

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Standards

Howard Gugel, Vice President of Engineering and Standards
Board of Trustees Meeting
May 13, 2021

RELIABILITY | RESILIENCE | SECURITY



- Background
 - Address FERC Order No. 777
 - Address issues identified in [Project 2015-03 Periodic Review of System Operating Limit Standards](#)
- Minority Issue
 - Proposed FAC-014-3 Requirements R6, R7 and R8 are duplicative with certain requirements in the IRO-017, TPL-001 and MOD-032 Reliability Standards.

- Action

- Adopt

- 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 Limit
- IRO-008-3 – Reliability Coordinator Operational Analyses and Real-time Assessments
- PRC-002-3 – Disturbance Monitoring and Reporting Requirements
- PRC-023-5 – Transmission Relay Loadability
- PRC-026-2 – Relay Performance During Stable Power Swings
- TOP-001-6 – Transmission Operations

- Background
 - Updated to clarify terminology
 - Updated to clarify and streamline process steps
 - Supportive comments received
- Action
 - Approve WECC Reliability Standards Development Procedures

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Low Impact BES Cyber Asset Update

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- Standard development
 - Standard Authorization Request Standard Drafting Team to address Transmission Only Control Centers
 - Potential Field Test
- Broader review and analysis
 - Low Impact Criteria Review Team forming
 - Cross section of industry
 - Look at degrees of risk presented by low impact Bulk Electric System Cyber Systems
 - Report to be developed

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Cold Weather Standards Update

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Current draft

- EOP-011
 - TOP and BA emergency plans include cold weather impacts
 - GO have cold weather preparation plans
 - Appropriate freeze protection measures (self determined)
 - Annual inspection
 - Know operating limits
 - Awareness training on plans
- IRO-010 and TOP-003
 - RC and TOP data specifications to include requesting operating limits

Future plans

- Implement actions from FERC/NERC inquiry
- Standard for RC and/or BA seasonal emergency energy management plans
- RC standard for rolling three week emergency energy management plan



Questions and Answers

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NERC Membership Renewal

Lauren Perotti, Senior Counsel
Board of Trustees Meeting
May 13, 2021

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- NERC members participate in NERC governance
- Elect members of Member Representatives Committee (MRC)
 - MRC elects Trustees
 - MRC advises Board on budget and other issues
 - MRC votes on Bylaws changes
- Members agree:
 - To promote, support, and comply with the purposes and policies of NERC
 - To execute an agreement that they will hold harmless all Trustees, officers, employees, and agents of NERC, as well as volunteers participating in good faith in NERC activities

- NERC Bylaws provide that the NERC Board may periodically renew its membership roster
- Staff proposes to conduct membership renewal process July-August 2021
 - Last membership renewal conducted in 2018
 - FERC-approved Bylaws changes in April 2021 will affect composition of membership Sectors
- Next MRC and Sector-based standing committee elections will take place with updated membership list

- Sectors 1-9 and 12:
 - Defined entities, *plus*
 - Not-for-profit associations that coordinate and help represent the interests of the members of the Sector, unless the majority of the Sector members object.
 - *Previously, consultants, vendors, agents, attorneys, and the like were permitted to join the Sector if they provided services to or otherwise represented the interests of the Sector.*
- Sector 9, Small End-Use Electricity Customer
 - Now includes persons or entities such as associations, state consumer advocates, or other advocacy organizations that represent the collective interests of groups of small electricity end users.

- New Sector 13, Associate
 - Candidates for membership that do not meet the definition of another Sector.
- **NOTE:**
 - The Reliability Standards Registered Ballot Body is not affected by these changes.

- Prescribed in Bylaws
- General Process
 - Corporate Secretary sends notice
 - Registrations due within 30 days
 - Board sets date, 30 days after which non-responders may be removed from the roster
 - After 30 days, non responders removed from membership roster
- Reminders sent at various times

Date	Action
July 7, 2021	Corporate Secretary sends registration renewal request to current members
July 22, 2021	Reminder sent to current members
August 6, 2021	Deadline for submission of registration renewals
August 20, 2021	Board-established deadline, 30 days after which a member may be removed from the roster for non-renewal of its membership
September 10, 2021	Notice of possible removal from NERC Membership roster for failure to re-register
September 20, 2021	Date on which a member may be removed from the membership roster for non-renewal of membership

- Notice to be sent electronically on/around July 7, 2021
- Renewal to be conducted electronically through the ERO Portal
- Review/update contact information (primary and alternate contacts)
- Select Sector and provide supporting explanation

- Locate ERO Portal Account user credentials
- Update primary contact info (if necessary)
- Confirm that recent organizational changes have not resulted in the entity or its affiliates having more than one (1) membership

- Future outreach planned for June timeframe to assist members in preparing for membership renewal
- Fall MRC election to take place under updated membership roster



Questions and Answers

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Revisions to Section 1003 of the Rules of Procedure

Shamai Elstein, Associate General Counsel
Board of Trustees Meeting
May 13, 2021

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- Section 1003 of the Rules of Procedure describes NERC's infrastructure security program, including its operation of the E-ISAC
- Proposed modifications to section 1003 require NERC to share with FERC any All Points Bulletins issued by the E-ISAC at the time of issuance
 - Consistent with current E-ISAC practice
- Proposed revisions responsive to FERC directive related to NERC's Five Year Performance Assessment
- NERC did not receive any stakeholder comments on the proposed revisions



Questions and Answers

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Proposed Rules of Procedure Revisions for Compliance Monitoring and Enforcement Program and Training and Education Program

Steven Noess, Director of Regulatory Programs

Teri Stasko, Assistant General Counsel and Director of Enforcement

Board of Trustees Meeting

May 13, 2021

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- 2015: FERC approves enhanced risk-based approach to monitoring and enforcing compliance (Reliability Assurance Initiative)
 - Use of Enforcement Discretion (Compliance Exception and Self-Logging Programs)
 - Monitoring Plans Informed by Entities' Inherent Risks and Controls
- Annual CMEP Filings with FERC
 - Includes results of NERC's Compliance Exception and Find, Fix, Track (FFT) Review

- Draft revisions to the NERC Rules of Procedure to align with the risk-based approach to compliance monitoring and enforcement implemented over the last several years
- Benefits for registered entities, the ERO Enterprise, and other stakeholders

- Input from CMEP subject matter experts across the ERO Enterprise
- Consultation with registered entities
- Posted for public comment in November
- Modest revisions in response to industry comments
- Outreach to broad range of interested parties
- Endorsed for approval by the Board of Trustees Compliance Committee

- Provide the Compliance Enforcement Authority (CEA) discretion as to when to conduct Compliance Audits and whether they will occur on the registered entity's site
- Remove the requirement to post an Annual Audit Plan
 - CEAs would provide registered entities with at least 270 days' notice of an upcoming Compliance Audit
 - CEAs would continue to provide notice 90 days before the commencement of the Compliance Audit
- Clarify the shift from Compliance Audits examining all Reliability Standards to risk-based Compliance Audits

- Implementing recommendations from Standards Efficiency Review
- Activities occurring at least once every three years
 - Three years of evidence
- Activities occurring less often than once every three years
 - Evidence of last performance
 - Evidence of the intervals for performance

- Self-Certification
 - Eliminate the posting of a Self-Certification schedule
 - Allow flexibility to initiate Self-Certifications as needed based on identified emerging risks
- Anonymous Complaints
 - Clarify that NERC can share the identity of an anonymous complainant with Regional Entities, but not other third parties

- Self-Logging
 - Expand program to further streamline review of self-logs
 - Continue review by the CEA
 - NERC and FERC may review upon request
- Compliance Exceptions
 - CEA will continue to process minimal risk noncompliance as Compliance Exceptions, but will no longer submit to NERC for a 60-day review by NERC and FERC
 - Clarify the treatment of Compliance Exceptions in a registered entity's compliance history to reduce burden of reviewing each prior minimal risk noncompliance individually

- Encourage increased use of informal mitigation submission (mitigating activities)
 - Require Mitigation Plans only upon request by CEA, generally for complex, higher risk violations
 - Extending the CEA and NERC review periods for Mitigation Plans
- Reporting upon completion of milestones
 - Replaces regimented quarterly reporting

- Expand Personnel Certification in Section 600 to include Credential Maintenance
 - Responsibility moves from Reliability and Security Technical Committee to the Personnel Certification Governance Committee
- Move Continuing Education rule from Training and Education in Section 900 to Section 600
 - Renamed Credential Maintenance, focusing on the NERC System Operator certification

- File petition for approval with FERC
- Outreach to registered entities to broaden interest and participation in the Self-Logging Program



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2021 Summer Reliability Assessment

Status and Preliminary Findings

John Moura, Director, Reliability Assessment and Performance Analysis

Mark Olson, Manager, Reliability Assessments

Board of Trustees Meeting

May 13, 2021

RELIABILITY | RESILIENCE | SECURITY

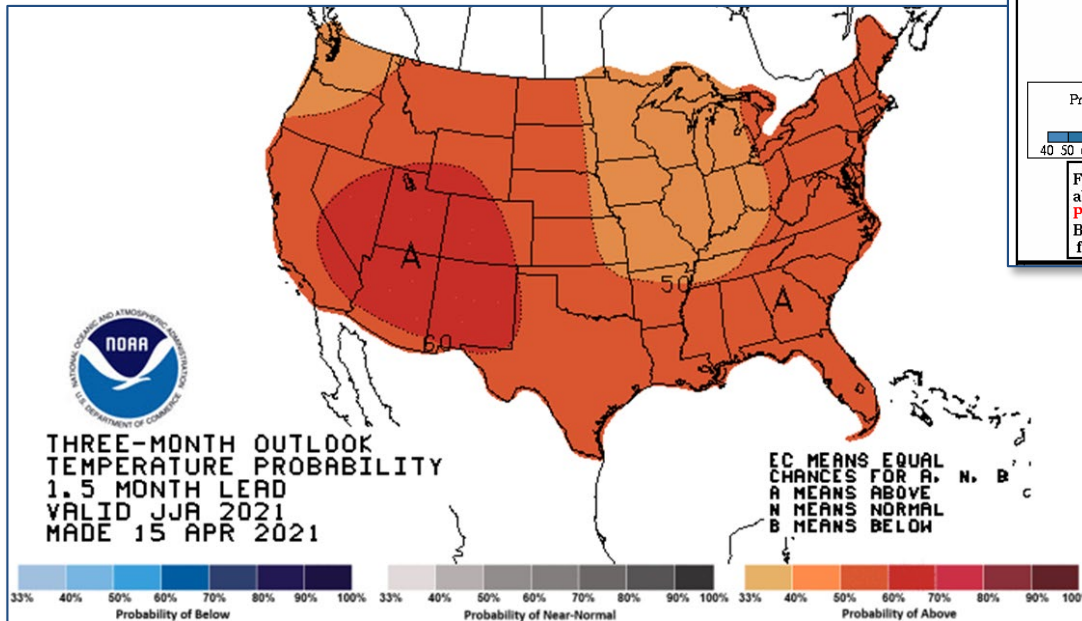
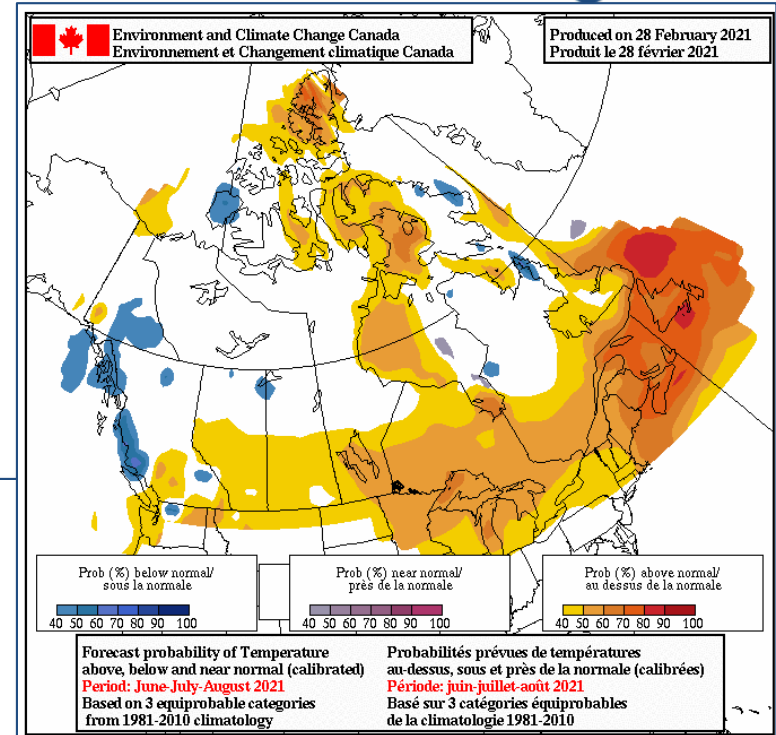


