NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Agenda
Board of Trustees

August 17, 2023 | 9:00 a.m.-12:00 p.m. Eastern
In-Person Meeting

In-Person
Westin Ottawa Hotel
11 Colonel By Dr.
Ottawa, ON K1N 9H4, Canada

Conference Room: CONF I/II

Virtual Attendees
Webcast Link *(Listen Only)*

Call to Order

NERC Antitrust Compliance Guidelines

Introduction and Chair's Remarks

Consent Agenda – Approve

1. **Minutes***
   a. May 11, 2023 Meeting
2. **Committee Membership and Charter Amendments***
   a. Personel Certification Governance Committee Membership

Regular Agenda

3. **Remarks and Reports**
   a. Welcome Remarks, Sami Khoury, Head of the Canadian Centre for Cyber Security (CCCS)
   b. Remarks by Harneet Panesar, Chief Operating Officer, Ontario Energy Board
   c. Remarks by Patricia Hoffman, Principal Deputy Assistant Secretary for the Office of Electricity, DOE
   d. Remarks by David Morton, Chair, CAMPUT
   e. President's Report
   f. Report on the August 15 and August 17, 2023 Closed Meetings
4. **Board Committee Reports**
   a. Corporate Governance and Human Resources

   i. Proposed Amendments to the Compliance Committee Mandate* – **Approve**
b. Compliance
c. Finance and Audit
   i. Second Quarter Statement of Activities – **Accept**
   ii. NERC and Regional Entity Proposed 2024 Business Plans and Budgets and Associated Assessments* – **Approve**
d. Enterprise-wide Risk
e. Technology and Security
f. Nominating
g. Report by Sue Kelly on Standards Quarterly Activities
h. Report by Rob Manning on RSTC Quarterly Activities

5. Semi-Annual Reports to the Board

a. Personnel Certification Governance Committee*
b. Compliance and Certification Committee*
c. Reliability and Security Technical Committee*
d. Standards Committee*
e. North American Energy Standards Board
f. North American Transmission Forum*
g. North American Generator Forum

6. Standards Quarterly Report and Actions*

a. Proposed Revisions to the NERC Rules of Procedure – Reliability Standards – **Approve**
b. Project 2021-06 Modifications to IRO-010 and TOP-003 – **Adopt**
c. Cold Weather Standards Status – **Update**

BREAK – 15 MINS

7. Other Matters and Reports

a. Input Letter and Member Representatives Committee Meeting – **Discussion**
a. ERO Reliability Risk Priorities Report* – **Accept**
b. Semi-annual Review of the Achievements of the NERC Work Plan Priorities* – **Update**

8. Other Matters and Adjournment

*Background materials included.

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Draft Minutes
Board of Trustees

May 11, 2023 | 10:00 a.m.–12:00 p.m. Eastern

Hybrid In-Person/Virtual

NERC DC Office
1401 H Street NW, Suite 410
Washington, DC 20005

Call to Order

Mr. Kenneth W. DeFontes, Jr., Chair, called to order the duly noticed open meeting of the Board of Trustees (the Board) of the North American Electric Reliability Corporation (NERC or the Corporation) on May 11, 2023, at 10:00 a.m. Eastern, and a quorum was declared present.

Present at the meeting were:

Board Members
Kenneth W. DeFontes, Jr., Chair
George S. Hawkins, Vice Chair
Jane Allen
Robert G. Clarke
Larry Irving
Suzanne Keenan
Susan Kelly
Robin E. Manning
Jim Piro
James B. Robb, President and Chief Executive Officer
Kristine Schmidt
Colleen Sidford

