

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Bulk Power System Awareness

Situational Awareness Q4 2022

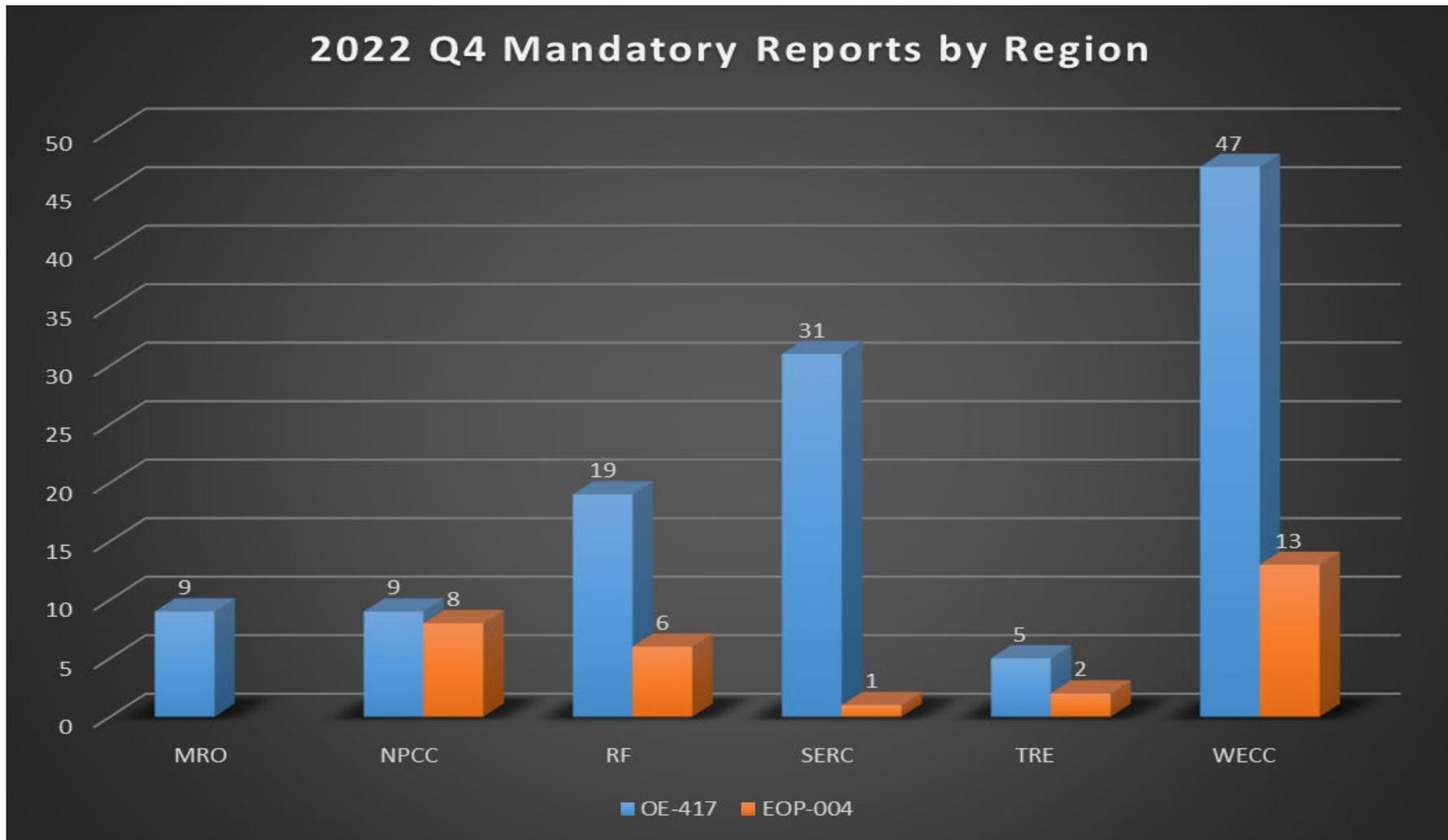
Darrell Moore, Director
Bulk Power System Awareness and Personnel Certification
Technical Session
February 15, 2023