- NERC's Summer Reliability Assessment (SRA) examines potential regional resource deficiencies and operating reliability concerns
 - Describes industry preparations to manage seasonal risks
- Developed with the Reliability Assessment Subcommittee (RAS) and reviewed by the Reliability and Security Technical Committee (RSTC)



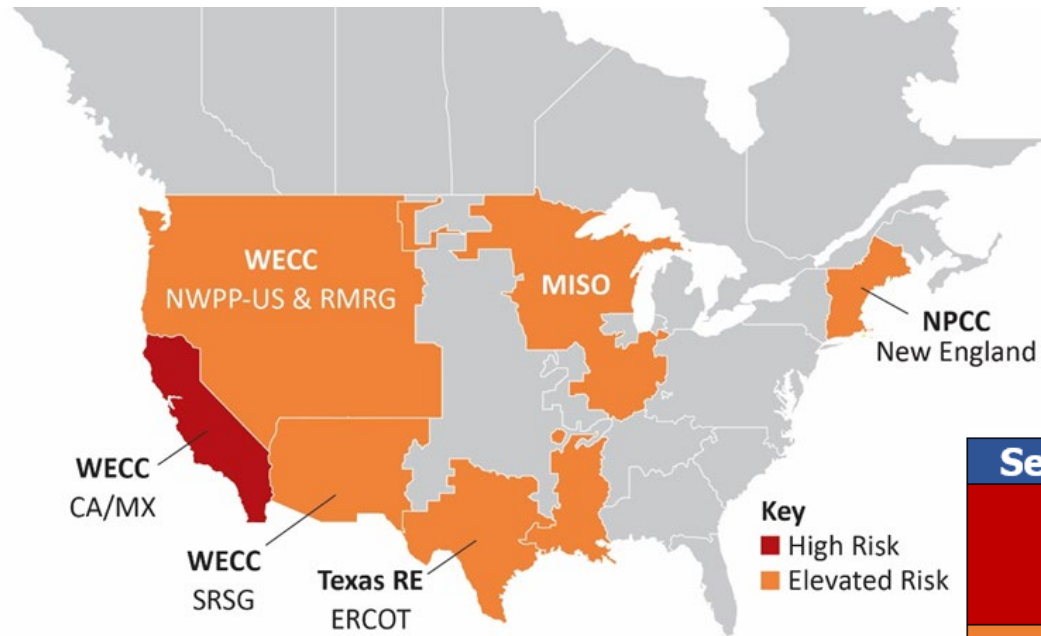
- The SRA report was reviewed by the RSTC in April-May
- Findings cover the following summer reliability concerns:
 - Adequacy risk assessment of peak demand and high-risk periods
 - Protecting electrical workforce during the ongoing pandemic
 - Potential wildfire risks in western United States and Canada
- Risk analysis is based on inputs from probabilistic studies and deterministic risk scenarios
- NERC Staff is preparing the report for RSTC endorsement and NERC Senior Leadership approval

- Weather officials indicate above-normal temperatures are likely across much of North America
- Temperature is key driver for peak electricity demand in most areas



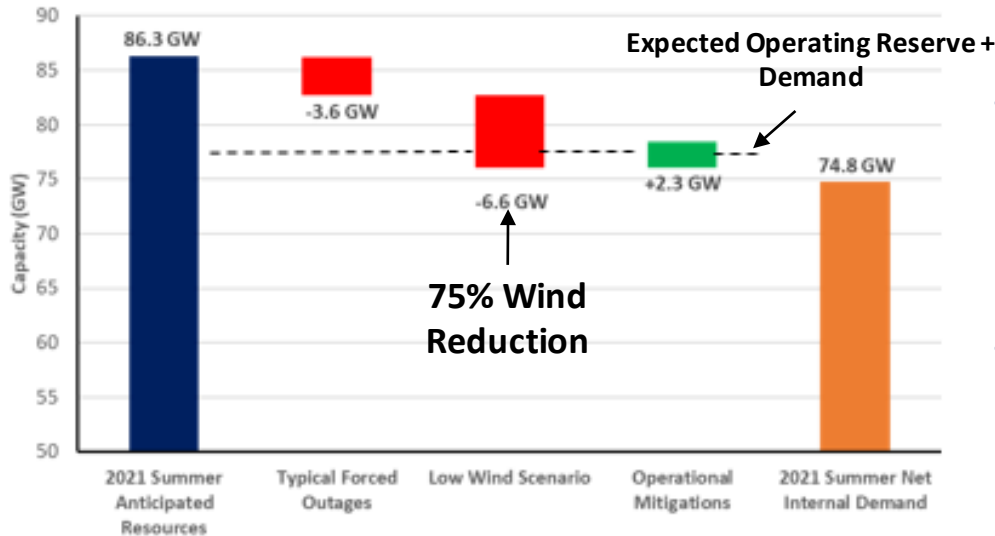
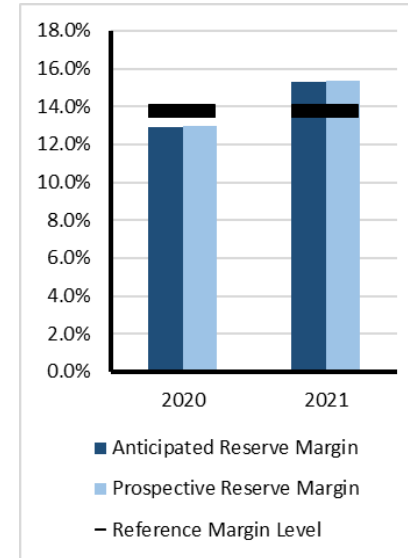
Seasonal Forecast Maps | June - August
Sources: Natural Resources Canada and U.S. National Weather Service

- Parts of North America are at **elevated** or **high** risk of energy shortfalls in extreme summer conditions



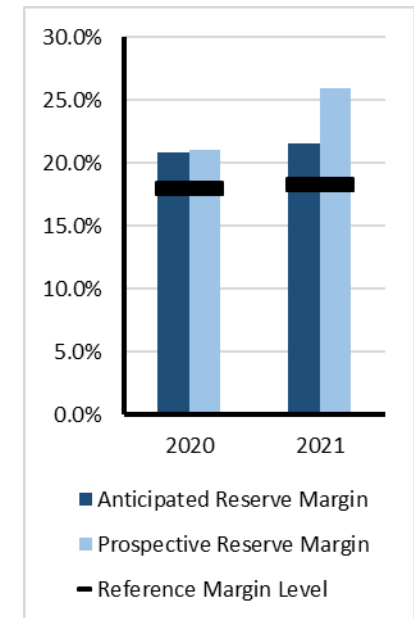
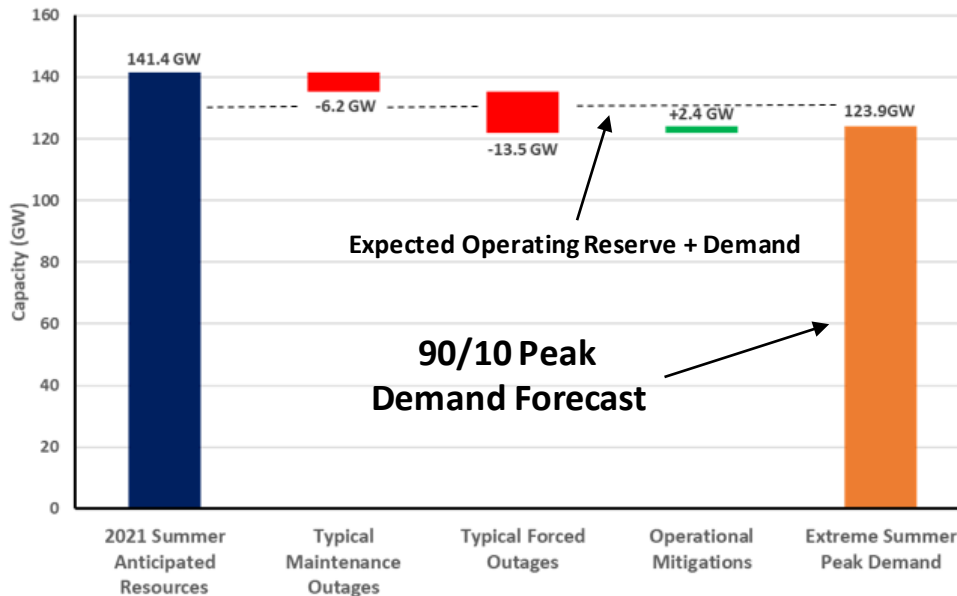
Seasonal Risk Assessment Summary	
High	Potential for Insufficient Operating Reserves in Normal Peak and Extreme Conditions
Elevated	Potential for Insufficient Operating Reserves in Extreme Conditions
Low	Sufficient Operating Reserves Expected in Normal and Extreme Conditions

- Nearly 8 GW of wind, solar, and battery resources added since summer 2020
- Anticipated Reserves increase to 15.3%
 - Reference Margin Level 13.75%



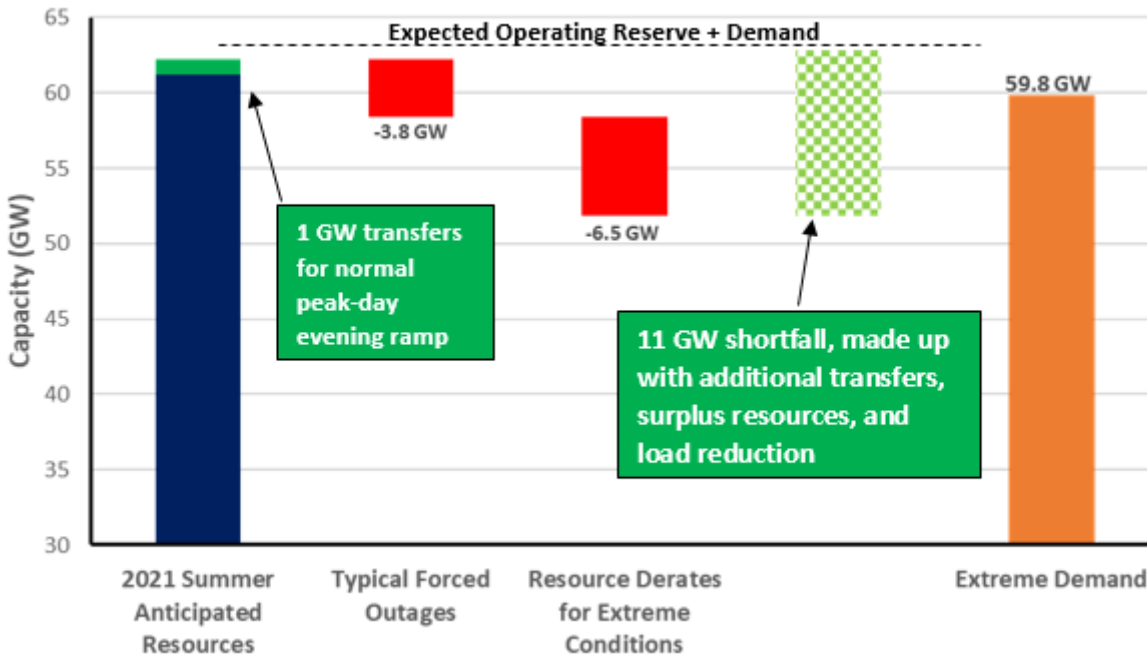
- Low wind output at peak demand can cause operating reserve shortfall
- Extreme demand and thermal resource outages result in energy emergencies

- Summer reserve margin is slightly higher compared to 2020
- Increasing use of load modifying resources (e.g., demand response) and non-firm imports during peak demand

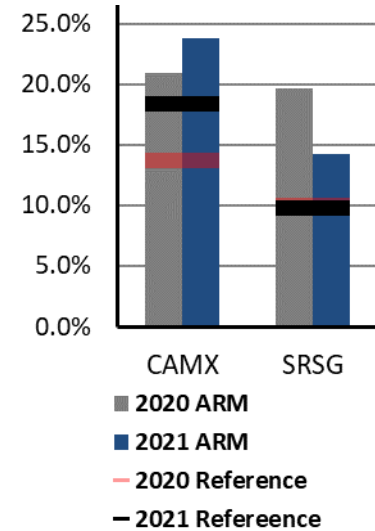


- Extreme demand or low resource performance can result in energy emergencies

- Western Interconnection resource levels are similar to 2020
- Transfers into CAMX are needed in late-afternoon to offset reduced solar PV output

