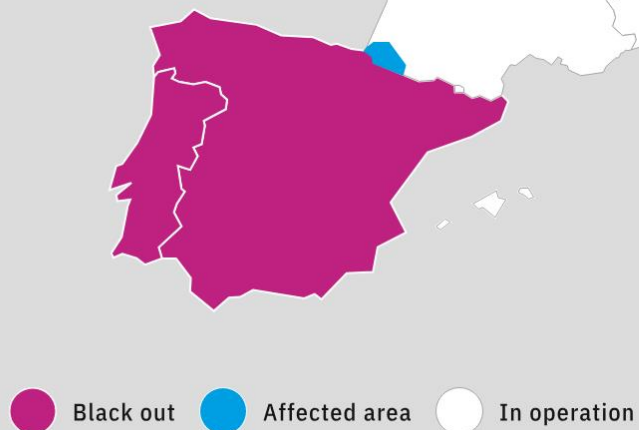
Estonia & Finland Battery Testing Fault (2026)

Chile Blackout (2025)

Current Events: Global Energy Impacts from the War with Iran



2025 IBERIAN PENINSULA BLACKOUT



On April 28, 2025, at 12:33 PM local time, the power systems of continental Spain and Portugal experienced a total blackout.

A small part of Southwest France experienced short duration disruptions, affecting several industrial consumers and generators.

This was the most severe blackout on the European power system in 20 years and the first ever of its kind.



“The investigation concludes that the blackout resulted from a combination of many interacting factors, including oscillations, gaps in voltage and reactive power control, differences in voltage regulation practices, rapid output reductions and generator disconnections in Spain, and uneven stabilization capabilities.

These factors led to fast voltage increases and cascading generation disconnections, resulting in the blackout in continental Spain and Portugal.”

-ENTSO-E ICS Investigation Expert Panel Final Report

<https://eepublicdownloads.blob.core.windows.net/public-cdn-container/clean-documents/Publications/2025/iberian-blackout/Final%20Report%20on%20the%20Grid%20Incident%20in%20Spain%20and%20Portugal%20on%2028%20April%202025.pdf>