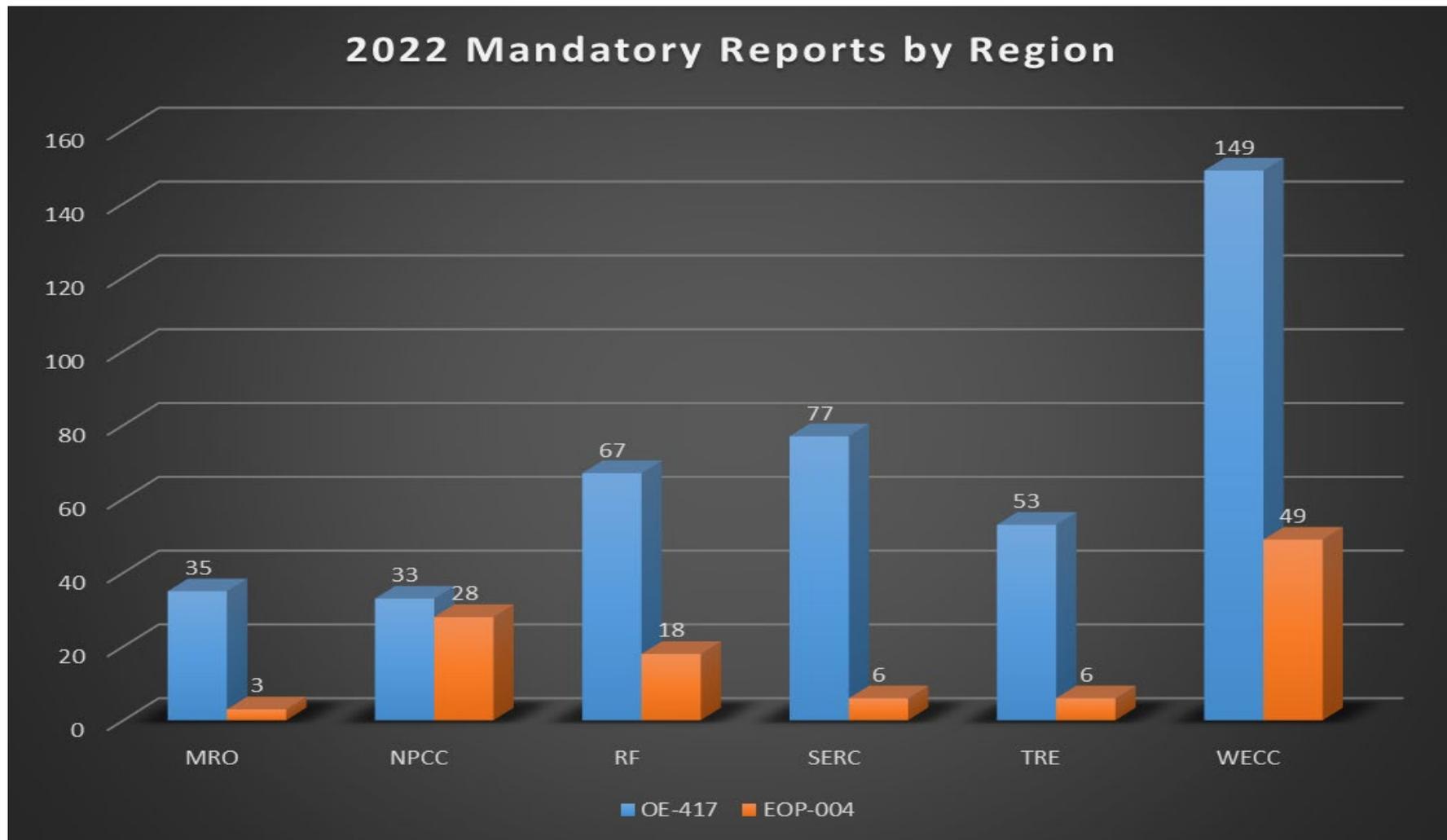
RELIABILITY | RESILIENCE | SECURITY

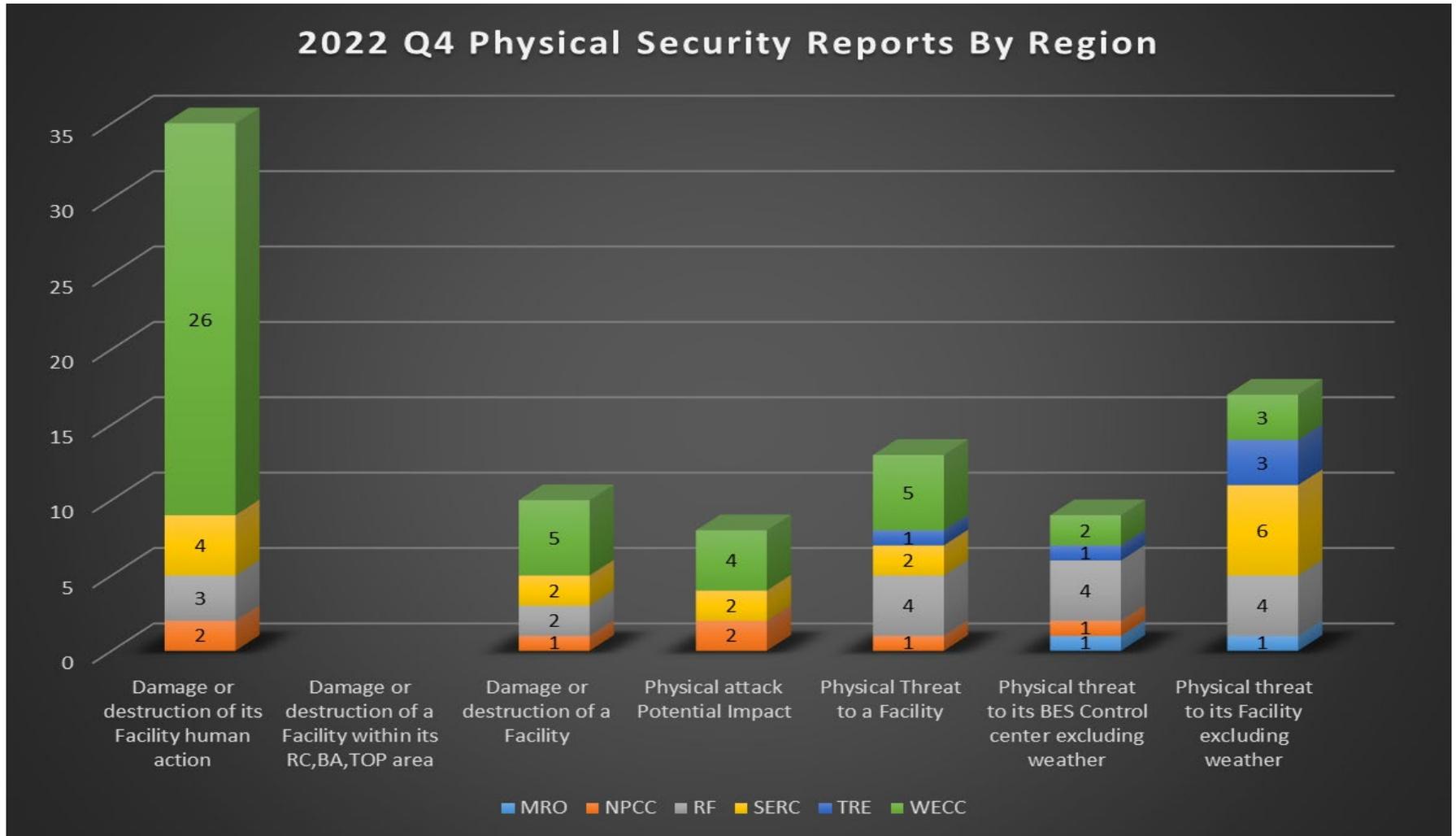


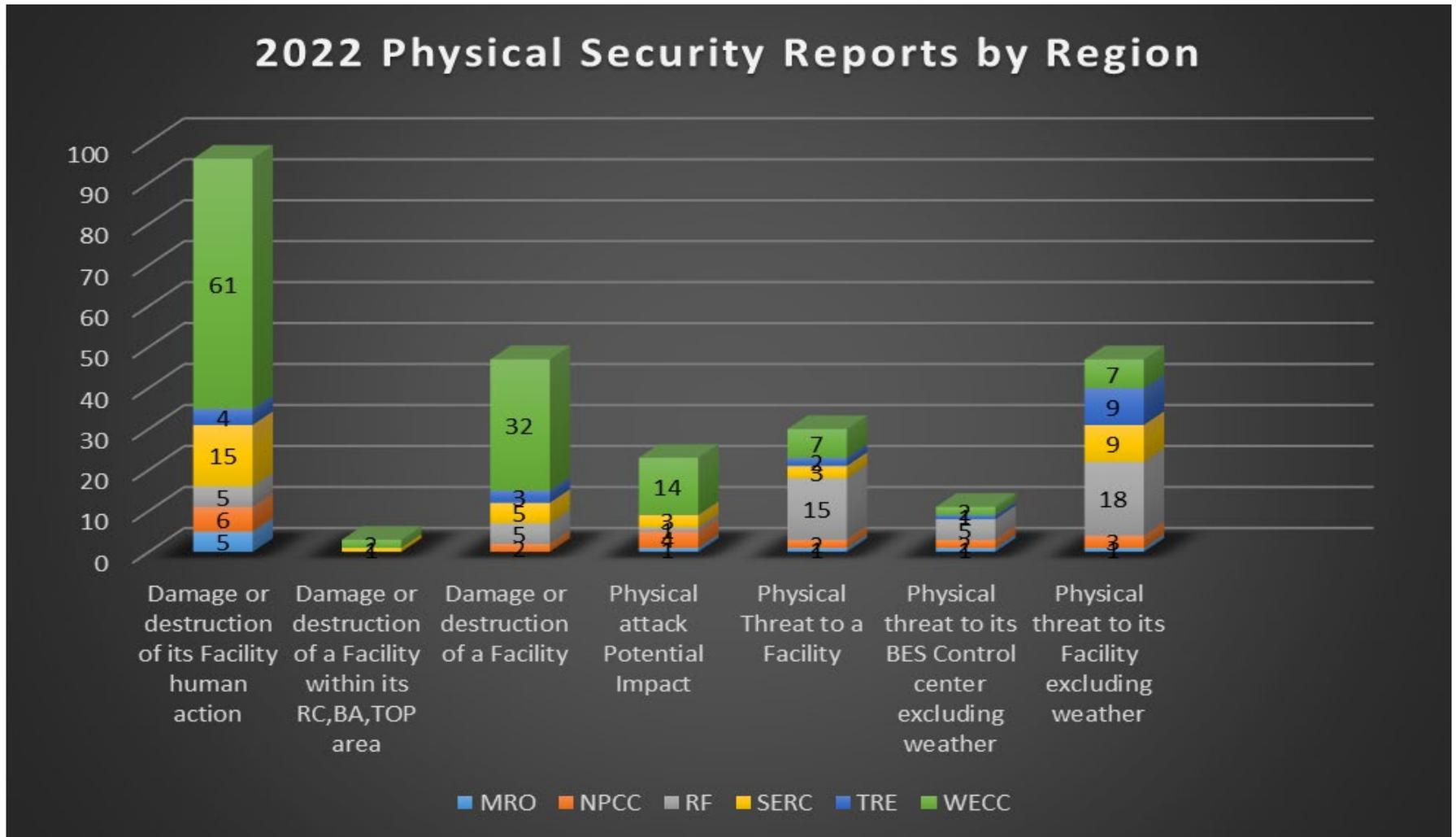
For the Forth Quarter 2022 there were several significant events that impacted the North American bulk power system (BPS).

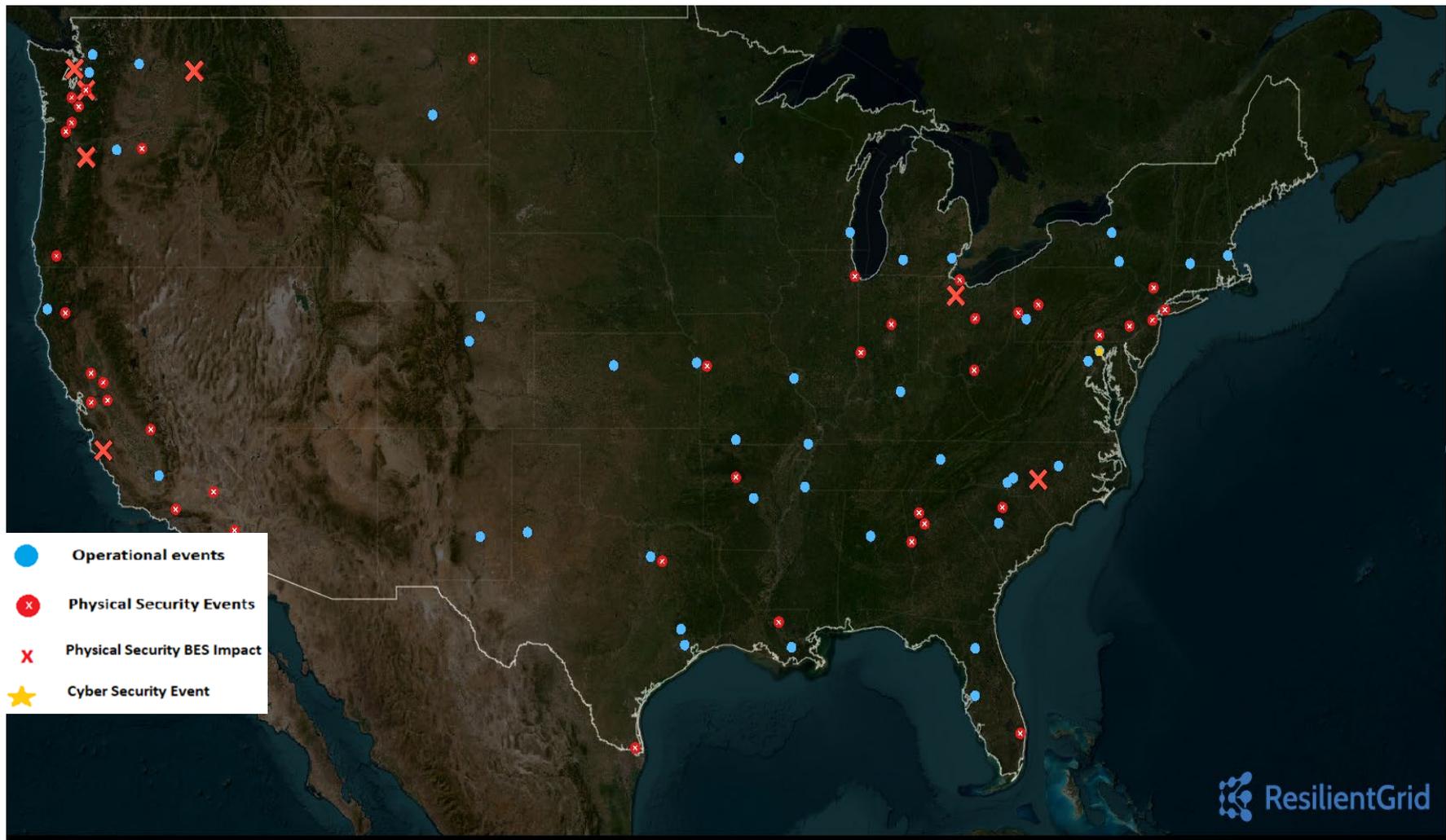
- November 10th Hurricane Nicole made landfall south of Vero Beach Florida as a Category 1 Hurricane. Number of customer outages peaked at 356k.
- December 3rd physical attacks on the Carthage 115kV and West End 230kV substations in Moore County, North Carolina.
- December 19th Winter Storm Elliott's Arctic air-mass began a stretch southward from west-central Canada to Texas and across the eastern two-thirds of the United States.
- December 25th multiple physical attacks in the Seattle-Tacoma, Washington area.