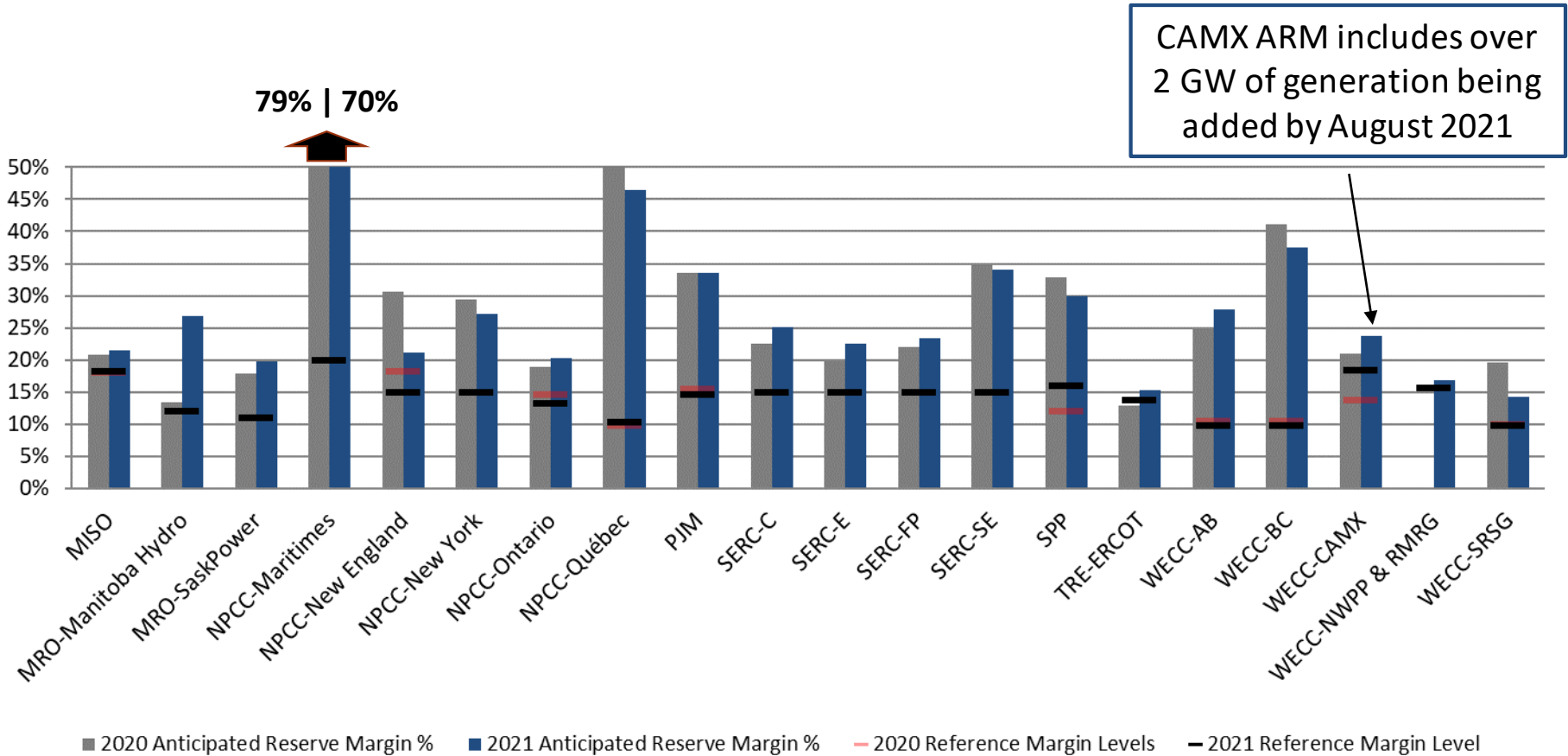


CAMX and Southwest Reserve Group – Year-on-Year Reserve Margin Change



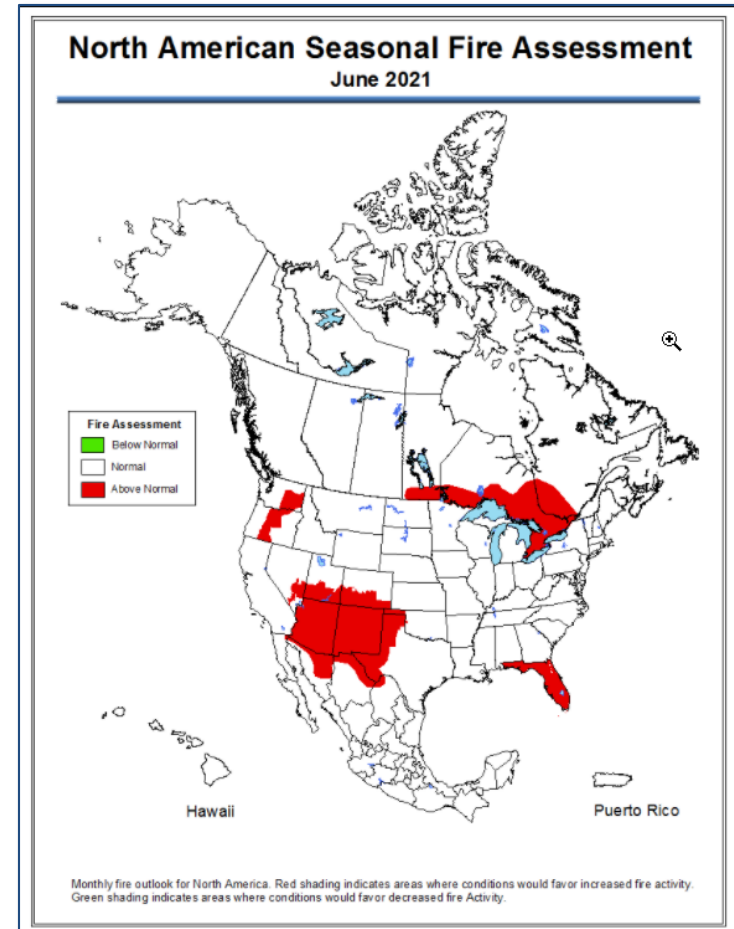
- Higher imports may be needed for extreme demand or low resource performance

- Anticipated Reserve Margins meet reference levels in all areas



Summer 2020 to Summer 2021 Anticipated Reserve Margins

- North American fire agencies project above-normal risk for wildfires in U.S. Southwest and parts of Canada in early Summer
 - Expect above-normal risk in California and U.S. west coast in late summer
- Operation of the BPS can be impacted in areas where risk of wildfire ignition is present or where wildfires are active



Source: National Interagency Fire Center

Date	Milestone
May 17	Report sent to RSTC for Endorsement
May 24	Final Report sent to NERC Board of Trustees and MRC
May 26	Pre-publication Report sent to ERO Executive Committee and MRC
May 27	Report Release



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**DO NOT CITE OR USE THE DATA IN THIS
PRESENTATION – Preliminary Data and Results**

2021 State of Reliability Report

Preview

John Moura, Director of Reliability Assessment

Donna Pratt, Performance Analysis Manager

Board of Trustees Meeting

May 13, 2021

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- Provide objective, credible, and concise information to policy makers, industry leaders, and the NERC Board of Trustees on issues affecting the reliability and resilience of the North American bulk power system (BPS)
 - Identify system performance trends and emerging reliability risks
 - Determine the relative health of the interconnected system
 - Measure the success of mitigation activities deployed

- Unprecedented conditions in 2020 challenged BPS resilience:
 - COVID-19 Pandemic
 - Historic hurricane season
 - Extreme heat with load shed and wildfires in the West
 - October 2020 ice storm in Texas
 - December 2020 supply chain compromise
- Escalated resource adequacy risk and a wide-spread heatwave across the Western Interconnection led to substantial load shedding in August
- Cybersecurity attacks and vulnerabilities remain a significant concern
- Favorable Trends
 - Improving restoration times of transmission system outages after extreme weather
 - Continued reduction in the misoperations rate
- Unfavorable Trends
 - Highest AC circuit unavailability due to extreme weather
 - Highest transmission-related events that resulted in load loss

4,588,062,000 MWh
2020 Actual Energy

1,048,944 MW
2020 Summer Peak Capacity

503,551 mi
Total Transmission Circuit Miles > 100kV/m

6,009
Number of Conventional Generating Units > 20MW

99.745%

Time with no operator-initiated firm load shedding associated with EEA-3 (13.8 GWh energy unserved or 0.0003% of total energy served)

0

Category 3, 4, or 5 Events (non-weather related)





The reliability indicators below represent four core aspects to system performance that are measurable and quantifiable:

- **Resource Adequacy** - Does the system have enough capacity, energy, and ancillary services?
- **Transmission Performance and Availability** - Is the transmission system adequate?
- **Generation Performance and Availability** - What is the outage performance of the generation fleet?
- **System Protection and Distribution Performance** - Can the system remain stable and withstand disturbances?