NERC Staff
Tina Buzzard, Assistant Corporate Secretary
Manny Cancel, Senior Vice President and Chief Executive Officer of the E-ISAC
Howard Gugel, Vice President, Engineering and Standards
Kelly Hanson, Senior Vice President and Chief Administrative Officer
Stan Hoptroff, Vice President, Business Technology
Mark G. Lauby, Senior Vice President and Chief Engineer
Kimberly Mielcarek, Vice President, Communications
Darrell Moore, Director, Situational Awareness and Personnel Certification & Credential Maintenance (*via Webex*)
Lauren Perotti, Assistant General Counsel
Bryan Preston, Vice President, People and Culture
Sônia Rocha, Senior Vice President, General Counsel, and Corporate Secretary
Janet Sena, Senior Vice President, External Affairs
Andy Sharp, Vice President and Chief Financial Officer

NERC Antitrust Compliance Guidelines

Mr. DeFontes noted the public nature of the meeting and directed the participants' attention to the NERC Antitrust Compliance Guidelines included in the advance meeting materials. He stated that any additional questions regarding these guidelines should be directed to Ms. Rocha.

Introduction and Chair's Remarks

Mr. DeFontes welcomed all of the attendees to the meeting and remarked on the recent meeting with the Canadian regulators at the CAMPUT meeting in Toronto, ON. He also welcomed Ms. Jen Easterly, Director, Cybersecurity and Infrastructure Security Agency (CISA), Department of Homeland Security and Ms. Patricia Hoffman, Principal Deputy Assistant Secretary for the Office of Electricity, U.S. Department of Energy.

Consent Agenda

Upon motion duly made and seconded, the Board approved the consent agenda as follows:

Minutes

The draft minutes for the February 16, 2023 meeting were approved as presented to the Board at this meeting.

Committee Membership

Compliance and Certification Committee Membership

RESOLVED, that the Board hereby appoints the following individuals to the Compliance and Certification Committee for the terms listed below:

- Scott Brame, North Carolina Electric Membership Corporation: Sector 3, to complete a term ending December 31, 2024

- Tino Zaragoza, Imperial Irrigation District: At Large, to complete a term ending December 31, 2025

Regular Agenda

Remarks by Jen Easterly, Director, CISA

Mr. Cancel introduced Ms. Easterly, Director of CISA. Ms. Easterly remarked that the electricity sector has a strong focus on cyber issues that can serve as a model for other sectors. She discussed efforts at the federal government level to address vulnerabilities highlighted by the Colonial Pipeline incident, collaboration with industry and international partners, guidelines and other activities underway to address cyber risks, and the challenges of artificial intelligence. Ms. Easterly also discussed the need to prioritize security in software and technology development design as driving a sustainable cyber strategy in a time of rapidly evolving threats.

Remarks by Patricia Hoffman, Principal Deputy Assistant Secretary for the Office of Electricity, DOE

Mr. DeFontes introduced Ms. Hoffman of DOE. Ms. Hoffman remarked on the DOE's focus on transmission issues, including the recent issuance of a Request for Information to guide potential improvements to the transmission process and efforts to coordinate permitting among multiple federal agencies. She also highlighted continued coordination and collaboration on resilience issues, including on extreme weather issues, and efforts to understand resource availability.

Remarks by David Morton, CAMPUT Representative to NERC

Mr. DeFontes reported that Mr. Morton was unable to provide remarks at this meeting due to the ongoing CAMPUT meeting.

President's Report

Mr. Robb provided the president's report. He remarked on the new hybrid format for the meeting, with the Board and Member Representatives Committee ("MRC") meeting in person at the new D.C. Collaboration Hub with others participating remotely. Mr. Robb noted the productive and collaborative discussions at the meetings and thanked the NERC and vendor staff who made the meetings possible.

Mr. Robb noted the recent passing of Mechelle Thomas, most recently NERC's Vice President of Compliance. He remarked on her many contributions to NERC and her collegiality and friendship. The attendees observed a moment of silence in her honor.