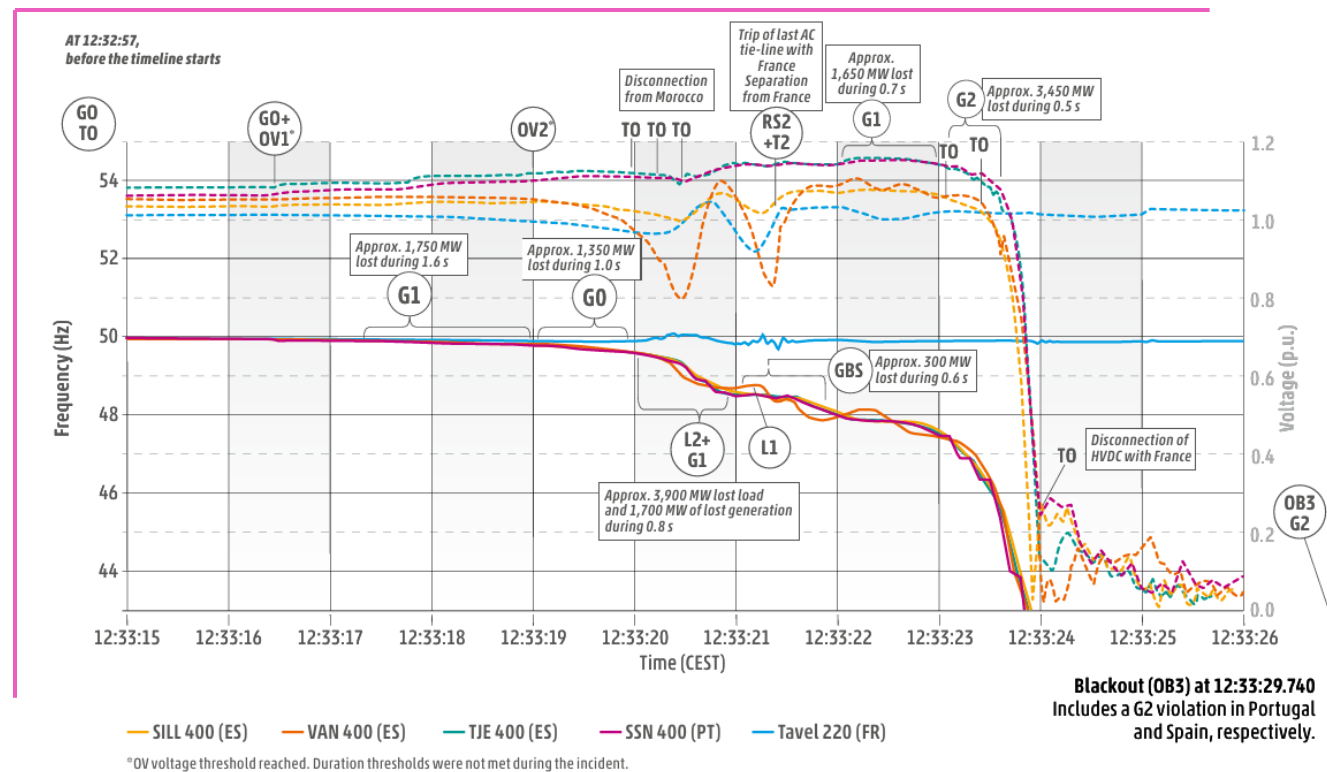


Figure 8-2: ICS criteria violations for Portugal and Spain during the incident

ROOT CAUSE TREE

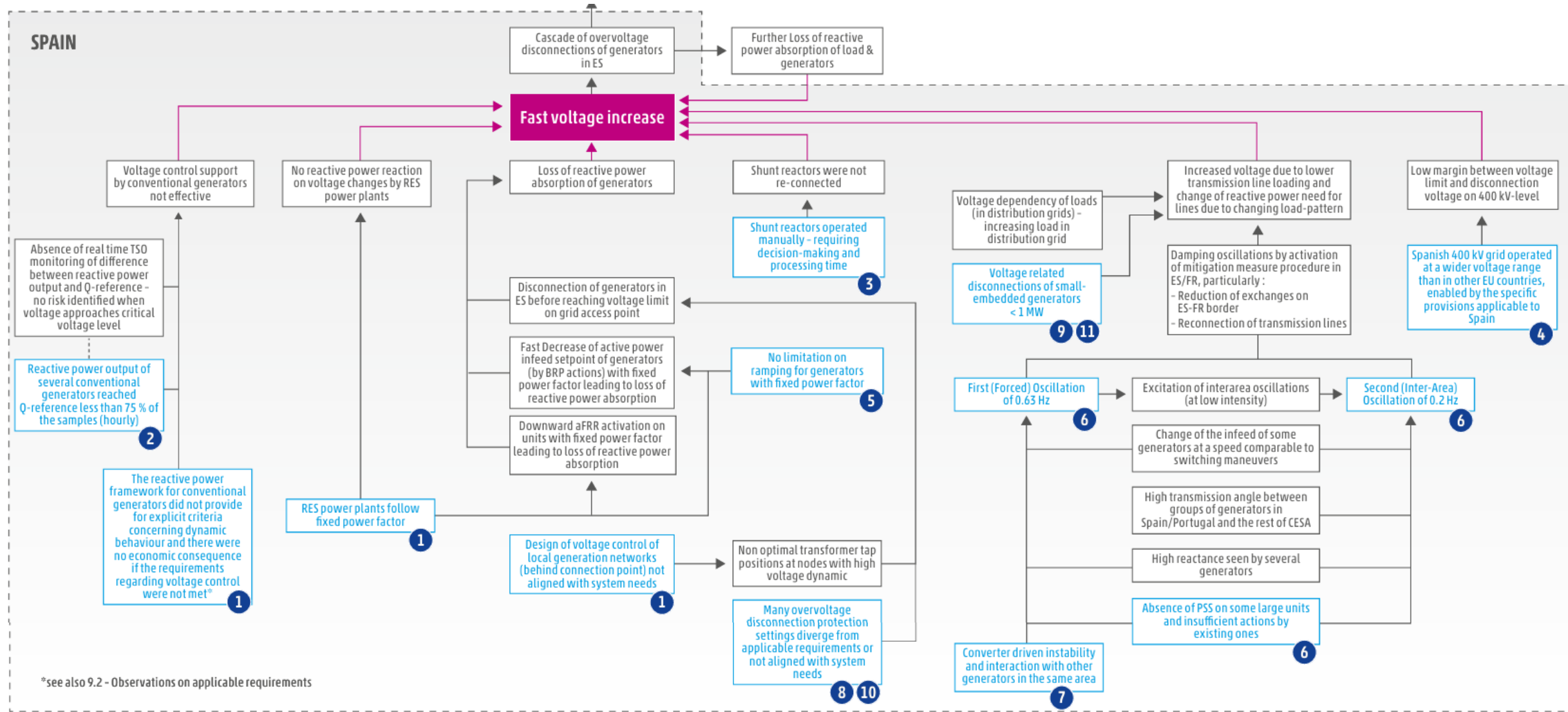


Figure 4-124: Root cause tree linked with recommendations

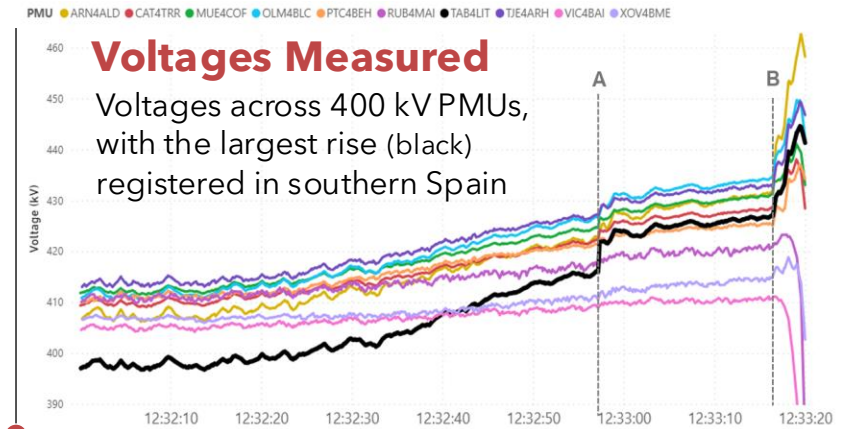
VOLTAGE CONTROL

Reactive Power Resources

lack of effective voltage control support to respond to approx. 1-min-long voltage rise