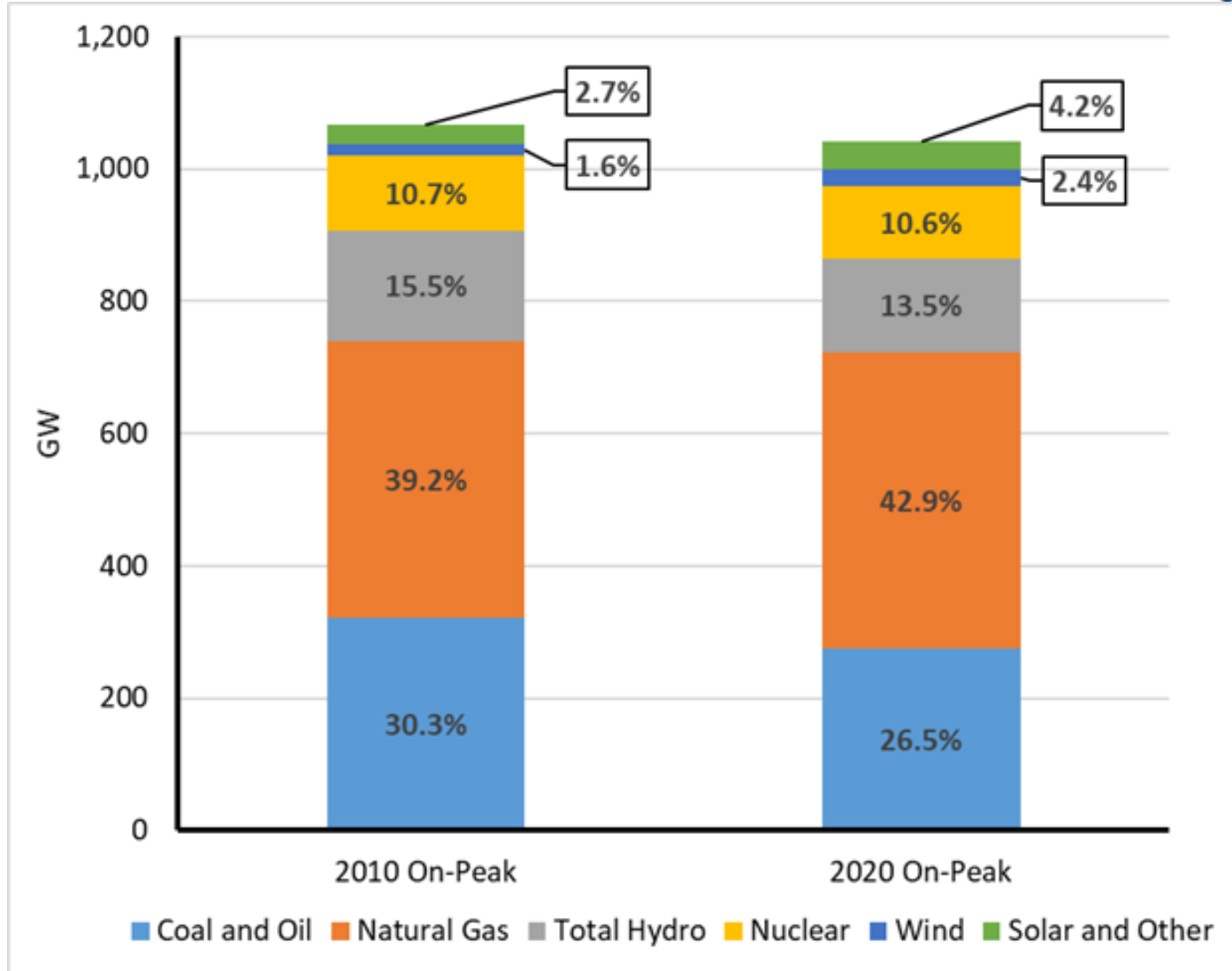
 Red – Actionable, key finding

 White – Stable or no change

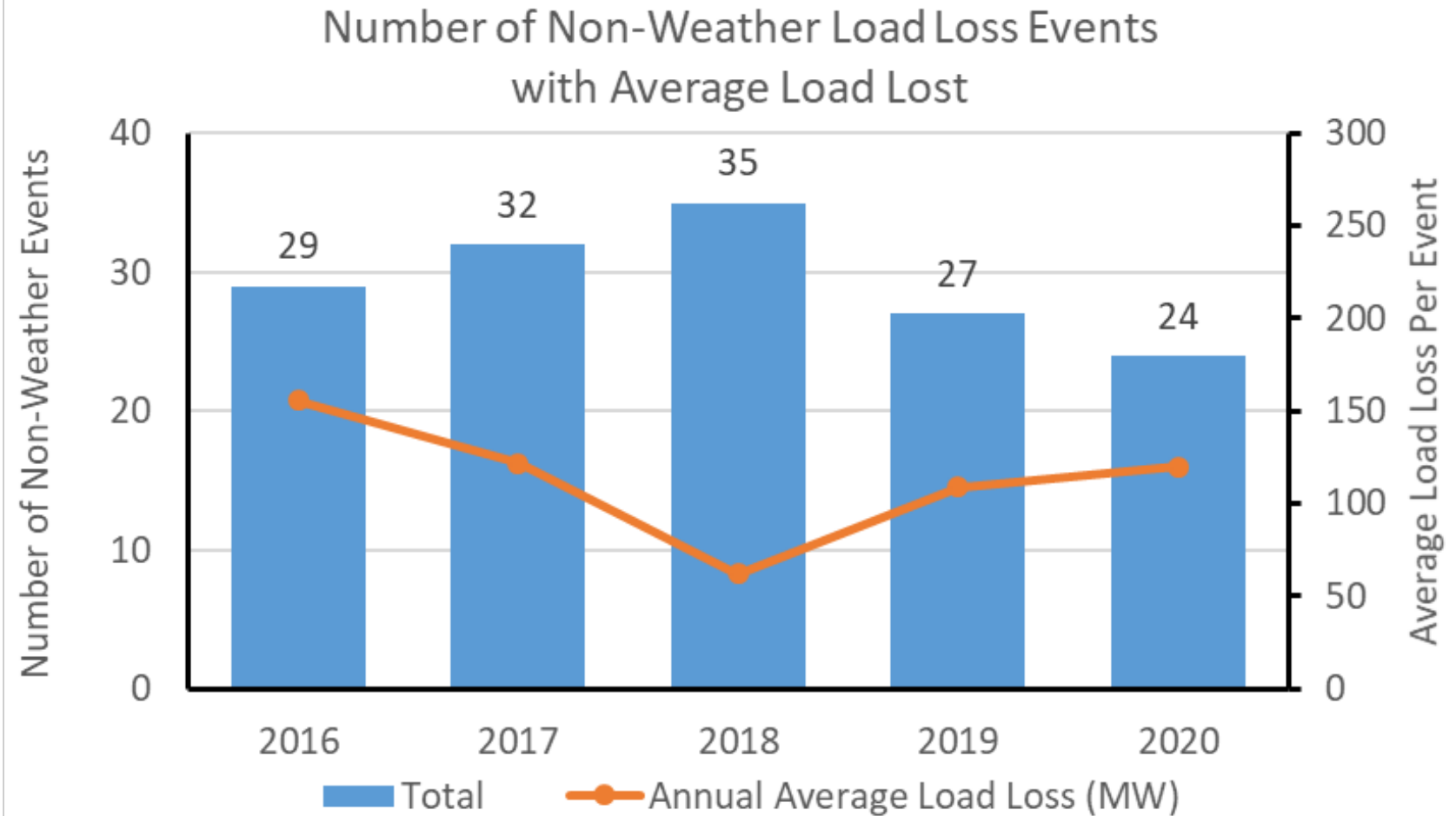
 Yellow – Declining, heightened monitoring