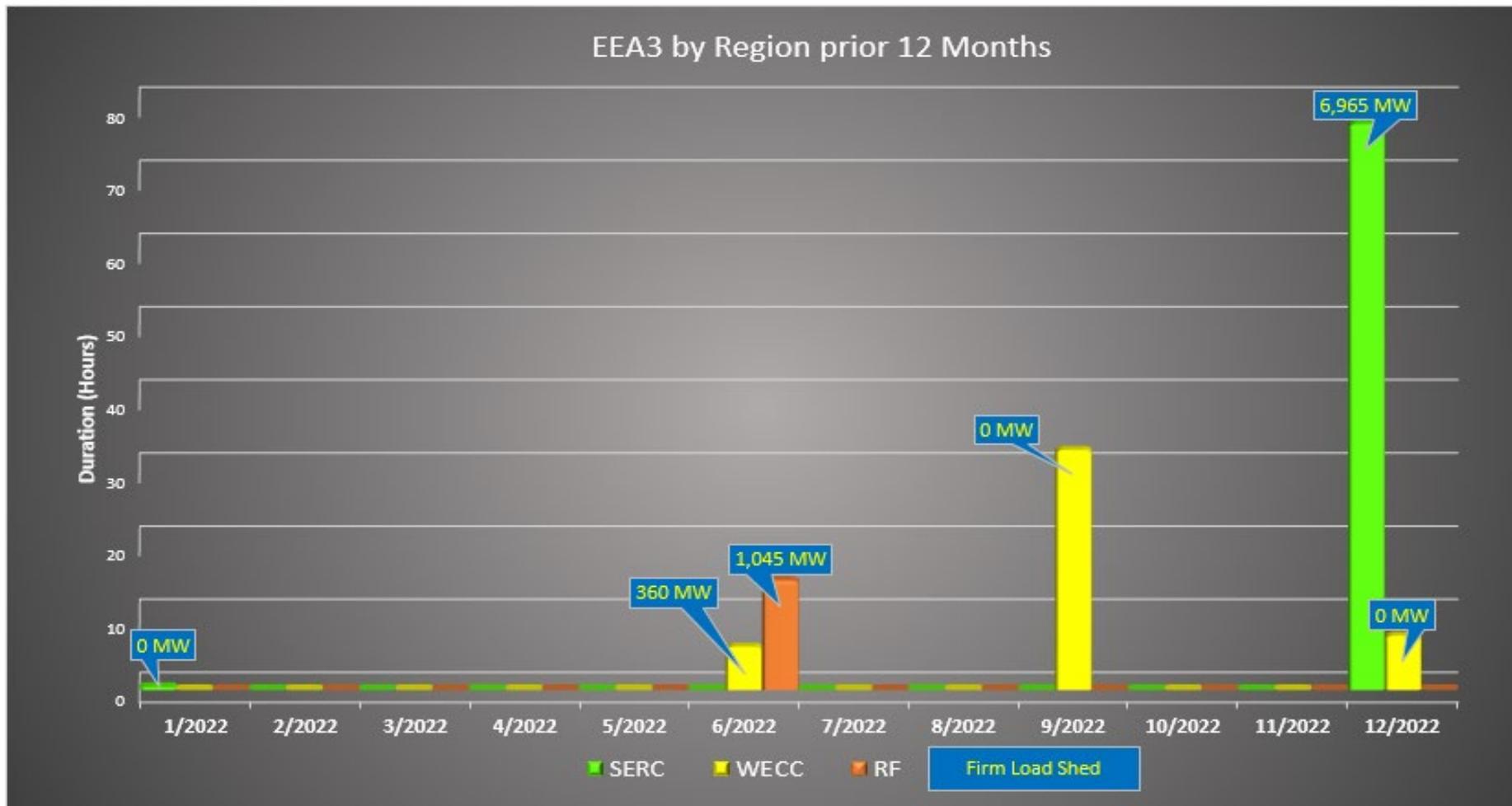








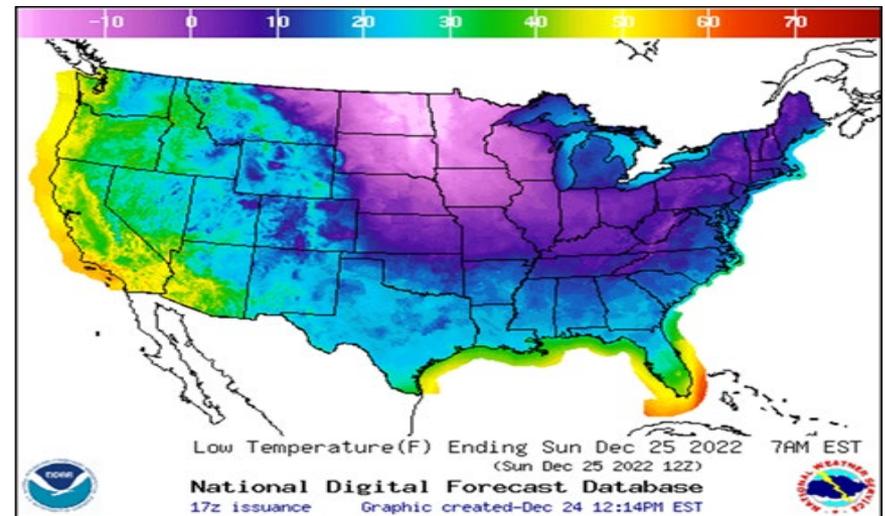
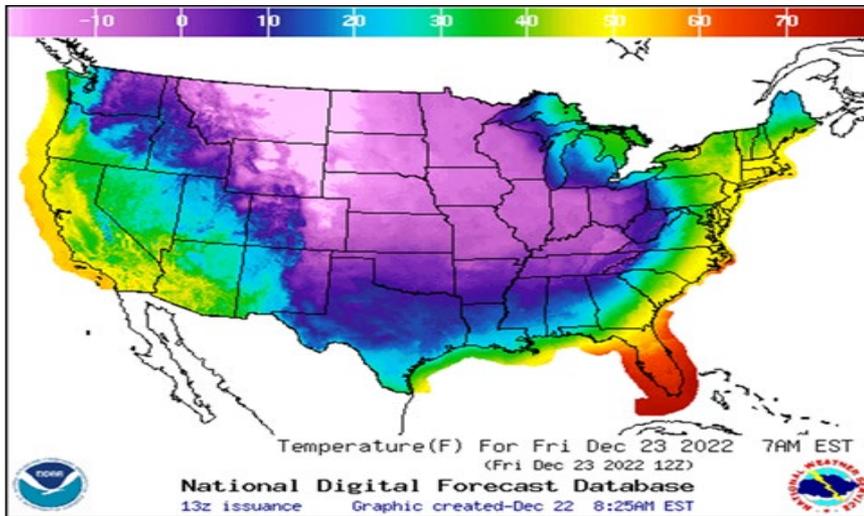
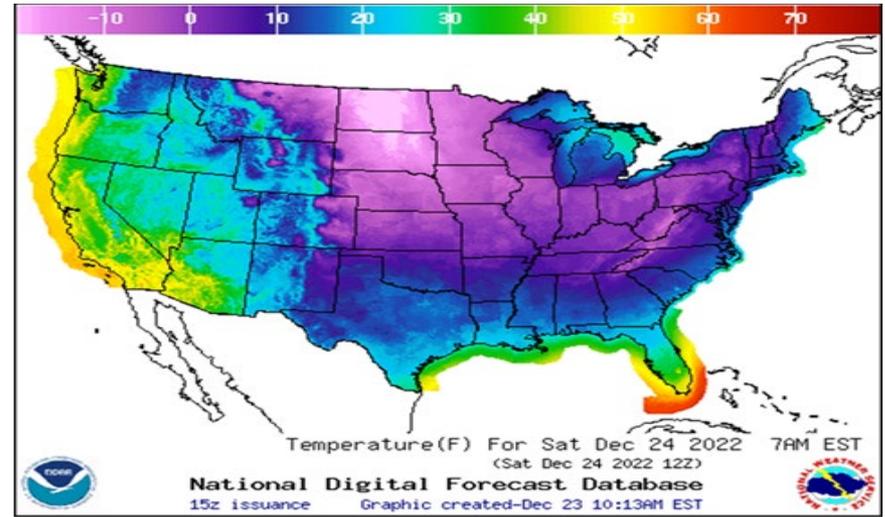
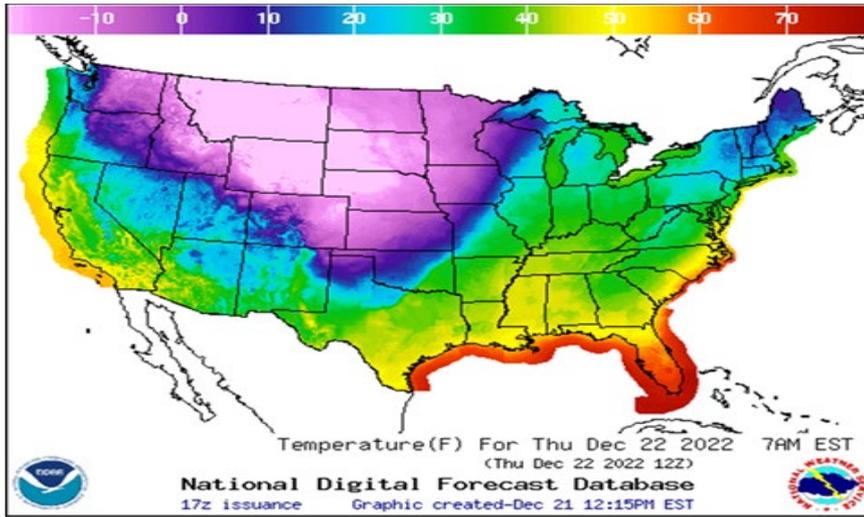
EEA3 Reports – 12 month view



Electric Reliability Organization (ERO) System Awareness (SA) teams begin monitoring the Arctic air-mass, as it dipped out of Western Canada. The Arctic air-mass slowly entered the Northwest and Northern Great Plains. As the week progressed the arctic air-mass crept southward into the eastern two-thirds of the United States.

- The ERO SA teams initiated a special ERO SA process and expanded outreach to the Reliability Coordinators (RCs), Transmission Operators (TOPs), Balancing Authorities (BAs), and Generator Operators (GOPs).
- The impacted regional SA staff begin attending calls with the RCs within their footprints
- Provided daily updates on the status, condition and impacts on the BPS to ERO Leadership, Federal Energy Regulatory Commission (FERC), Department of Energy (DOE), and other stakeholders.