Voltage Management

reactive power capabilities were unable to absorb the voltage rise



Voltage Control Timeline

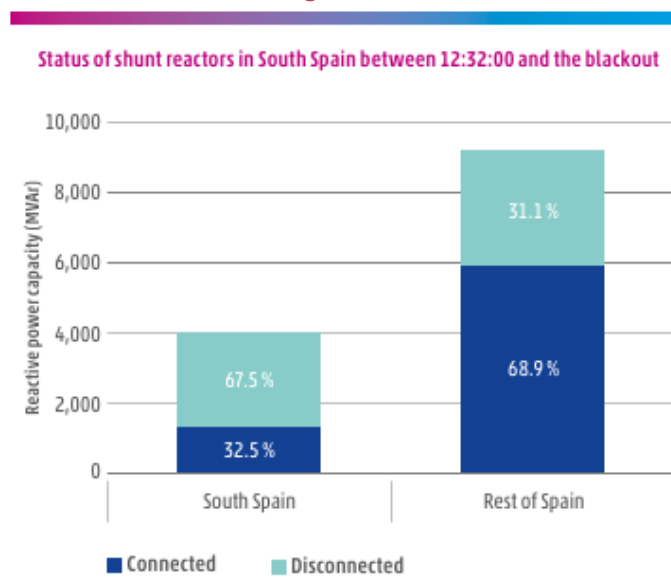
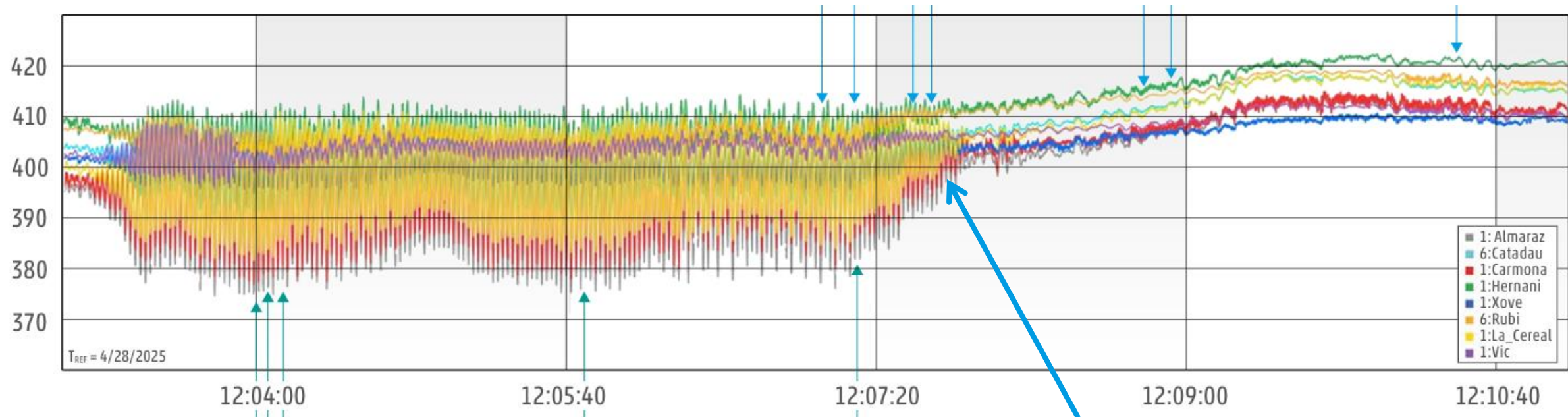


Figure 4-1: Status of shunt reactors between 12:32:00 and the blackout.