Mr. Robb reported that the 2024 business plan and budget process is underway, and that NERC's projections for 2024 and 2025 are consistent with those reported last year. He noted that the draft business plan and budget will be posted for a 30-day public comment beginning beginning on or around May 25, 2023. Mr. Robb also reported on NERC's continued focus on key reliability issues, including rapidly evolving cyber and physical threats, and the need for continued collaboration to address these risks. He noted continued challenges in gas/electric coordination and market incentives for reliability investments. He stated that while NERC is unable to solve these challenges on its own, collaboration and coordination can lead to a successful path forward.

Mr. Robb concluded his remarks by reporting the selection of Soo Jin Kim as the new Vice President of Engineering and Standards, as Howard Gugel transitions to his new role as Vice President of Compliance Assurance and Registration. Upon motion duly made and seconded, the Board approved the following resolution:

> **RESOLVED**, that the Board hereby appoints Soo Jin Kim as Vice President, Engineering and Standards and Howard Gugel as Vice President, Compliance Assurance and Registration.

Mr. Robb then introduced Mr. Jason Blake, CEO of SERC, and co-chair of the ERO Executive Group. Mr. Blake extended condolences on behalf of the Regional Entities on the passing of Ms. Thomas, noting her strong working relationships with Regional Entities. He reported on Regional Entity efforts to develop a common framework for security and driving accountability to the identified measures. Mr. Blake also discussed continuing progress in leveraging ERO Enterprise knowledge and expertise to optimize its reliability efforts and advancing change leadership within the ERO Enterprise.

Report on the May 9 and May 11, 2023 Closed Meetings

Mr. DeFontes reported that on May 9, 2023 and May 11, 2023 (as is its custom), the Board met in closed session with NERC management to review NERC management activities. On May 9, the Board discussed feedback from the May 9, 2023 MRC closed meeting, received updates on the standards process improvement initiative, discussed Board oversight over standards and reliability assessments, and received an update on future possibilities for the Atlanta office. On May 11, the Board discussed the Board's resolutions for this meeting, feedback on policy input and the MRC meeting, and additional discussion from the Committee meetings. The Board adjourned into executive sessions with the General Counsel and the CEO, and with the General Counsel separately, to discuss confidential matters. The Board also adjourned into executive session to discuss confidential matters.

Board Committee Reports

Corporate Governance and Human Resources

Ms. Keenan, Committee Chair, reported on recent Committee meetings and actions. At the May 9, 2023 closed meeting, the Committee reviewed the corporate governance aspects of the Form 990, the 2022 Committee self-evaluation results, and the 2022 Board annual evaluation results, and it received an update regarding human resources administrative matters. She reported that the Committee will add Board education to its mandate and is

adding items to its upcoming governance retreat. The Committee also met in executive session with the CEO, the General Counsel, and the Vice President, People and Culture to discuss organization matters, and without staff to discuss other confidential matters. At the May 10, 2023 open meeting, the Committee received an update on NERC's leadership development initiatives and reviewed the 2022 Board evaluation results. Ms. Keenan emphasized that the Committee considered all comments submitted and plans to assess the effectiveness of the recent governance changes in next year's assessment.

Compliance
Mr. Manning, Committee Chair, reported on recent Committee meetings. At the May 9, 2023 closed meeting, the Committee reviewed the 2022 Commtitee self-evaluation results and received updates on NERC and Regional Entity Compliance Monitoring and Enforcement Program and Organization Registration and Certification Program audit remediation. The Committee also adjourned into executive session to discuss confidential matters. At the May 10, 2023 open meeting, the Committee received updates on the recent cold weather small group advisory sessions and vegetation management issues.

Finance and Audit
Mr. Sidford, Committee Chair, reported on recent closed meetings of the Committee. At the April 28, 2023 closed meeting, the Committee reviewed the first draft of the 2024 business plan and budget. At the May 9, 2023 closed meeting, the Committee reviewed the 2022 financial statement audit results and met with NERC's external auditor to discuss their clean audit findings, reviewed the financial aspects of the Form 990, received an update on the 2024 business plan and budget process, received an internal audit update, and reviewed the Committee self-evaluation results. The Committee then adjourned into executive session.