Winter Storm Elliott Temperature Progression Dec 22-25

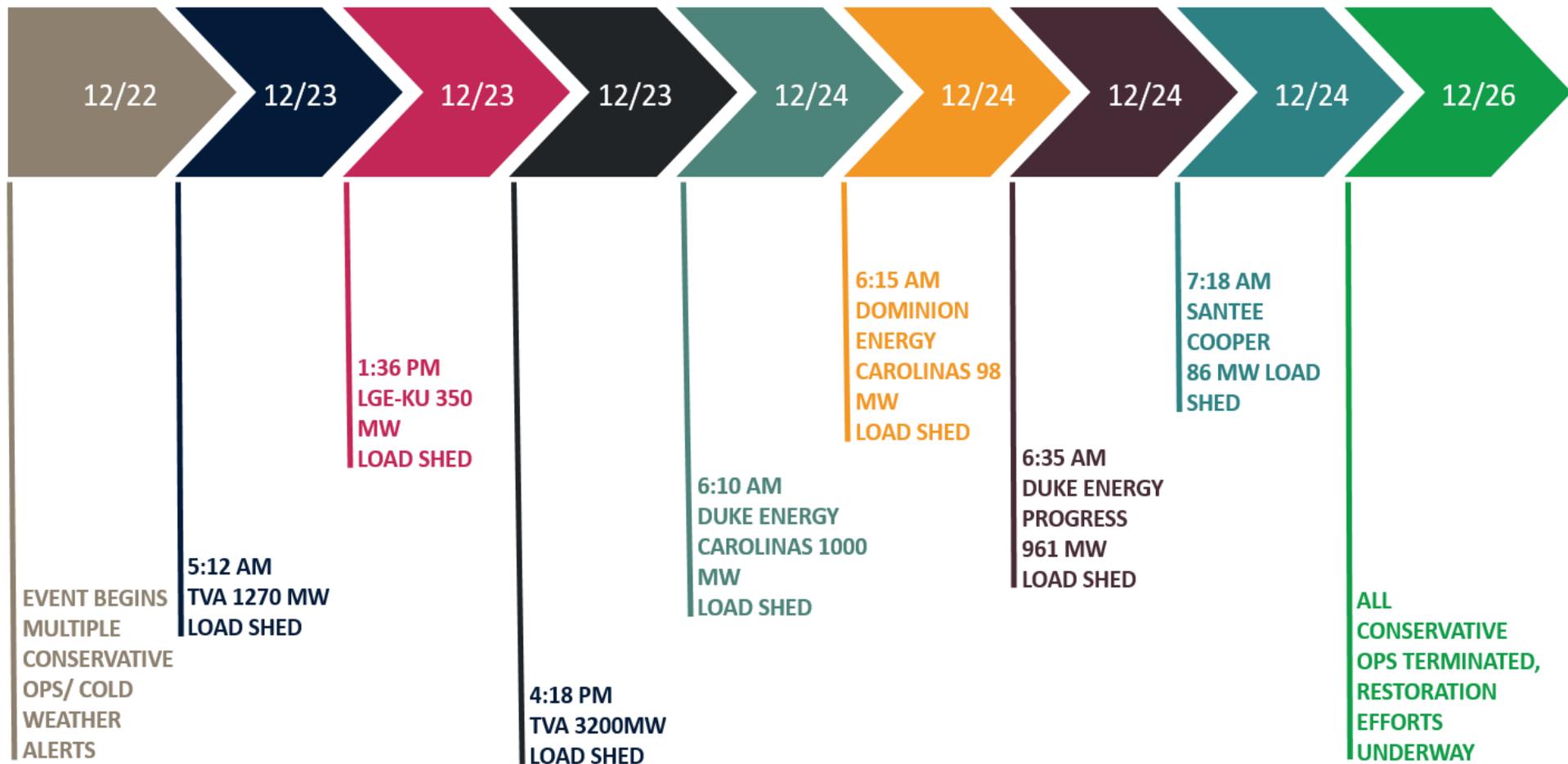


- Dec 15th NERC Started tracking the storm, noticed forecasted lows in the southeast region as low as 8 degrees with a high of 15 degrees in Nashville on Dec 23-24th.
- Dec 19th ERO SA teams started providing daily special reports on winter storm Elliott to the ERO Leadership, DOE, FERC, and other stakeholders.
- Dec 19-22nd entities started activating their operating procedures in advance of the storm.
 - Issuing advisories, alerts, emergency operations, conservative operations, Max Generation, resource advisories, and EEAs etc. Recalled outages, and postponed non-essential work and maintenance.
- BAs monitored fuel supplies and maintained strong reserve margins where possible.

- Entities closely monitored wind generation during the event; wind generation decreased in ERCOT as the event unfolded with 8 to 9 MW of wind generation being available.
- Dec 23-24th TVA and VACAR South RCs, BAs, and Registered Entities started experiencing significantly higher than expected load forecast due to extreme weather. Duke Energy Progress had several units trip. TVA's Cumberland fossil plant units 1 and 2 tripped offline.
- Dec 23-24th System operators begin shedding load in TVA and VACAR South RC footprints to maintain system reliability. This was due to higher than forecast load and the forced outages of generation and transmission constraints.

- Several RCs provided emergency energy throughout this event to help their neighboring RCs.
- The Department of Energy (DOE) issued a Federal Power Act 202c Emergency Order to ERCOT and PJM.
- Entities issued public appeals.
 - Managed transmission congestion
 - Implemented their emergency procedures which allowed access to demand response.
 - Declared maximum generation
 - Declared Energy Emergency Alerts

Timeline load shed events





Questions and Answers

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ERO Enterprise Winter Coordination and Alert Follow-up

Soo Jin Kim, Director
Power Risk Issues and Strategic Management (PRISM)
Technical Session
February 15, 2023

RELIABILITY | RESILIENCE | SECURITY



- Level 2 Alert ahead of the 2022-2023 Winter Season
- Industry Outreach
 - NERC Cold Weather Webinar
 - ERO presentation at the NAGF Fall Standards and Compliance Seminar
 - Numerous Regional Entity presentations and webinars
- Regular coordination with Regional Entities

Level 2 Alert Follow-Up

- Contacted entities on specific questions we felt needed more explanation, this was a strategic approach in terms of BES impact
- Do you provide training to your System Operators on extreme winter weather preparedness?
- Do you provide a cold weather cut-out temperature (as referenced in Standard EOP-12-013) to your RCs, BAs, and TOPs that has been validated by the default factory setting?

Industry Outreach

- MRO gave a detailed presentation on its Generator Winterization Program during the MRO Compliance Monitoring and Enforcement Program Advisory Council Conference in July.
- MRO in collaboration with the MRO Reliability Advisory Council hosted the 2nd Annual Virtual Cold Weather Preparedness Workshop in October.
- MRO completed 6 site visits for the Generator Winterization Program
- MRO staff held a webinar on the findings from the 2022 MRO Regional Winter Assessment
- Published Newsletter Articles on the company website regarding Winter Preparedness

Level 2 Alert Follow-Up

- Continue to review and analyze responses and gather information for potential outreach/follow up
- Incorporate analysis of entities' responses with actual performance during the December '22 cold weather event (Winter Storm Elliott)

Industry Outreach

- Presentations at the 2022 NPCC Compliance and Reliability Conferences
- Outreach to GO/GOP, based on the ERO CMEP Practice Guide on Cold Weather Preparedness survey and 2021 Cold Weather Preparations Alert responses
- 2022 GO/GOP on-site winterization walk-downs (5) and winter preparedness discussions (8)
- Presentations and discussions at the NPCC Reliability Coordinator System Operator Seminar
- Presentation to the NPCC Board of Directors on the Findings and Recommendations from 2021 Winter Storm Uri report

Industry Outreach

- Regionally-specific Area winter preparations (annual Fall meeting) and review and follow up on industry efforts around recommendations from 2021 Winter Storm Uri Report
- Presentation at the ISO-NE Annual Pre-Winter Communications Training - NPCC's Winter Reliability Assessment
- NPCC Electric-Gas Operations reliability ongoing coordination efforts
- Participation in the FERC-NERC-RE Winter Storm Elliott Inquiry

Level 2 Alert Follow-Up

- Collected additional info. for responses relating to lack of training, preparedness plans, fuel supply, etc.
- GO/GOPs: Solar: Taking steps including training; Wind: Deicing as build, not retrofitting due to cost; No units providing “cut-out” temperatures prior to Standard, concerns for multiple cold conditions
- TO/TOPs: “No” responses due to RCs performing functions for them

Industry Outreach

- 21 Generating Facilities completed RF’s cold weather survey
- 9 received site visits to assess their cold weather preparations
- In lieu of a site visit, 12 responded to RFIs to provide additional detail on their responses, preparedness, etc.
- RF performed a cold weather readiness webinar in July 2022
- RF organized a quarterly meeting of Regional cold weather contacts to share best practices, lessons learned and updates on outreach
- RF discussed cold weather topics with their Transmission and Generator Committees
- RF’s quarterly newsletter included cold weather topics

Level 2 Alert Follow-Up

- SERC coordinated follow-up on specific responses to NERC Level II Alert on Cold Weather with selected SERC entities
- Focus was on entities of relevant size: 1 RC, 14 BA/TOP, 20 GO
- Several fact patterns emerged in follow-ups to questions