OSCILLATIONS DEEP DIVE

12:03 PM The First Oscillation: 0.63 Hz



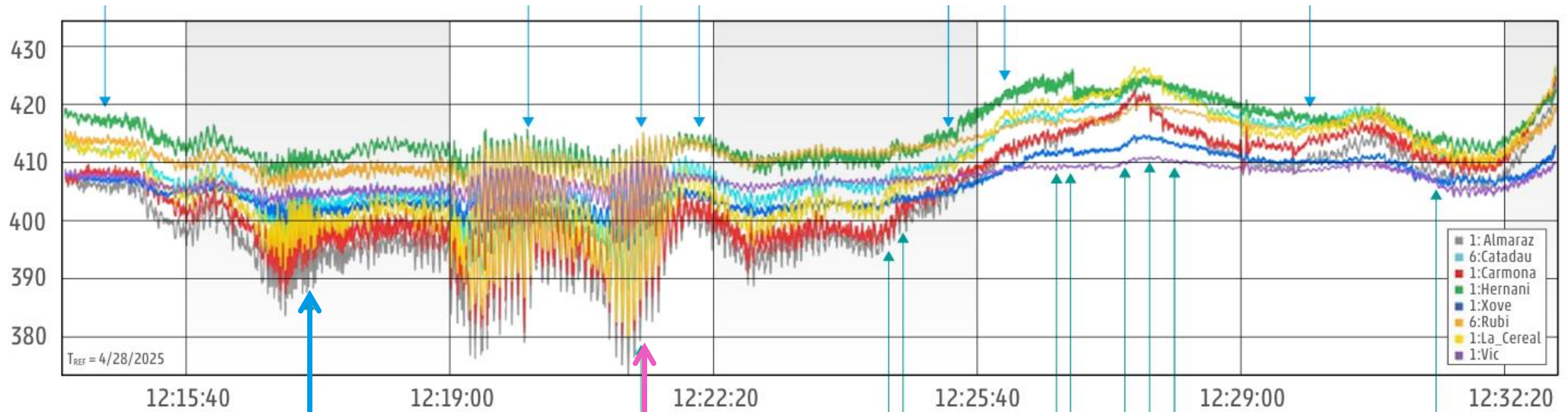
Oscillation solved in
< 5 minutes

slido



OSCILLATIONS DEEP DIVE

12:19 PM The Second Oscillation: 0.2 Hz



0.6 Hz oscillation,
undervoltage risk

0.2 Hz oscillation,
solved in < 3.5 mins

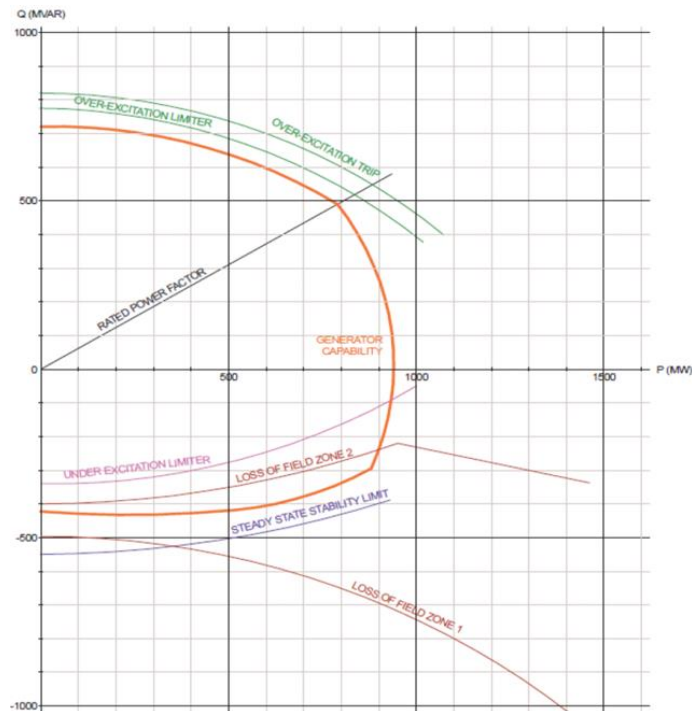
slido



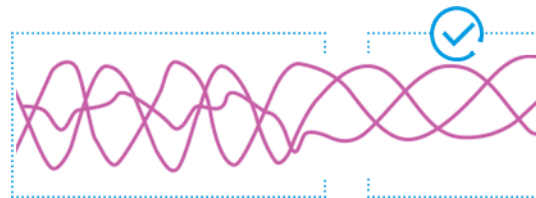
OSCILLATIONS DEEP DIVE



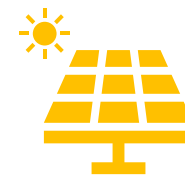
Power angle between
the generators and the grid



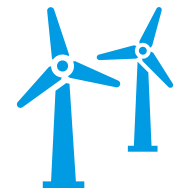
Operating points
and voltage profiles



Reactive power resources &
dynamic stabilization resources



IBRs



OSCILLATIONS DEEP DIVE

Generator reactance

Perform inspections and testing in the field to certify stability and mandatory services operating as expected

High-frequency and power quality monitoring tools at relevant plants and significant sub-transmission areas

Power angle between the generators and the grid

Perform IBR-focused system studies and laboratory tests, including them in acceptance testing for new generators and significant loads

Operating points and voltage profiles

Ad hoc studies to identify automatic containment actions and oscillation damping

Perform periodic tuning of Power System Stabilizers (PSS)

Evaluate power quality monitoring systems and plant control systems of existing generators for improvement

Extend mandatory requirement for PSS on new or existing power plants

Requirements for demand/generation/HVDC and FACTS to support system stability and avoid converter-driven instability

Reactive power resources & dynamic stabilization resources


IBRs

BUT WHAT ABOUT US?

Reactive Power:
Quantity vs. Quality

Reaction Time

Snowball Effect



Unit Compliance
vs.
System Resilience

ESTONIA & FINLAND DISTURBANCE: BATTERY TESTING FAULT



On January 20th, 2026, the testing of a 100MW/200 MWh battery energy storage system triggered a disturbance in the power systems of Estonia and Finland

ESTONIA & FINLAND DISTURBANCE: BATTERY TESTING FAULT



IBRS & OSCILLATIONS

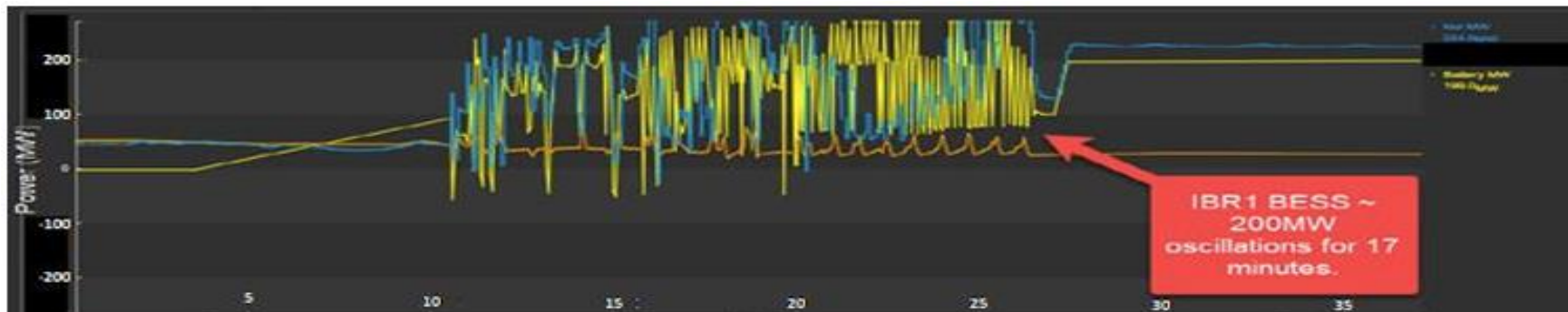


Figure 1: The First of the Three Oscillatory Controller Responses in the U.S.