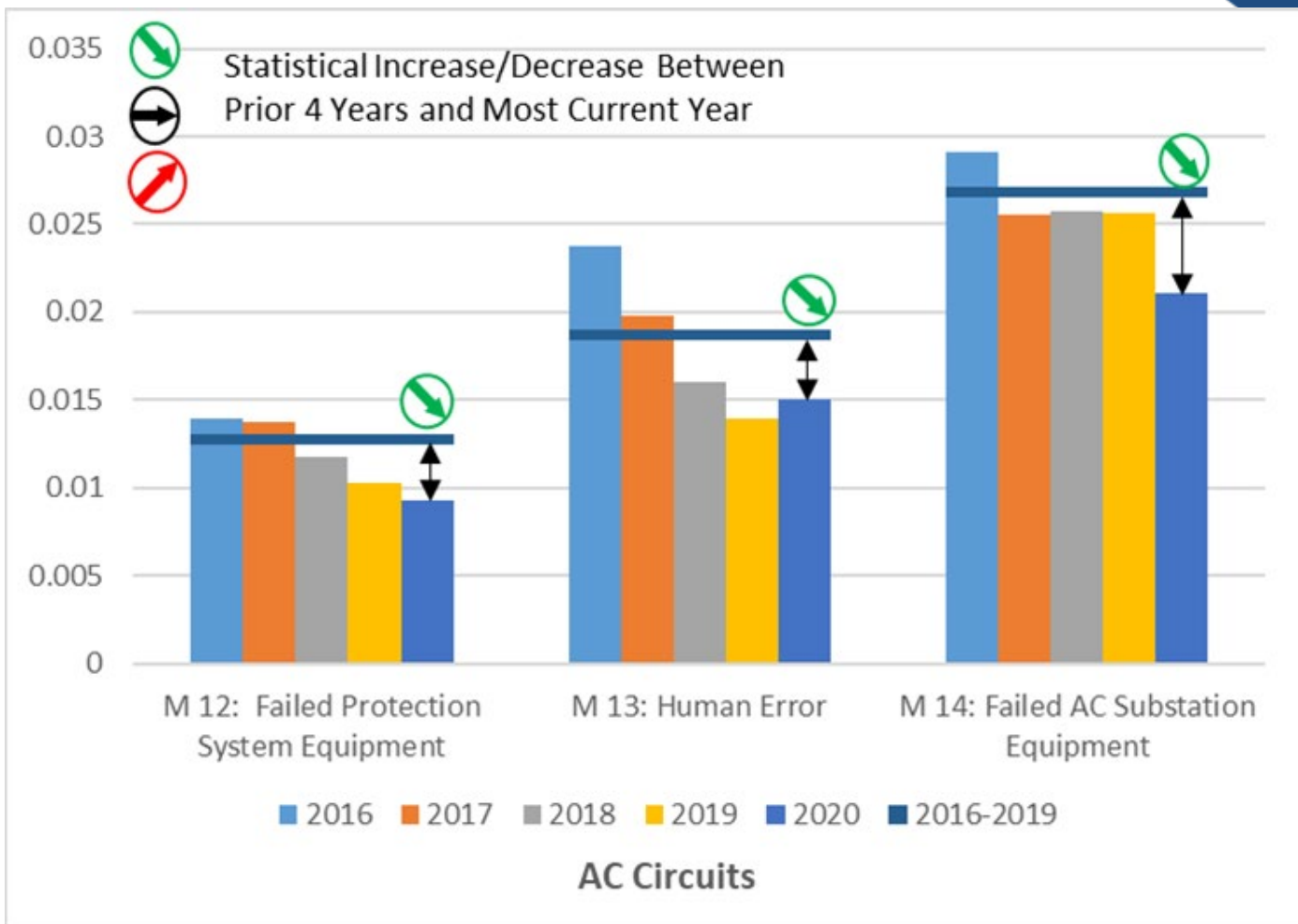
 Green – Improving

NERC-Wide Resource Mix On-Peak Capacity 10-Year Comparison



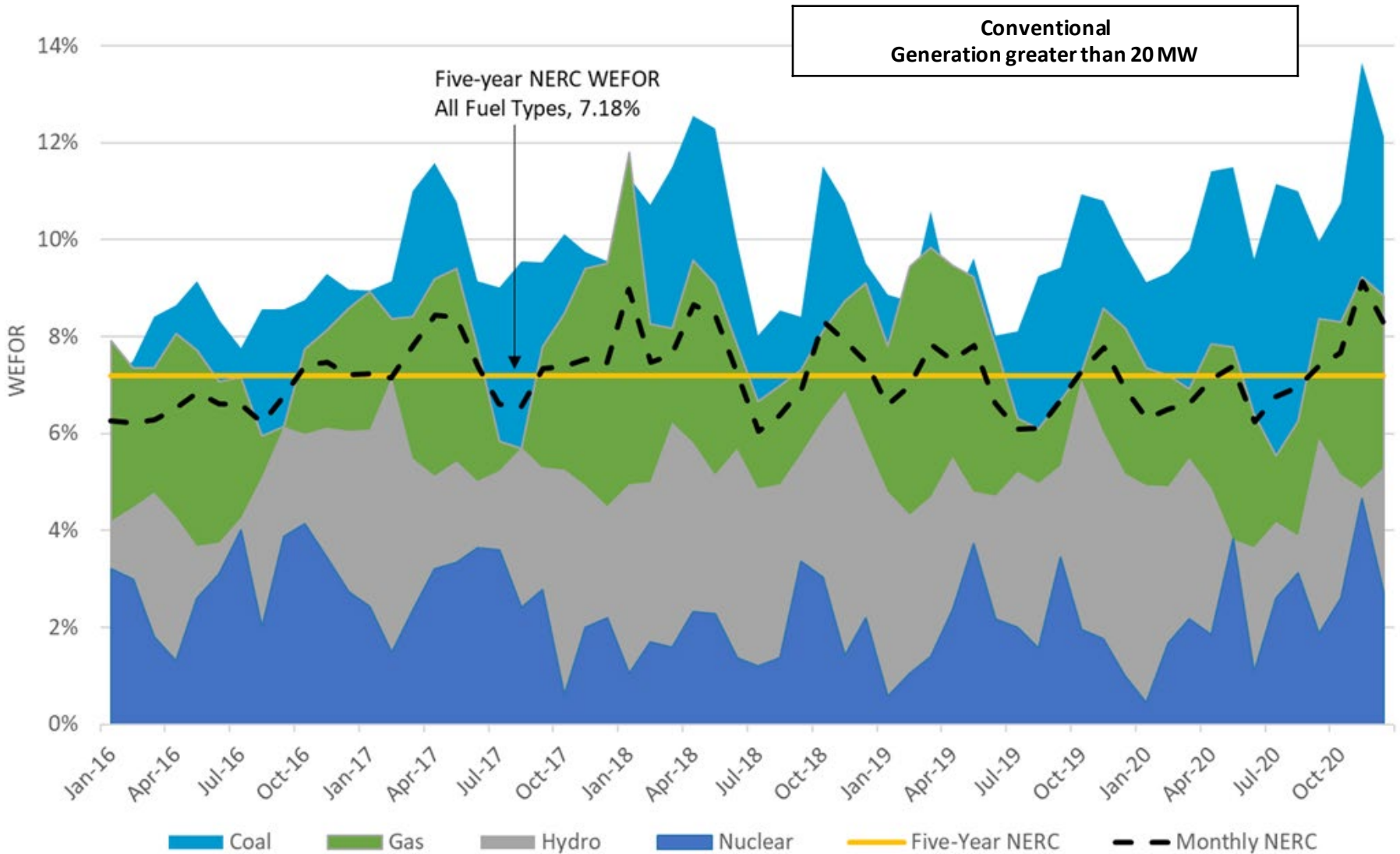
Transmission greater than 100kV

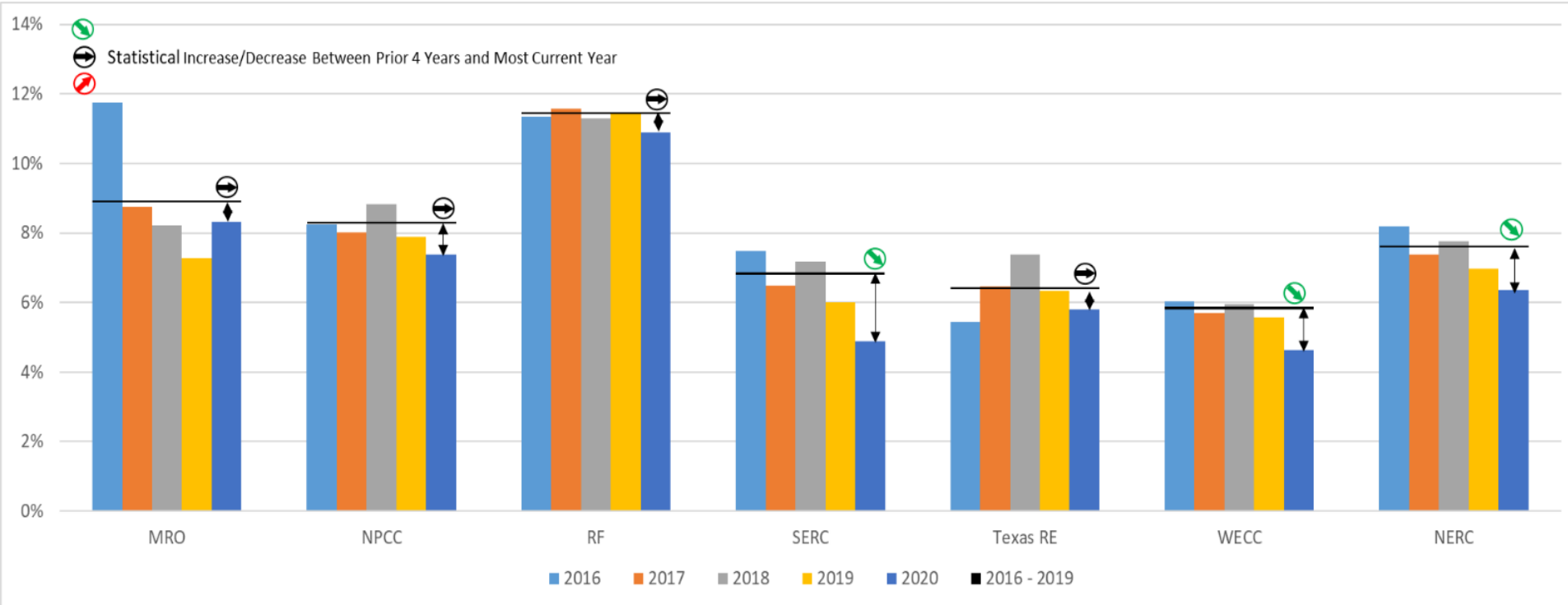




- Protection System
- Human Error
- AC Substation Equipment

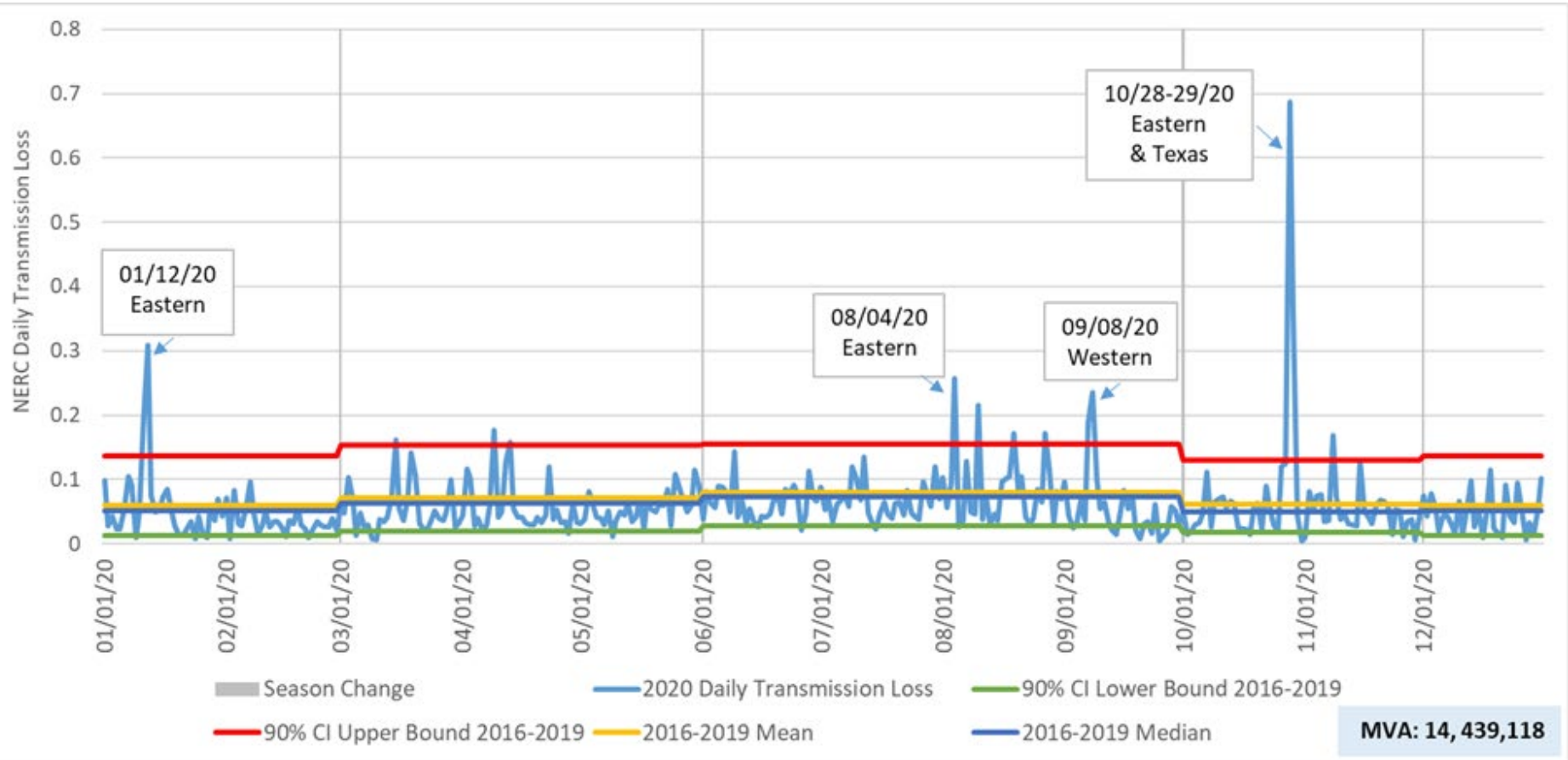
Conventional Generation Availability by Major Fuel Type



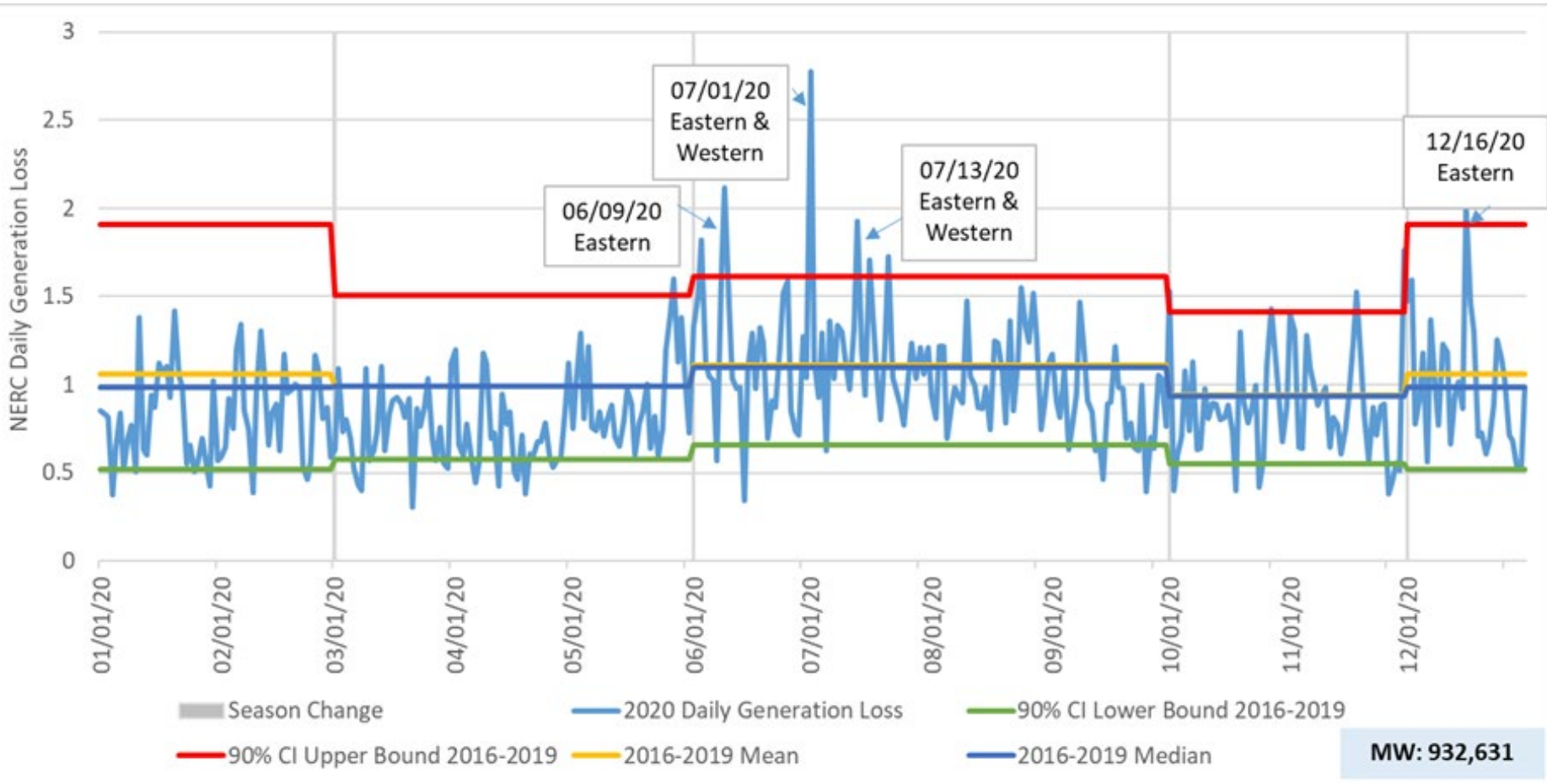


BES Protection Systems

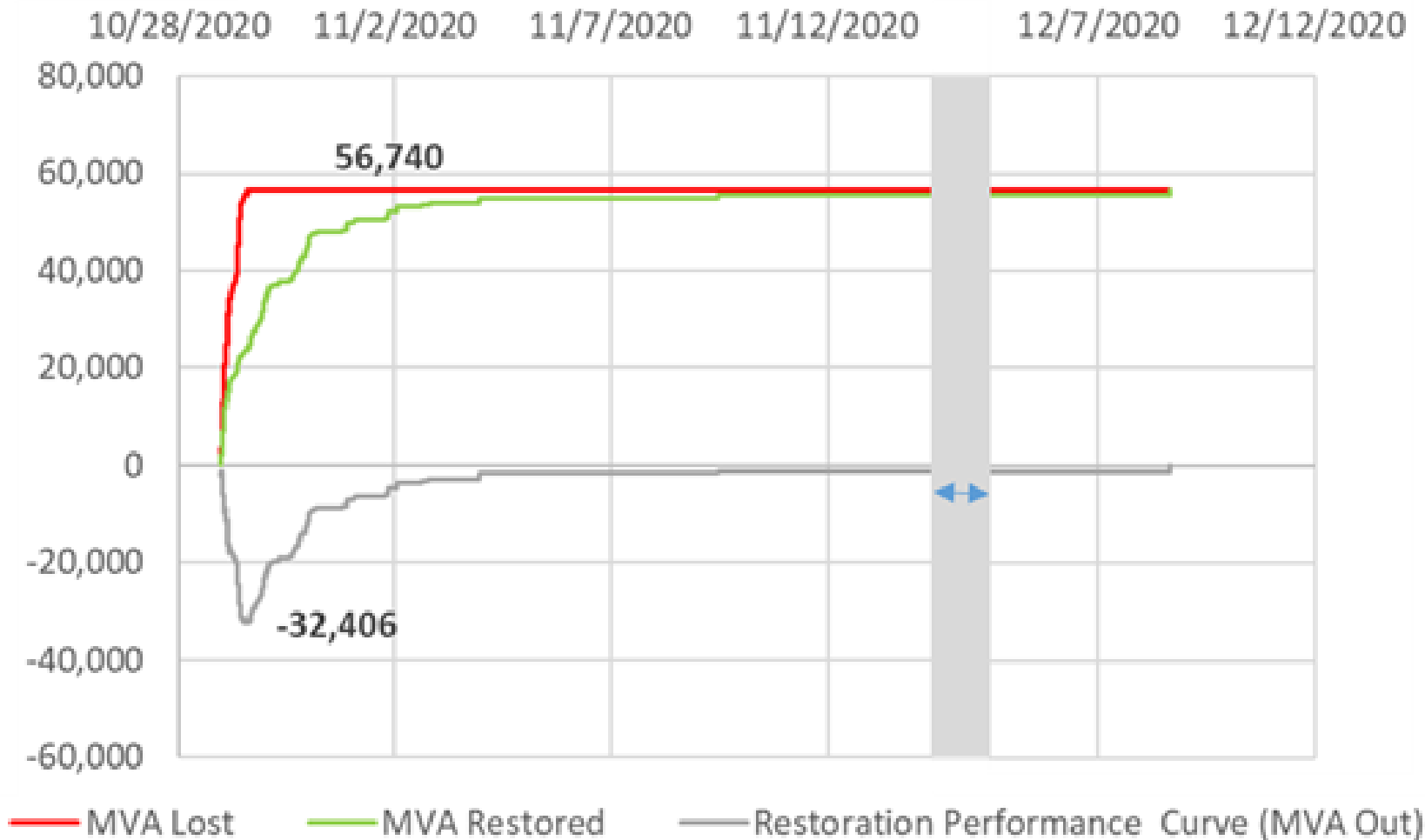
Priority Reliability Issues Example: Extreme Natural Events - Transmission



Priority Reliability Issues Example: Extreme Natural Events - Generation



Hurricane Zeta, October 28, 2020 56,740 MVA Affected, Eastern Interconnection



Date	Milestone
July 17	Electronic Voting Deadline for Report Acceptance by the Reliability Security and Technical Committee
July 23	NERC Board of Trustees Review
August 12	NERC Board of Trustees Acceptance
August 13	Target Release



Questions and Answers

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RELIABILITY CORPORATION

2021 First Quarter Reliability Indicators

Soo Jin Kim, Director of Power Risk Issues and Strategic Mgmt.
Board of Trustees Meeting
May 13, 2021

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- **Why is it important?**

- Provides a quantitative measure and trend of actual impacts on the BPS

- **How is it measured?**

- Count: Number of Category 3 or above events
- Trend: Statistical test is performed on the five-year cumulative daily event Severity Risk Index (eSRI) for (Category 1–3) events

Data (Annual Measurement)

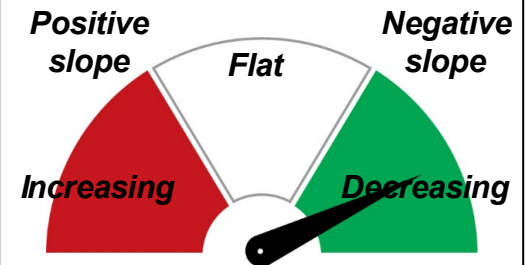
- Threshold: No Category 3 or above events: *Zero is green, else is red*

2021 Status



Data (Compared to a 5-year rolling average)

- Slope of eSRI line is flat to decreasing and does not show an increase above zero that is statistically significant (95% Confidence Interval).
- “2021 Status” relates to the slope of the 5 year rolling average (Positive, Flat, or Negative), not just the 2021 performance.