Enterprise-wide Risk
Mr. Piro, Committee Chair, provided an overview of the Committee, including its composition and oversight responsibilities. He then reported on the Committee's closed meeting on May 9, 2023. At its meeting, the Committee received updates from Mr. Scott Tomashefsky, Chair of the Compliance and Certification Committee (CCC), on CCC activities, and from Mr. Jason Blake, President and CEO of SERC, regarding Regional Entity activities. The Committee also reviewed the Committee self-assessment results, received an update on Internal Audit activity, and discussed corporate risk management issues. The Committee concluded in executive session to discuss confidential matters.

Technology and Security
Ms. Allen, Committee Chair, reported on recent meetings of the Committee. At the April 28, 2023 closed meeting, the Committee discussed the information technology strategy as reflected in the 2024 business plan and budget. At the May 8, 2023 closed meeting, the Committee reviewed the Committee self-assessment results, received cyber security training, and received an update on NERC's cyber security posture and the status of remediating issues identified on IT security audits. The Committee also met in executive session to discuss confidential matters. At the May 10, 2023 open meeting, the Committee received updates on cyber strategy documents released by the Canadian and U.S. governments, E-ISAC operations, and ERO Enterprise Business Technology, including Align, infrastructure services, and cloud usage.

Nominating
Mr. DeFontes noted that Chair Clarke provided a report at the May 10, 2023 Member Representatives Committee meeting.

Report by Susan Kelly on Standards
Mr. DeFontes reported that this update would be skipped in the interest of time, noting that standards matters would be discussed later in the agenda.

Report by Rob Manning on RSTC Quarterly Activities
Mr. DeFontes noted that this item would be skipped in the interest of time.

Standards Quarterly Report and Actions

Texas Reliability Entity Regional Standards Development Process
Mr. Gugel presented the proposed revisions to the Texas Reliability Entity Regional Standards Development Process, noting that the Texas RE board previously approved the proposed revisions and no issues were identified during the NERC public comment period. After discussion, and upon motion duly made and seconded, the Board approved the following resolutions:

> **RESOLVED**, that the Board hereby approves the proposed Texas Reliability Entity Regional Standards Development Process, as presented to the Board at this meeting.
>
> **FURTHER RESOLVED**, that NERC management is hereby authorized to make the appropriate filings with ERO governmental authorities and take such further actions and make such further filings as are necessary and appropriate to effectuate the intent of the foregoing resolution.

Standard Process Improvement Opportunities
Mr. Gugel provided an update on activities to implement the recommendations of the Standards Process Stakeholder Engagement Group, as directed by the Board at its November 2022 meeting. He reported that the proposed revisions to the NERC Rules of Procedure and Standard Processes Manual were first posted for comment from January 18, 2023 through March 6, 2023, and the initial ballot of the Standard Processes Manual was unsuccessful. He reported that, with the Standards Committee's authorization, NERC Staff reviewed the comments on the draft Standard Processes Manual, made changes in response to comments, and posted a second draft which is open for comment and ballot through May 30, 2023. Mr. Gugel reported that Staff is still reviewing the comments on the proposed Rules of Procedure changes to determine appropriate next steps. He also reported that the standing committees are discussing how to best implement the recommendations directed at their activities, including recommendations related to Standard Authorization Requests, administrative efficiencies, and other recommendations to improve agility. Mr. Gugel thanked NERC's stakeholders for their feedback throughout this process and noted several lessons learned for conducting effective outreach in the future. Ms. Kelly expressed her thanks for the work and engagement on this initative.

Inverter-Based Resources Work Plan
Mr. Gugel provided an update on activities to develop and implement a work plan to register inverter-based resources (IBRs) not currently registered with NERC, revise Reliability Standards to address the risks and gaps in the current standards for IBRs, and issue a Level 2 alert on IBR performance issues. He also reported on recent educational efforts, including publishing a recap of the IBR panel at the first quarter technical meeting, developing *IBR Basics* and *IBR Primer* documents, and conducting a 10-part IBR webinar series in summer 2023. Mr. Gugel also reported on recent guidelines and reports published by NERC on IBRs and the development of an IBR quick resource guide. Mr. David Ortiz, Director, Office of Electric Reliability, U.S. Federal Energy Regulatory Commission discussed the status of FERC efforts to address IBRs.