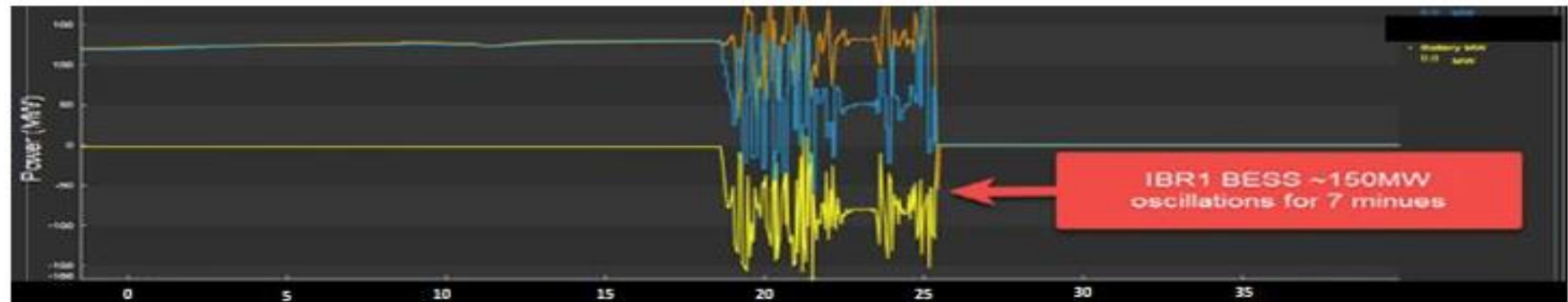


Figure 2: The Second of the Three Events

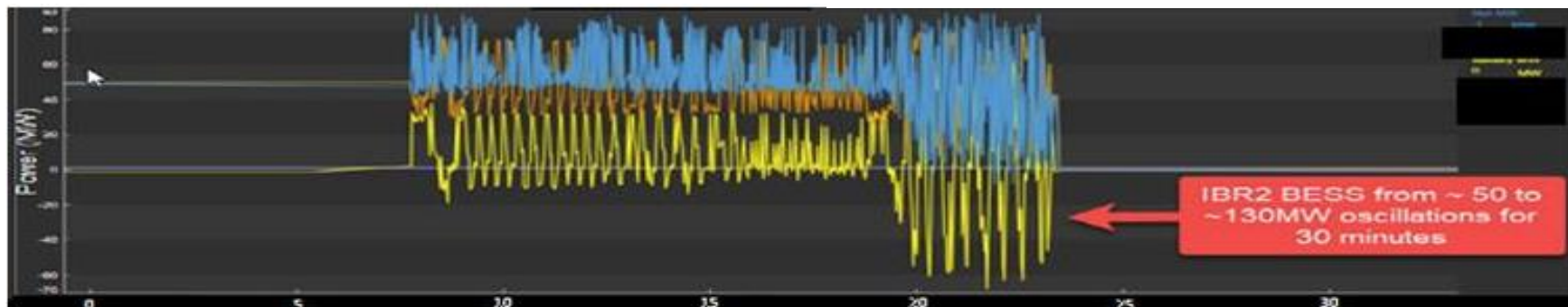


Figure 3: The Third of the Three Events

NERC Lessons Learned from these events [here](#)

2025 CHILE BLACKOUT

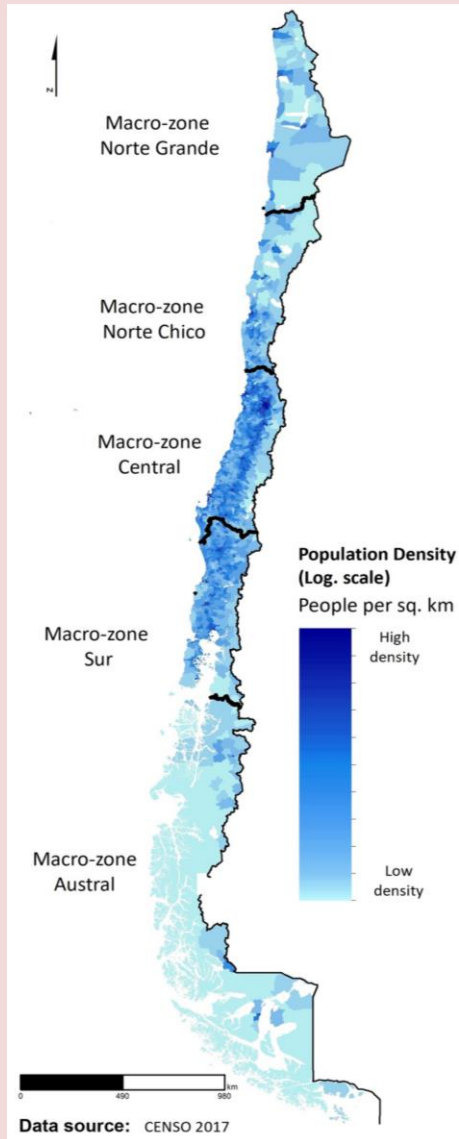
On February 25, 2025, at 3:16 pm local time, Chile experienced widespread power failure.

A malfunction in electric and software protection systems resulted in the disconnection of a critical transmission line.

Over 90% of the population was affected, and a state of emergency was declared.

Picture: Santiago, Chile in complete darkness amidst the blackout.