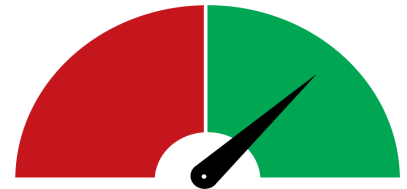


- **Why is it important?**

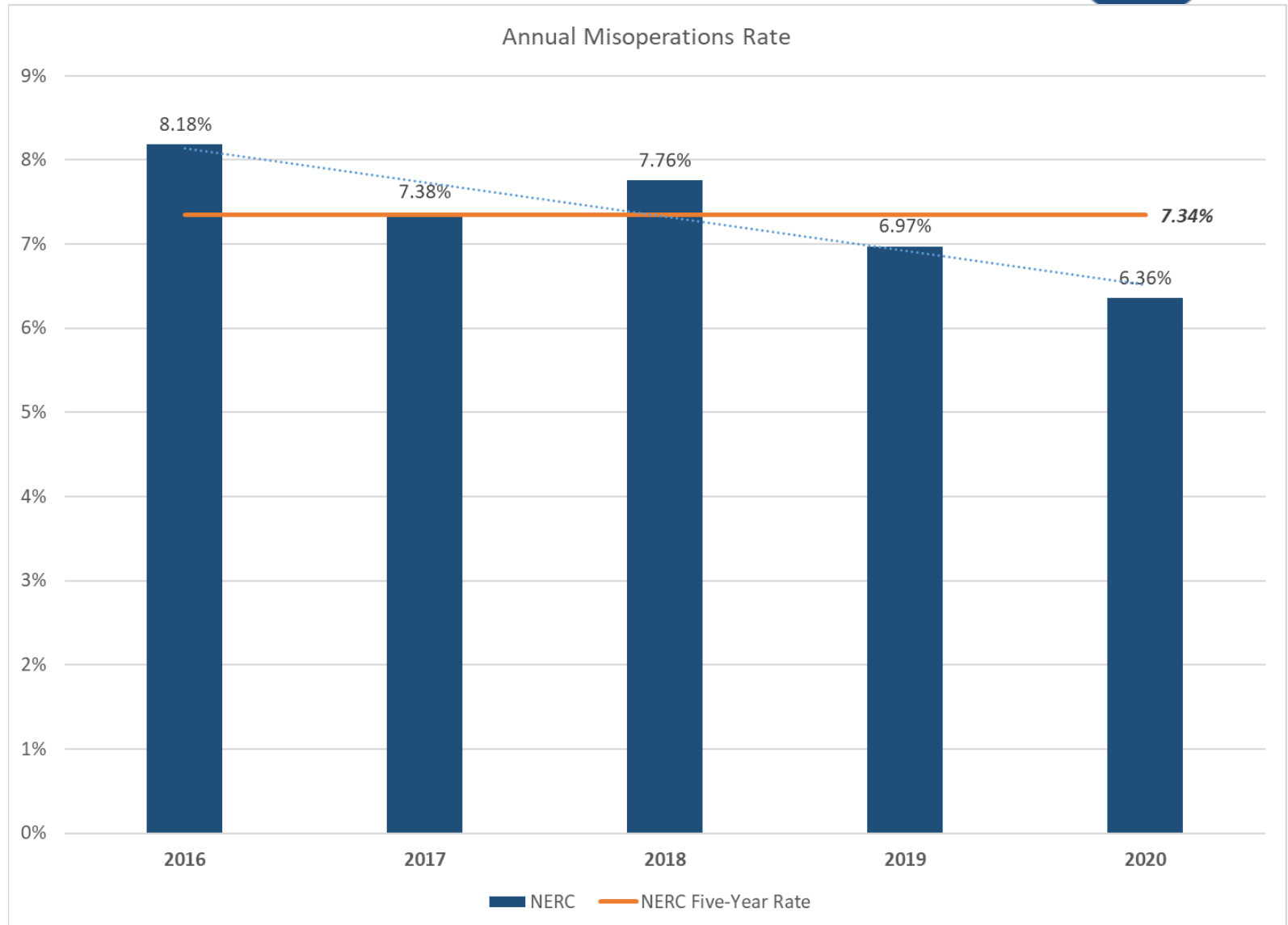
- Reduce risk to BPS reliability from Standard violations by registered entities

- **How is it measured?**

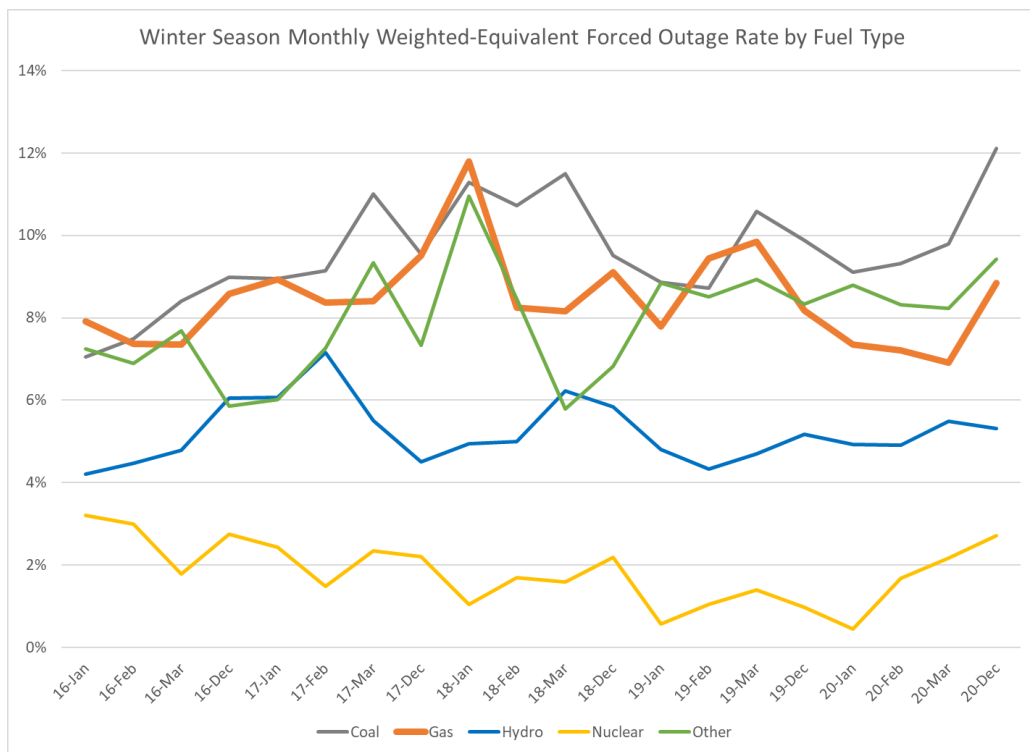
- Moderate and serious risk noncompliance with a relevant history of similar past conduct: **12% of the Q1 2021 moderate and serious risk filings had relevant past conduct.**
- The number of violations discovered through self-reports: **88% of noncompliance submitted during Q1 2021 were self-reported**
- Risk to the BPS based on the severity of Standard violations: **9% of the violations filed in Q1 2021 were assessed as serious risk.**
 - *2% of past 5-year filings are assessed as serious risk.*



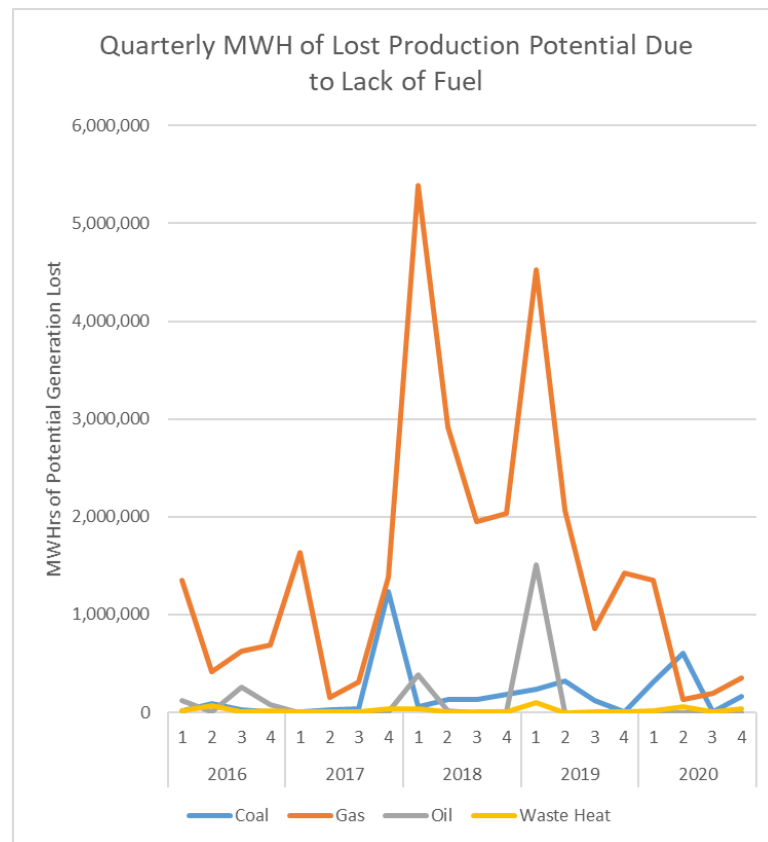
Indicator 3: Protection System Misoperations Rate



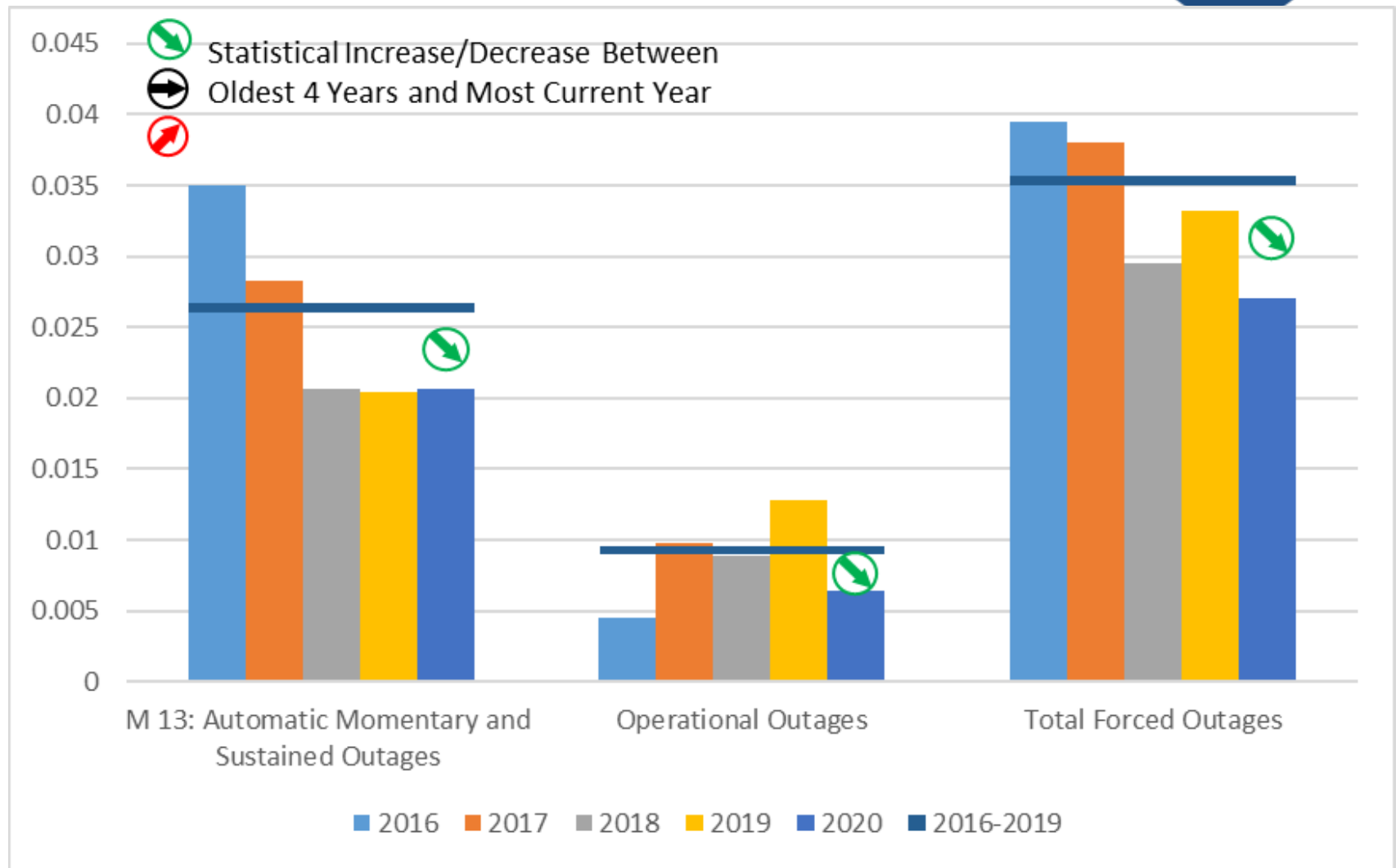
Indicator 4: Forced Outage Rate During Cold Weather Months and Potential Production MWH Loss Due to Lack of Fuel