Cold Weather Standards Status
Mr. Gugel provided an update on the status of standards development to address the second phase recommendations for Reliability Standards improvements from the FERC and ERO Enterprise Joint Inquiry Report into

the causes of the February 2021 cold weather event. He reported that the initial ballot of the second phase standards was not successful, and that the team is working to address the comments and post a second draft in the coming weeks. Mr. Gugel reported that the team is also working to include a revised EOP-012-2 standard addressing the directives in FERC's February 16, 2023 order approving EOP-012-1 and EOP-011-3 in that posting.

Other Matters and Reports

Input Letter and Member Representatives Committee Meeting
Mr. DeFontes reported that this item would be skipped in light of the robust discussion at the May 10, 2023 MRC meeting.

Level 3 Alert Essential Actions to Industry: Cold Weather Preparations for Extreme Weather Events III
Mr. Moore presented the proposed Level 3 Alert Essential Actions to Industry: Cold Weather Preparations for Extreme Weather Events III. He highlighted how several notable events have demonstrated the impacts extreme cold weather can have on reliability and the need for NERC to understand how entities are taking steps to mitigate known risks. Mr. Moore explained that the Essential Actions are specific actions that NERC has determined to be essential for certain segments of owners, operators, or users to undertake to ensure the reliable operation of the Bulk-Power System, and he noted that this is the first time NERC has proposed to use this authority in the NERC Rules of Procedure. Mr. Piro requested a copy of the resulting report be provided to the Board.

After discussion, and upon motion duly made and seconded, the Board approved the following resolutions:

> **WHEREAS**, several notable events since 2011 have demonstrated the substantial impacts that extreme cold weather conditions, and the failure to properly prepare for them, can have on the reliability of the bulk power system (BPS);
>
> **WHEREAS,** NERC has taken several actions to address this important reliability risk and advance reliability in cold weather conditions, including the development of currently effective Reliability Standards EOP-011-2, IRO-010-4, and TOP-003-5; the development of cold weather preparedness Reliability Standard EOP-012-1, effective October 1, 2024; and the issuance of cold weather alerts providing recommended actions for industry in advance of prior winter seasons;
>
> **WHEREAS**, the need for entities to prepare for cold weather conditions remains especially important pending the effective date of Reliability Standard EOP-012-1;
>
> **WHEREAS,** the Board has the authority under Section 800 of the NERC Rules of Procedure to approve the issuance of Essential Actions to Industry, containing specific actions that NERC has determined are essential for certain segments of owners, operators, or users of the BPS to take to ensure the reliability of the BPS;
>
> **WHEREAS,** the Board has determined that it is essential for Generator Owners, Balancing Authorities, and Transmission Operators to take certain steps to prepare for extreme cold weather conditions to ensure the reliability of the BPS;
>
> **NOW, THEREFORE, BE IT RESOLVED**, that the Board hereby approves the Level 3 Alert Essential Actions to Industry: Cold Weather Preparations for Extreme Weather Events III, substantially in the form presented to the Board at this meeting.