CRITICAL TRANSMISSION CORRIDOR



2/3 of Chile's population resides in the central region near Santiago

Solar power projects are primarily being developed in northern Chile

geographic separation of generation & demand



TRANSFER CAPABILITY IN THE U.S.

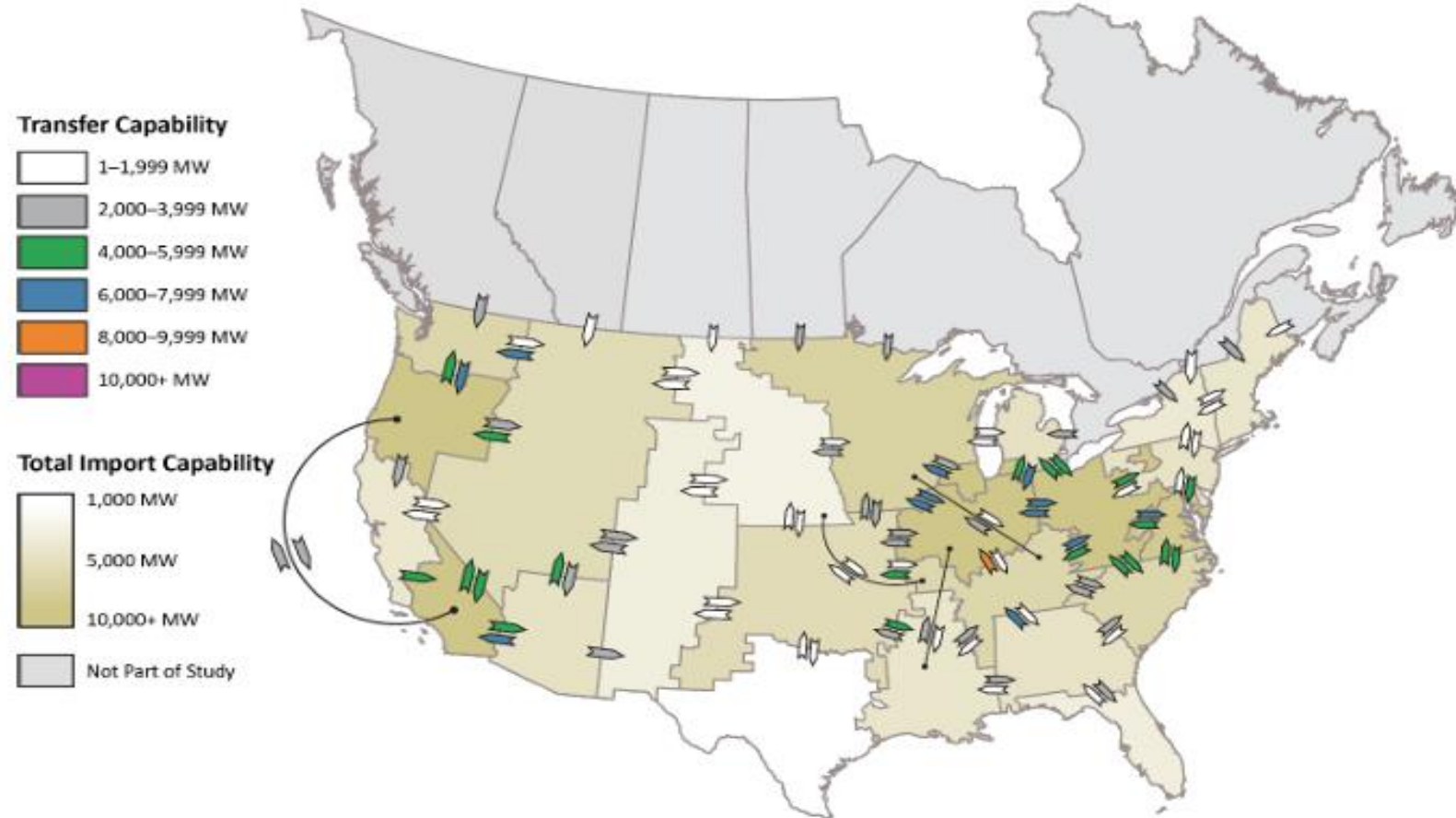
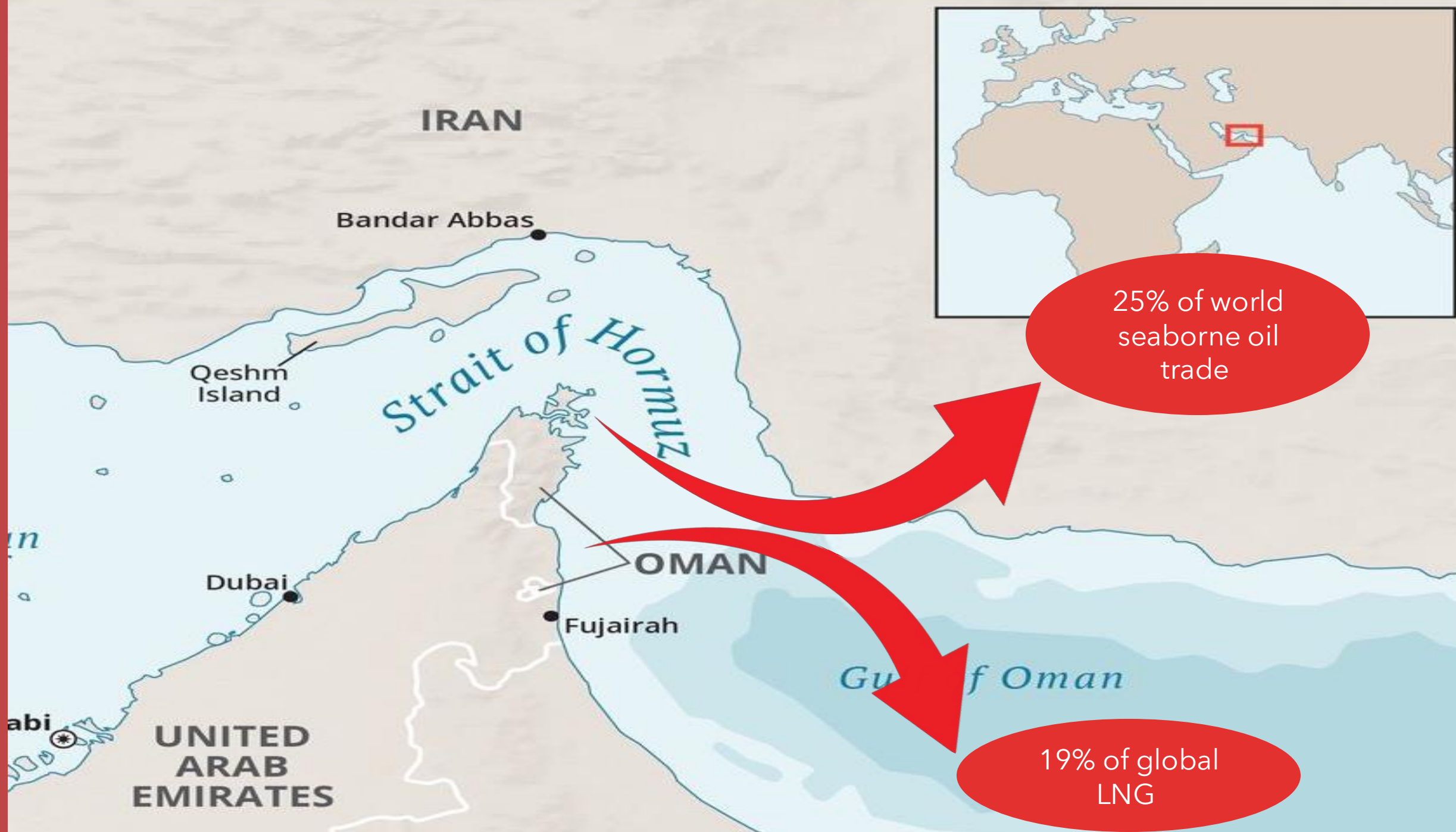