Winter Season Monthly Weighted EFOR by Fuel Type

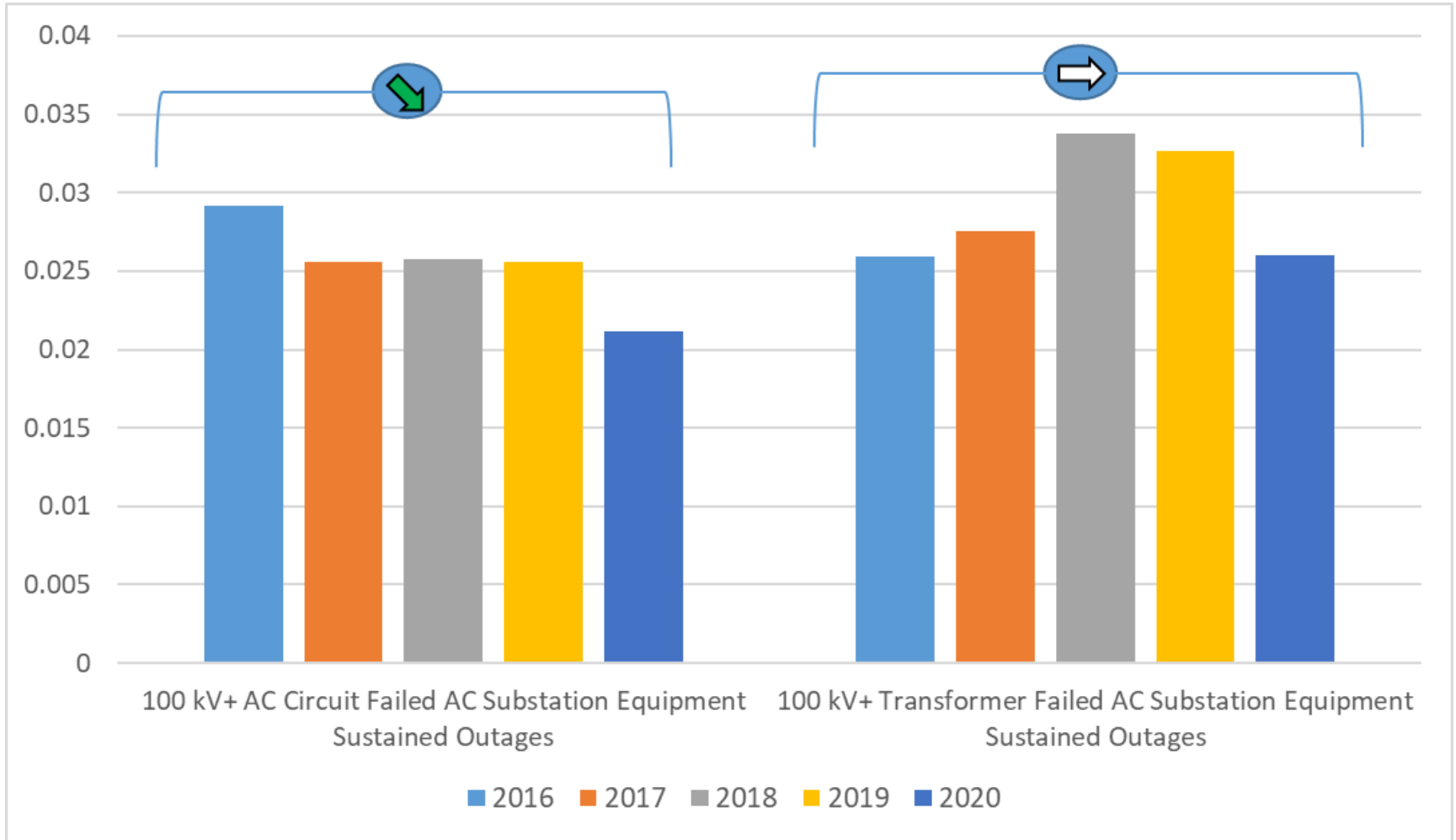


Percent of Potential Production Lost Due to Lack of Fuel



**Outages Caused by Human Error
AC Circuits**

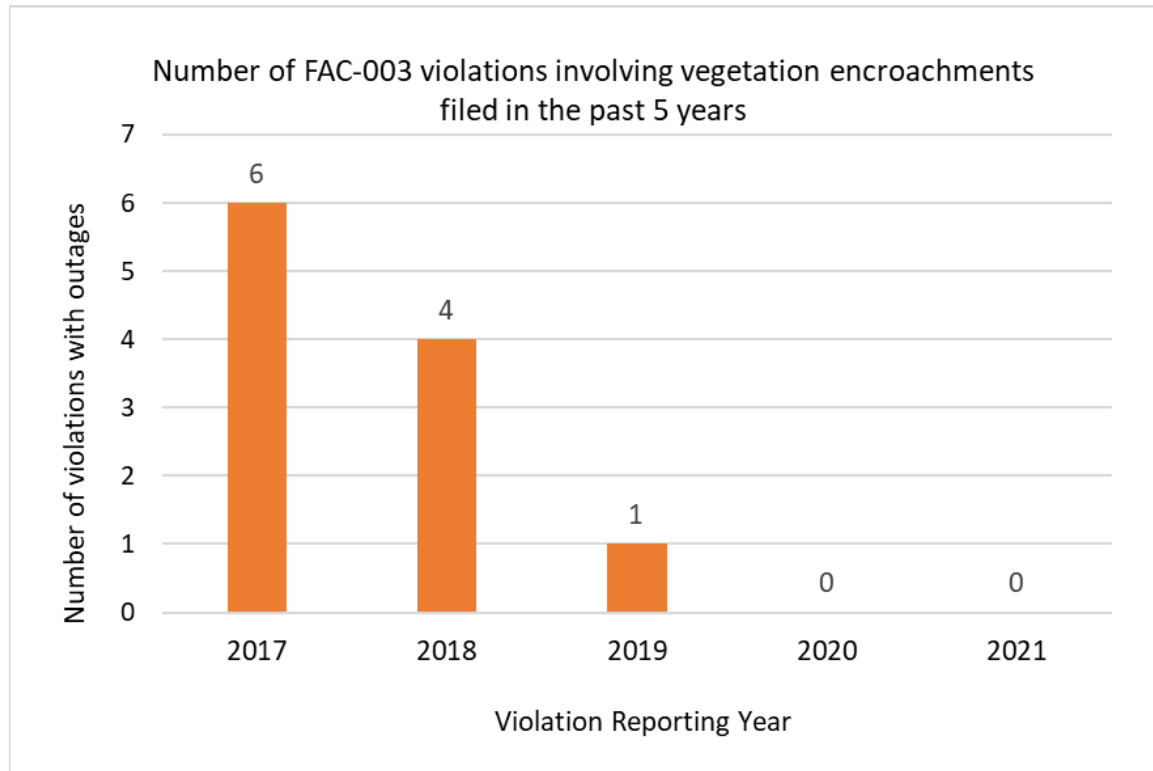
Indicator 5b: Substation Equipment Failures or Failed Circuit Equipment



Failed AC Substation Equipment

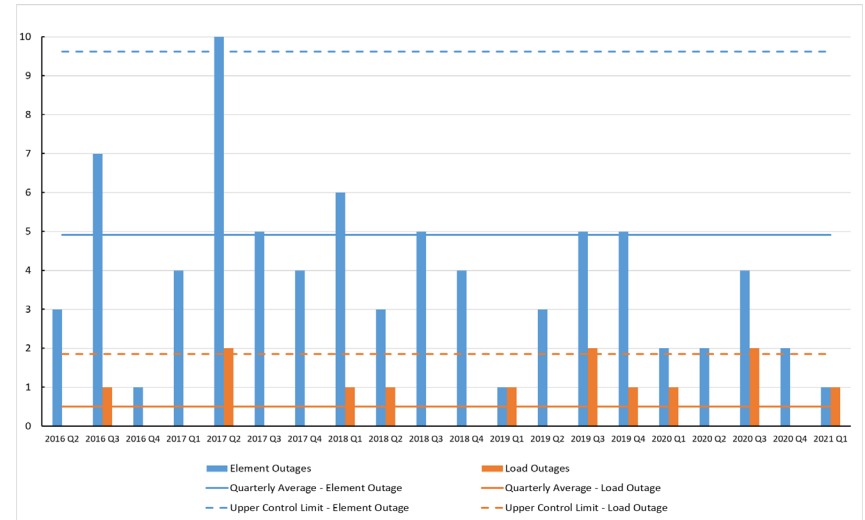
- **How is it measured?**

- Number of vegetation encroachments: 11 vegetation encroachments from inside of the right-of-way have been filed since 2017. The graph below shows those violations by reporting year.



• How is it measured?

- Number of applicable DOE OE-417 Electric Emergency Incident and Disturbance Reports and NERC EOP-004 Event Reports



Data (Compared to 2016-2018 Quarterly Baseline)

- No disruption* of BES operations due to cyber security incidents
Zero disruptions of BES operations due to cyber attacks in 2020 Q4
- Number of disruptions* of BES operations due to physical security incidents: *Below baseline Upper Control Limit is green, else is red*
One disruptions of BES operations (one with load loss) due to physical attacks in 2020 Q4

*A disruption means that a BES element was removed from service as a result of the cyber or physical incident

2021 Status

Cyber Security



Physical Security

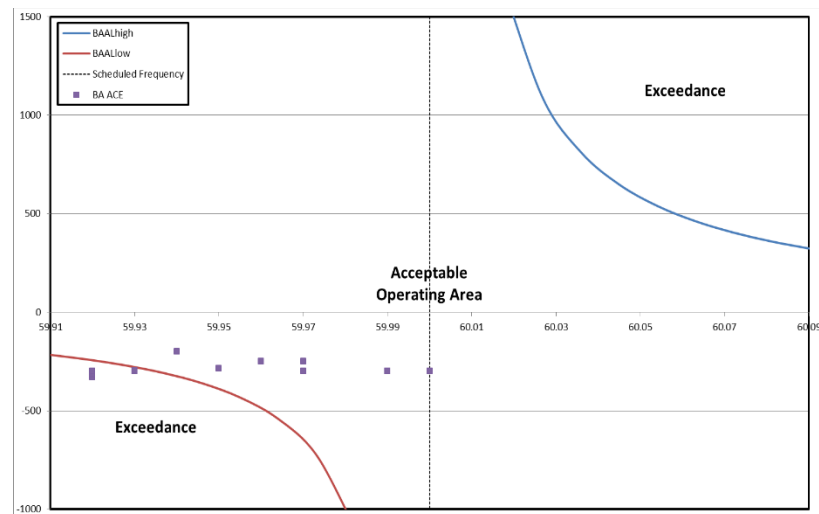
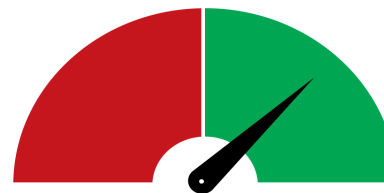


Why is it important?

Each Balancing Authority (BA) is required to operate such that its clock-minute average of reporting area control error (ACE) does not exceed its clock-minute BA ACE limit (BAAL) for more than 30 consecutive clock-minutes. The purpose of this metric is to measure risk to the BPS by monitoring the trend in the number of clock minutes in which BAs return their ACE to within their BAAL after an exceedance has occurred.

How is it measured?