Industry Outreach

- SERC Board Engagement and Risk Focus
 - 2022 SERC Regional Risk Report identified extreme weather (including winter weather) as a top SERC regional risk
 - Quarterly presentations on extreme weather (including winter weather), lessons learned, and SERC engagement strategies to SERC Board Risk Committee, SERC Board of Directors, and SERC stakeholders
- SERC Data Gathering/Reliability Assessments focused on Winter Weather
 - 2021/2022 SERC Post-Season Winter Survey of actual winter performance
 - SERC 2022/23 Winter Assessment

Industry Outreach

- SERC's Large Outreach Efforts
 - SERC Cold Weather Preparedness Webpage – throughout 2022
 - SERC Joint Technical Committee Conference (September): Discussed 2021 Cold Weather Event Recommendations
 - SERC Winter Weather Webinar (October): Lessons Learned from 2021 Cold Weather Event, best practices generally, and need for winter readiness (201 attendees)
 - SERC Presentations and Discussions on new Cold Weather Standards and need for winter readiness
 - SERC Newsletter articles on Winter Preparedness (January, April, May, October)
 - New SERC Generator Subcommittee: SERC Generator Owner and Operator forum to discuss and understand timely generator issues (including extreme weather)
 - SERC Request for State of Winter Preparedness (Fall): issued to all six SERC Reliability Coordinators to confirm winter preparedness for respective footprints
 - SERC Reliability Coordinator Working Group
 - SERC 2022/23 Cold Weather Request to develop winter preparedness outlook for the SERC Operating Committee (October)
 - SERC Situation Awareness Outreach: Engaged all six SERC Reliability Coordinators ahead of Winter Storm Elliott (starting December 16, 2022)

Level 2 Alert Follow-Up

- Reviewed responses for overall trends, patterns (merchant plants often showed less fuel management capability) and questionable responses (failing to consider ERCOT and state-mandated load shed training and emergency operations plans with extreme weather sections in their responses)
- Selected 17 entities to review less-favorable responses to generator questions; 13 received
- Gathering information on December 22-23 forced outages (during Elliott) to check against NERC Alert responses

Industry Outreach

- Presentations at Regional webinars and groups on Cold Weather Standards, Uri report recommendations and winter reliability assessments; maintained an Extreme Weather resource hub on Texas RE webpage
- Best practices and feedback visits to seven fossil-fueled facilities in early 2022
- September 2023 winter workshop featuring ERCOT, renewable and fossil plants, state electric and gas regulators

Industry Outreach

- Presentation at WECC's winter workshop on Texas and ERCOT programs and rulemakings for extreme weather
- Additional engagement with Texas Railroad Commission (gas regulator) and the Texas Oil and Gas Association
- Monitored ERCOT inspections, state weatherization rules for gas and power, and critical gas load mapping project
- Arranged stakeholder participants in blackstart unit availability study, a Uri report recommendation
- Reviewed grid performance in February 2022 cold snaps and winter storm Elliott

Level 2 Alert Follow-Up

- Conducted coordinated follow up with identified entities to clarify responses that stated no to specific questions and stated no intentions to take any action.
- Outreach to entities that failed to respond to the 2021 and 2022 NERC Alerts
- Outreach to entities who responded to Questions that might suggest they would not be compliant with Winter Readiness Standards going into effect April 1, 2023
- Focus was on entities of relevant size (RC, BAs, TOP, GO)

Industry Outreach

- September 15, 2022 – Winter Readiness Workshop (166 attendees)
 - Winter Weather Lessons Learned and Best Practices
 - Generator Owner, Generator Operator Communications and Changes to NERC's Winter Weather Readiness Guidelines
 - Feedback on Winter Storm Uri by Texas RE

Industry Outreach

- September 15, 2022 – Winter Readiness Workshop (166 attendees)
 - FERC and NERC Winter Weather Report and Recommendations
 - Winterization and Internal Controls—Enterprise Asset Management Software
 - Reliability First’s Winterization Program: Site Visits, Best Practices, and Surveys
 - CAISO Cold and Extreme Weather Contingency Planning Task Force Update
 - NERC Cold Weather Preparation Resources
 - WECC’s Winter Preparation Checklist “More Than Flipping a Switch
- November 17, 2022 – Winter Readiness Internal Controls, Compliance Open Webinar (239 attendees)
 - Update on the EOP-11 Standard
 - Risk Assessment for plan development and practical controls that can be implemented now
 - Multiple plant maintenance plan development and technical controls for management
 - Internal control considerations specific to Wind and Solar
 - Emergency Response/Resiliency planning

- Level 3 Alert with Essential Actions for next winter season
- Engage good performers to understand any best practices and lessons learned that could be shared across the ERO
- Engage distributed energy resources such as wind and solar to better understand the challenges they face with cold weather operations Seminar
- Evaluate the effectiveness of cold weather standards (in effect and future) against performance during extreme/significant winter weather events
- Incorporate (future) new findings and recommendations from the Winter Storm Elliott inquiry into Alerts and other industry activities