Figure ES.2: Transfer Capabilities (Summer)

Transfer capability analysis between each pair of neighboring transmission planning regions, 2024 Summer (ITCS)



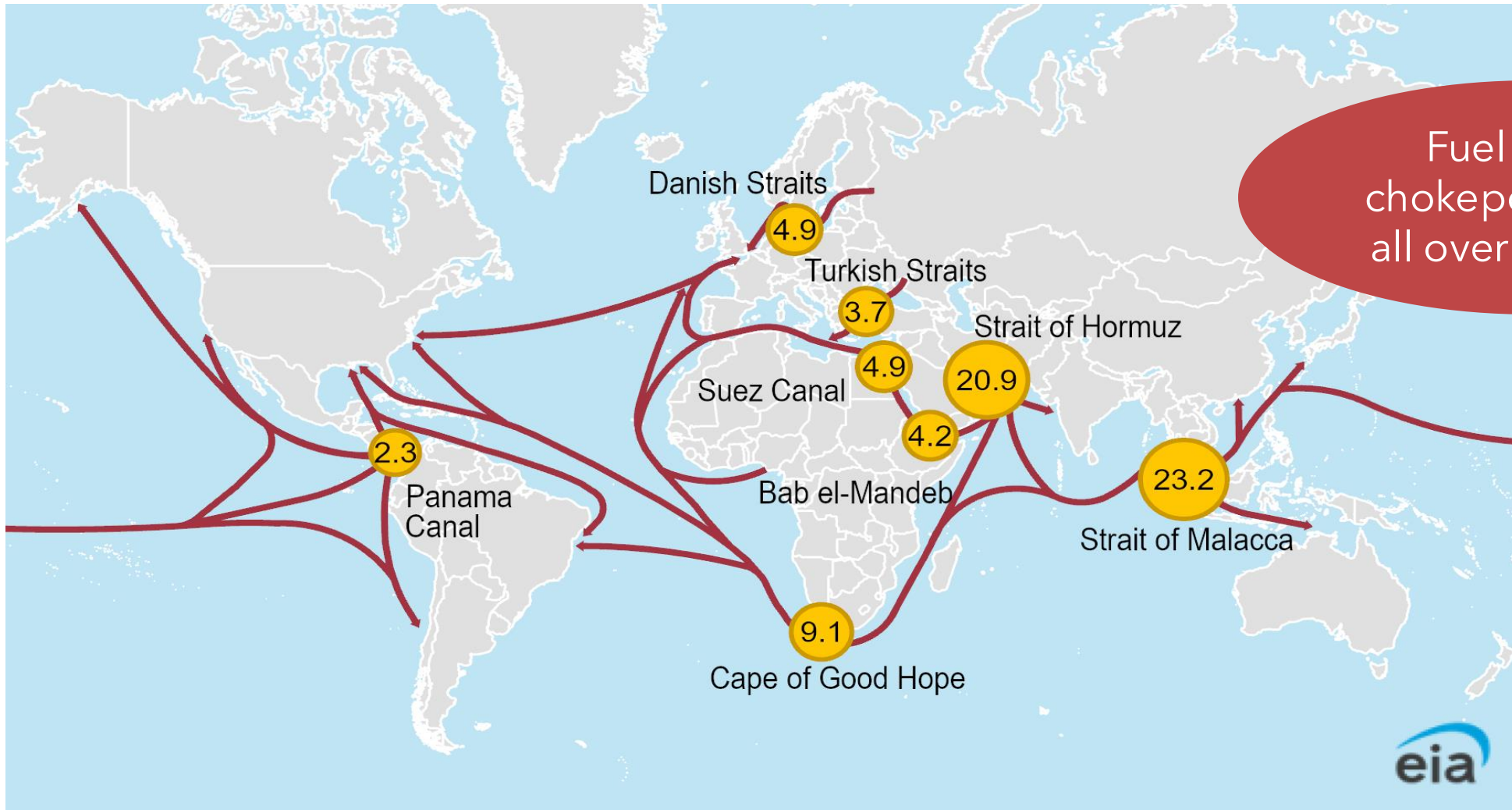
CURRENT ENERGY CRISIS: THE CONFLICT WITH IRAN



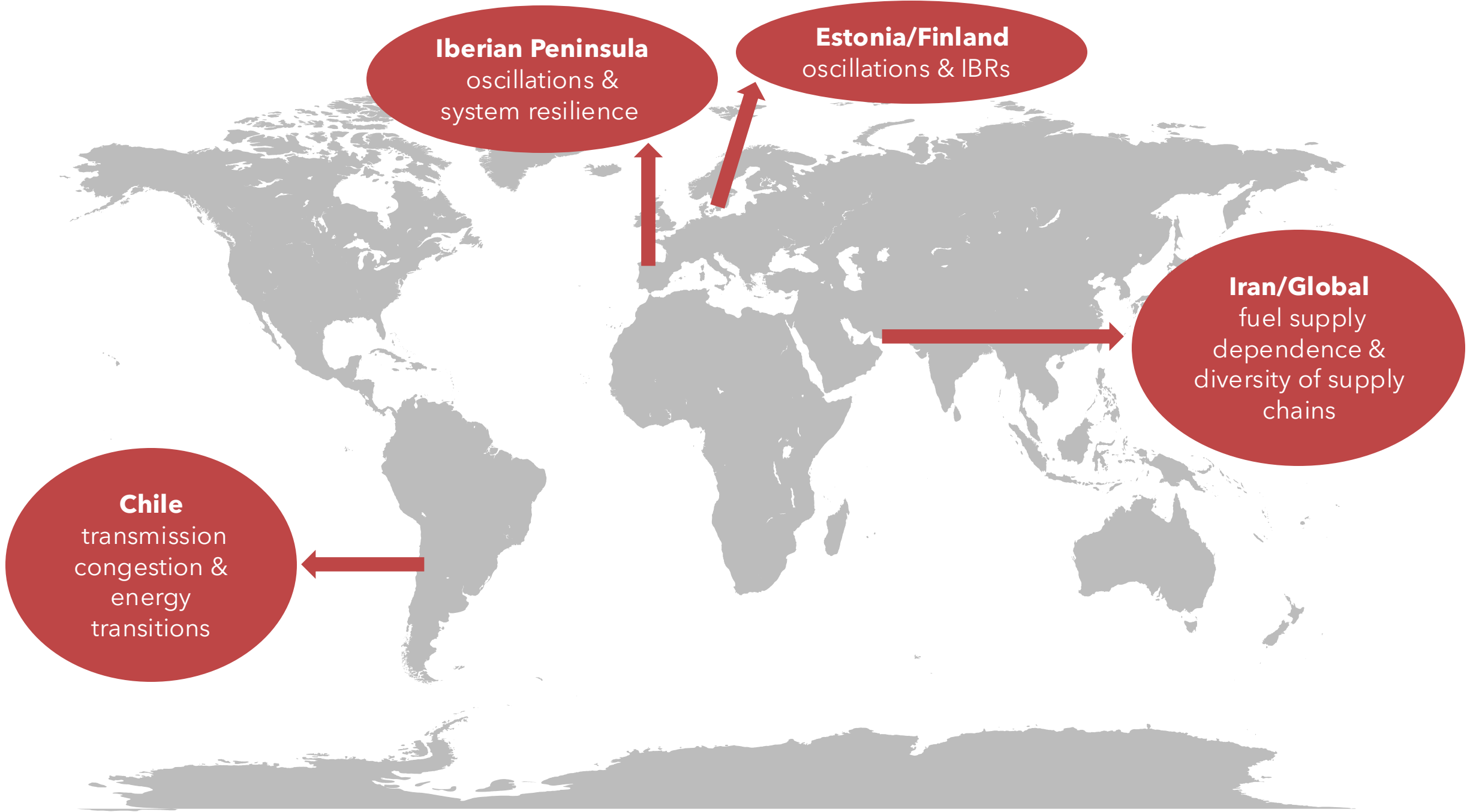
25% of world seaborne oil trade

19% of global LNG

FUEL SUPPLY DEPENDENCE



Map of daily transit volumes of petroleum and other liquids through world maritime oil chokepoints (million barrels per day) (2025)



Iberian Peninsula
oscillations &
system resilience

Estonia/Finland
oscillations & IBRs

Iran/Global
fuel supply
dependence &
diversity of supply
chains

Chile
transmission
congestion &
energy
transitions

Thank You

catherine.lewis@rfirst.org



THANK YOU

***Join us for our next Tech Talk -
June 22nd 2-3:30 pm EST***

[Webinar Link](#)