Success (green) is achieved when the linear regression line of the most recent four years of quarterly BAAL exceedances greater than or equal to 15 clock minutes has a statistically significant negative slope or when the slope of the time trend is statistically neither increasing nor decreasing. This equates to either improvement or no decline in performance. Failure (red) occurs if slope of the time trend is increasing with statistical significance.

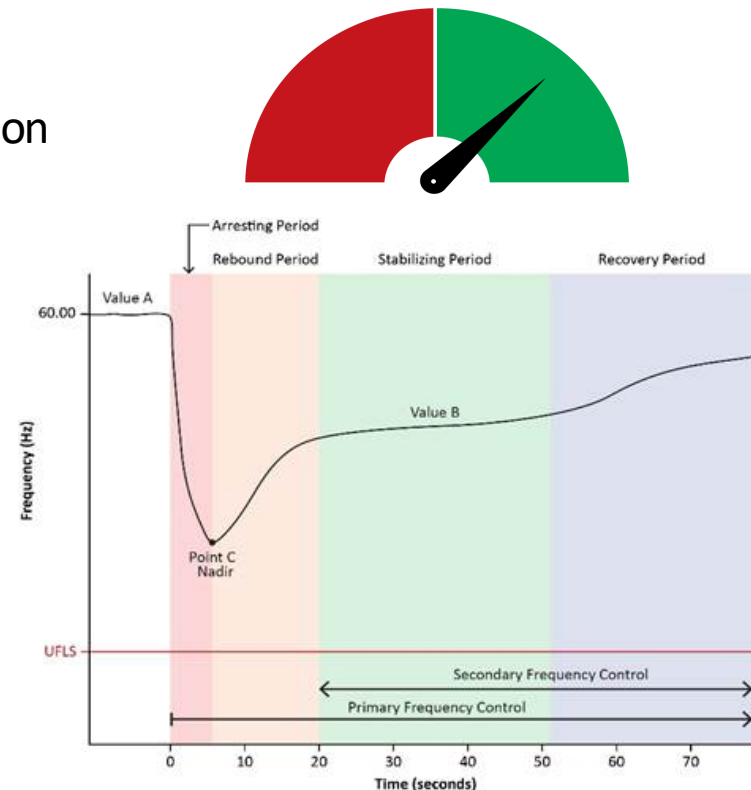


Why is it important?

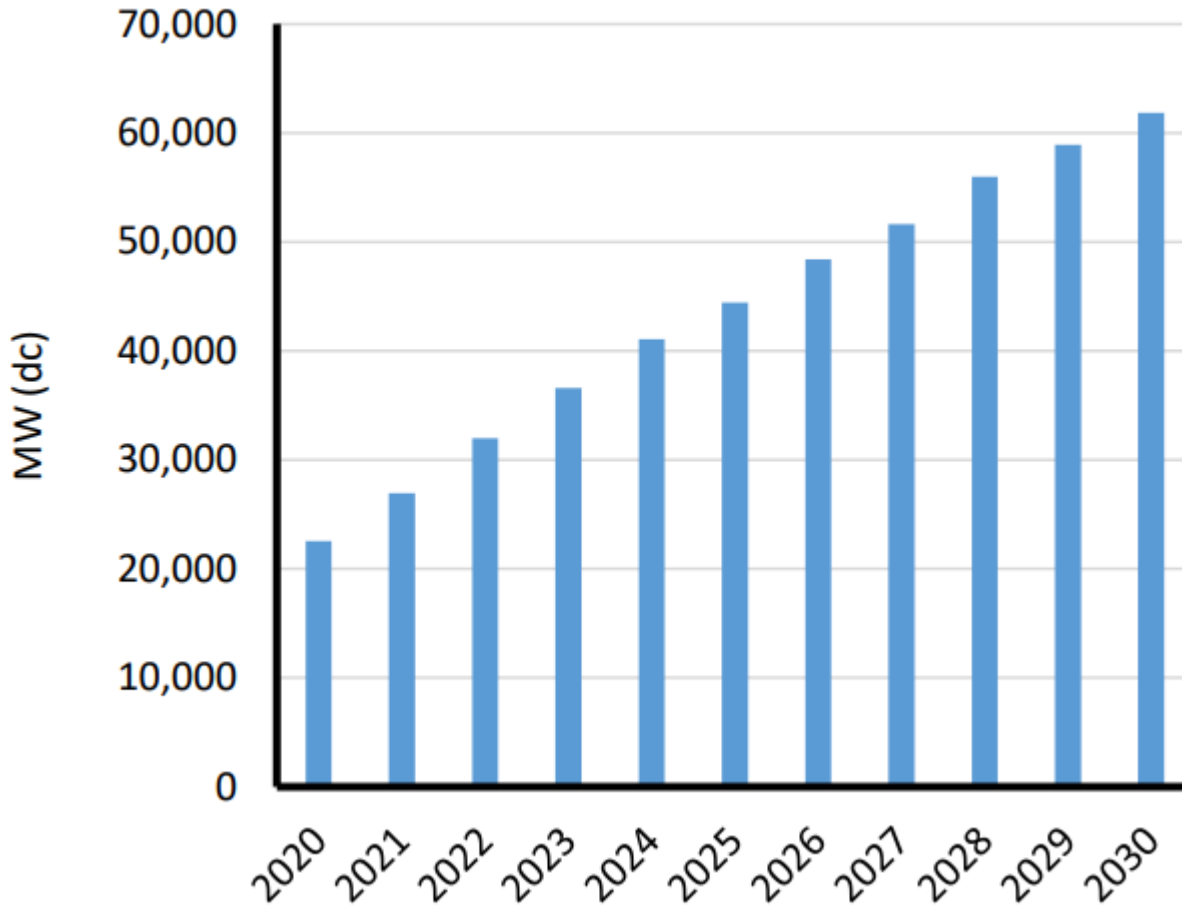
Measures risk and impact to the BPS by evaluating the trend in the magnitude of the decline in Interconnection frequency experienced in each Interconnection during low frequency events selected for BAL-003-1 compliance. The Indicator will evaluate whether the risk of activating under frequency load shed devices is increasing or decreasing.

How is it measured?

Success (green) is achieved when the linear regression line of the most recent four years of quarterly mean values of Frequency A minus Frequency C has a statistically significant negative slope or when the slope of the time trend is statistically neither increasing nor decreasing. This equates to either improvement or no decline in performance where Interconnection risk has not changed or declined. Failure (red) occurs if the slope of the time trend is increasing with statistical significance or if under frequency load shedding is activated for any single BAL-003 frequency event in any Interconnection.



Indicator 9: DER Penetration



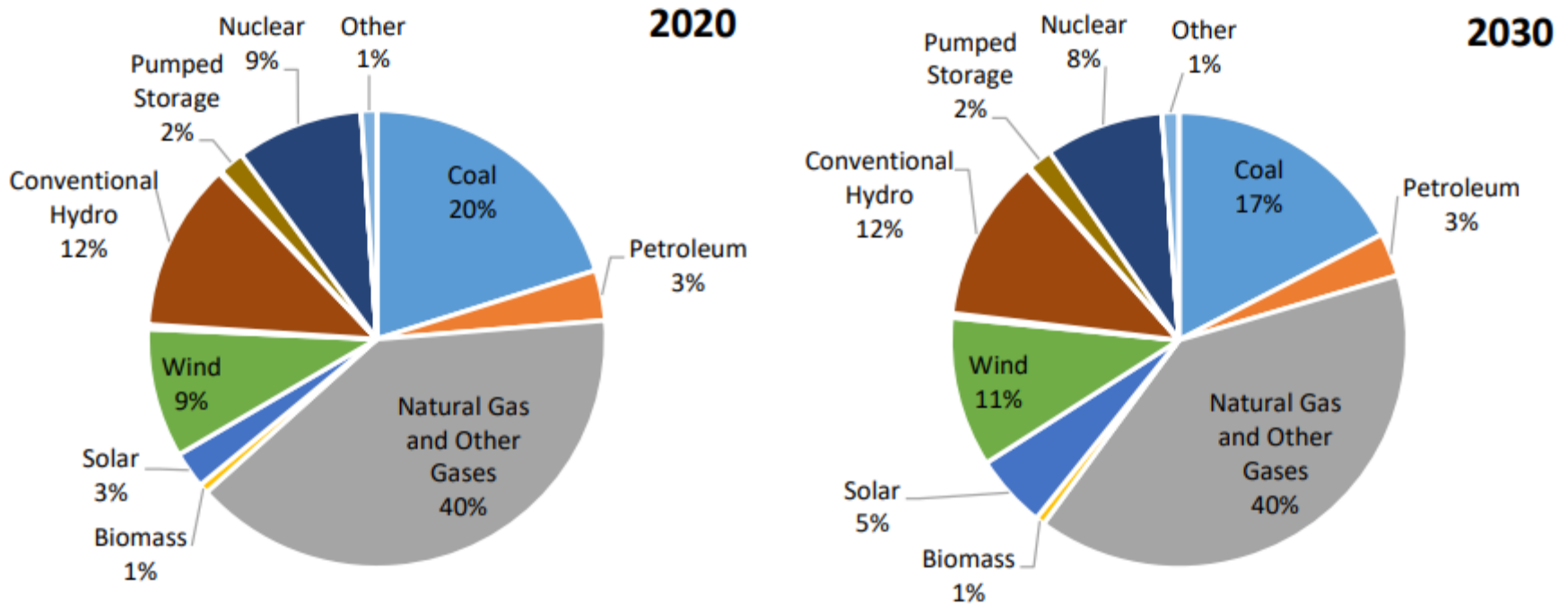


Figure 33: Installed Nameplate Capacity by Fuel Mix Trend (Includes Future Tier 1 Resources)

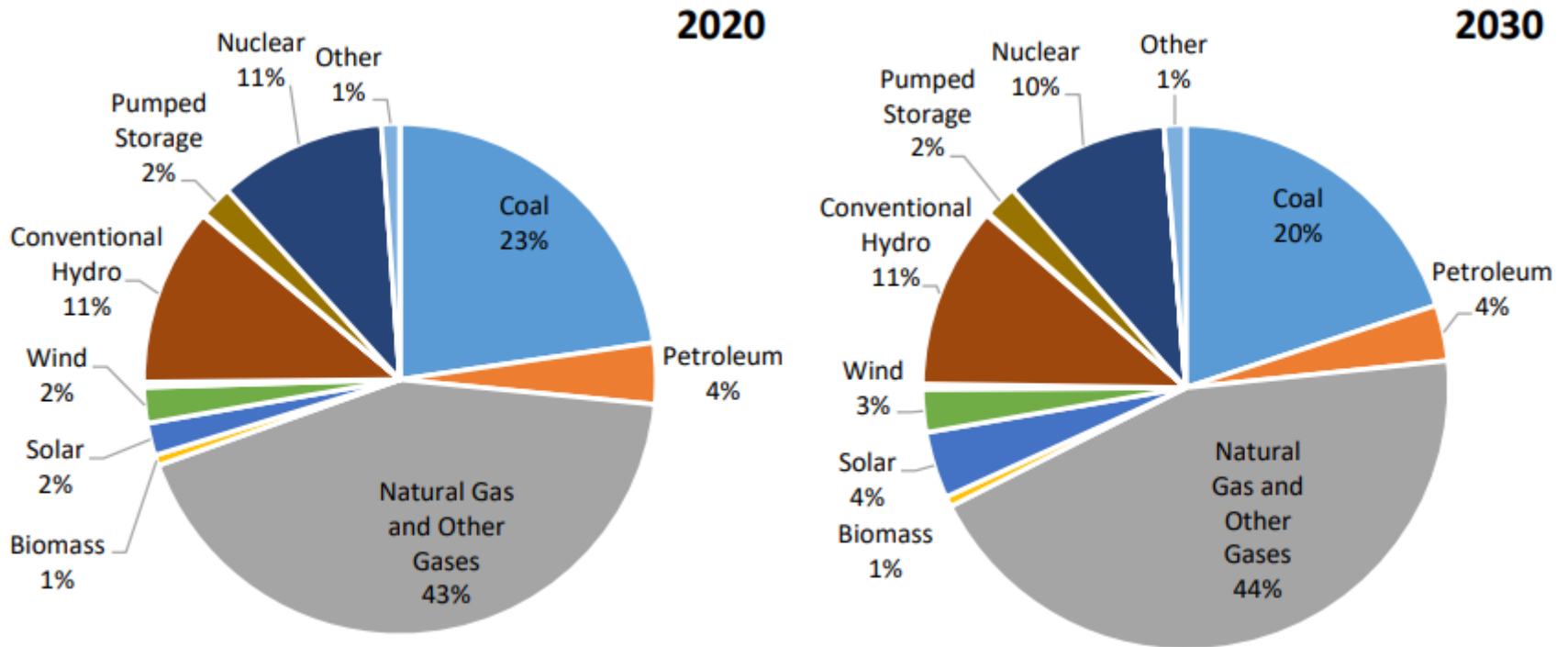


Figure 34: Installed On-Peak Anticipated Capacity Trend by Fuel Mix



Questions and Answers