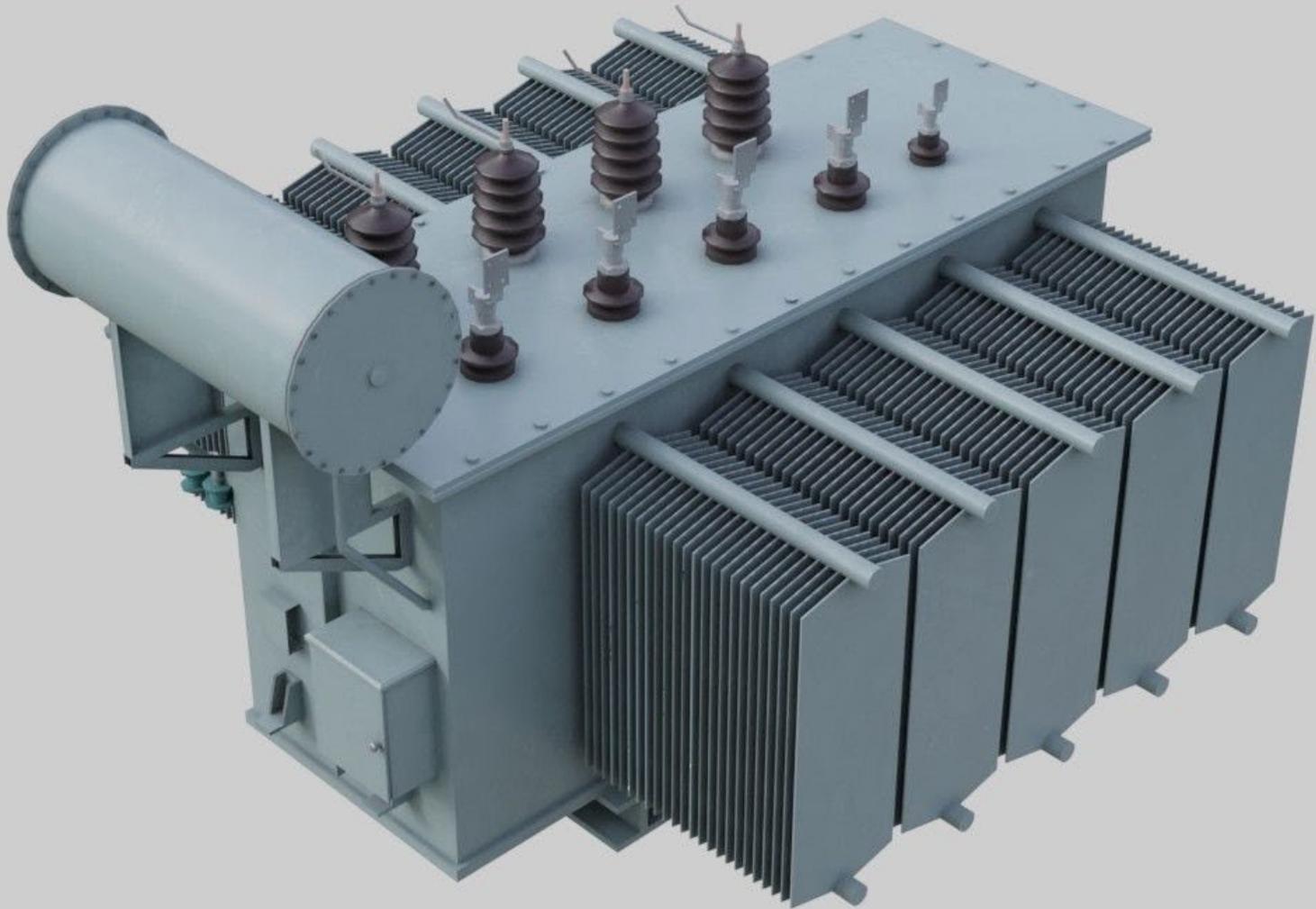


Questions and Answers

North Carolina December 2022 Physical Attack Event

Bill Peterson
Sr. Manager Training, Outreach and
Communication

Transformer



Rural Substation



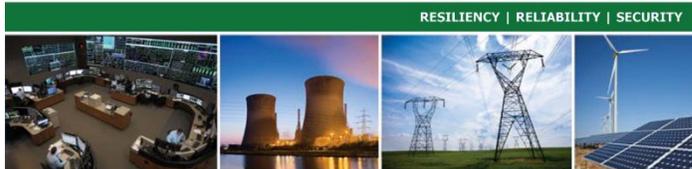
Urban Substation



NERC E-ISAC 2020–2023 Physical Security Incident Summary



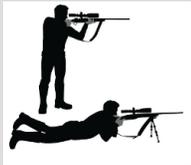
- Vast majority resulted in no grid impact and a small percentage resulted in outages or other grid impacts
- Notable increase in Q3-Q4 2022 compared to baseline trends over the past 18 months
- Recent uptick in ballistic damage, intrusion/tampering, vandalism
- Notable increase in repeat and clustered incidents



Moore County, NC – Substation Attack

Saturday, December 3

- Causes approx. 42K customer outage
- Critical facilities move to backup power systems
- Economic activity stops



Sunday, December 4

Federal Law Enforcement Engaged



Saturday, December 3

7:50 pm - 1st alarm 230 kV
8:25 pm - 2nd alarm 115 kV
Transformers damaged

Sunday, December 4

4 pm - State of emergency declared
9 pm – 5 am curfew

Monday, December 5

- Moore County cancels school
- National attention

Moore County, NC – Substation Attack

Thursday - December 8

- Power Restored

January 3

- SERC Task Force established



Wednesday - December 7

- \$75K reward
- FBI & SO post notice seeking info

December 15

- FERC orders 120 day review of CIP-014

January 17

- Randolph County, NC substation attacked
- Transformers damaged
- No significant outage

North Carolina Gunfire Attack Cluster

Three Gunfire Attacks in North Carolina in 3 Consecutive Months



1. November 11, 2022, a substation in Jones County, NC reported gunfire damage at one substations. All 4 transformers were damaged with bullet holes in the cooling fins.



2. December 3, 2022, two substations in Moore Country, NC attacked. Bullet hole damage to transformer cooling fins.



3. January 17th, 2023, a substation in Randolph County, NC attacked. Bullet hole damage to transformer cooling fins.

Unacceptable Consequences

Most life-sustaining activities are reliant on BPS health

- Securing electric power supply is Grid sustainment
 - Hospitals
 - Other critical infrastructure
 - Fire/EMS/Police Services
 - Water delivery
 - Fuel deliveries



Time, place, weather, and other extreme events impact backup power options and life-sustaining activities

- Moore County two weeks later
- Buffalo area during and after the blizzard (31 deaths)
- Current conditions in California

ERO Enterprise Response

Initiate Regional Response Plans and Task Force

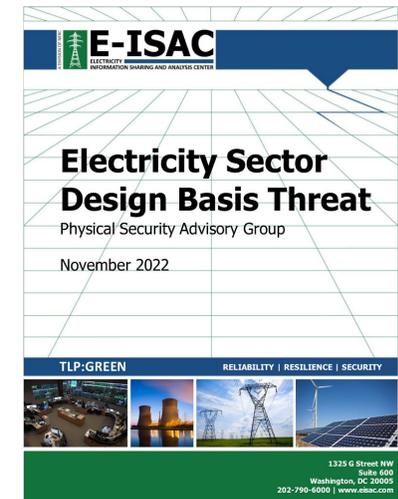
- Focused on systemwide security and operations understanding, problem identification, communication hub, solution recommendations

Partner with NERC E-ISAC in Information-sharing

- Promoting increased engagement within ERO Enterprise
- Participate in Region threat calls raising awareness
- Leveraging expertise in collaborative study and other training

SERC Assistance, Outreach & Training

- Assistance focused on partnerships, learning and sharing
- Outreach focused on large group awareness/best practices
- Training focused on physical security training
 - Insider Threats and Control Room Security (CIP-006) - 2022
 - Substation Security (CIP-014) - 2023



Substation Physical Security Resources

- Physical Security Resource Guide for Electricity Asset Owners and Operators
- VISA (Vulnerability Integrated of Security Analysis) Workshops
- Electricity Sector Design Basis Threat Reference Document
- Physical Security Advisory Group
- Asset-Specific Protective Measures
- Protective Measures Index Tool
- NERC Whitepapers: UAS, Copper Theft,
- SERC eLearning Modules
- CISA and other government partners