Internal Network Security Monitoring Data Request

Mr. Gugel presented the proposed internal network security monitoring data request to be issued under Section 1600 of the NERC Rules of Procedure. He highlighted the need for this data request to respond to a directive from FERC to NERC in a January 19, 2023 order. In that order, FERC directed NERC to revise the CIP Reliability Standards to require internal network security monitoring for some Bulk Electric System (BES) cyber assets, and to report on the feasibility of requiring it for other BES cyber assets not included in the scope of that directive. After discussion, and upon motion duly made and seconded, the Board approved the following resolutions:

> **WHEREAS**, on January 19, 2023, the U.S. Federal Energy Regulatory Commission ("FERC") issued Order No. 887 directing NERC to develop Reliability Standards requirements to require internal network security monitoring for all high impact Bulk Electric System (BES) Cyber Systems and medium impact BES Cyber Systems with External Routable Connectivity;
>
> **WHEREAS**, FERC also directed NERC in Order No. 887 to conduct a study of the risks stemming from a lack of internal network security monitoring and the feasibility of requiring it for other BES Cyber Systems not subject to the directed standards that includes certain categories of entity data, and to submit this study by January 18, 2024;
>
> **WHEREAS,** NERC Management proposes to issue a request for data or information under Section 1600 of the NERC Rules of Procedure to collect the data needed to perform the directed study, and all required procedures for the issuance of such a request have been completed;
>
> **NOW, THEREFORE, BE IT RESOLVED,** that NERC management is hereby authorized to issue to reporting entities the Internal Network Security Mentoring Data Request, substantially in the form presented to the Board at this meeting.

Other Matters and Adjournment

Mr. DeFontes thanked the attendees for their participation in NERC's first hybrid Board meetings at the D.C. Collaboration Hub. There being no further business, and upon motion duly made and seconded, the meeting was adjourned.

Submitted by,

Sônia Rocha
Corporate Secretary

Personnel Certification Governance Committee Membership

Action
Approve

Background
The Personnel Certification Governance Committee (PCGC) is seeking the Board of Trustees approval of the following new members:

Resignation:

- Brett, Hallborg, BC Hydro
  - Term ends after August 2023 PCGC Meeting
- Mark Ellis, AEP
  - Term ends after August 2023 PCGC Meeting

New Member:

- Derek Scott, System Control Training Coordinator, Manitoba Hydro
  - Term August 2023 to December 2025
- Tyler Springer, AEP
  - Term August 2023 to December 2025

Personnel Certification Governance Committee Report

Action
Information

Background
The Personnel Certification Governance Committee (PCGC) second quarter meeting was held in-person from May 2-3, 2023 in Jacksonville, Florida. During the second quarter meeting, the PCGC and Credential Maintenance Working Group (CMWG) discussed the approach that should be taken to socialize proposed program changes with NERC legal and leadership, and FERC prior to industry outreach.

Summary
The PGCG and CMWG is continuing to develop supporting documentation for proposed changes to the system operator and credential maintenance programs as a result of the recommendations provided in the Credential Maintenance Research Project Final report.

Report Key Findings

- An individual's performance peaks and declines over the course of their work life.
- Knowledge and skill retention is improved when refresher training is spaced across time.
- It is valid to establish equivalency between different types of educational activities for the purposes of recertification.
- An increase in the quality of learning activities can offset a decrease in the total (contact) hours without impacting the achievement of knowledge or skill objectives.
- A portion of credential maintenance activities should be practice-based and designed to strengthen and assess proficiency.
- Many credential holders are over-credentialed due to the perception that the Reliability Operator (RC) credential is of a higher quality and allows both the credential holder and the employer greater flexibility.
- Stakeholders (both credential holders and managers) prefer continuing education that provides opportunities for professional development, specifically the growth of knowledge and skills.

Compliance and Certification Committee Report

Action
Information

Highlights of Activities Held Since the First Quarter 2023 Board of Trustees Meeting

- The Compliance and Certification Committee (CCC) is pleased to welcome Tino Zaragoza (Imperial Irrigation District – At-Large Sector) and Scott Brame (North Carolina Electric Membership Corporation – Cooperative Sector) as the Committee's newest members. Tino's term extends through the end of 2025, where Scott's term ends in 2024.
- The CCC held its Q2 2023 meeting at ERCOT's offices in Austin, Texas. The most significant actions taken during the meeting included the following:
  - The CCC approved the 2022 Stakeholder Perception Report. The report is intended to document stakeholder perceptions of the policies, programs, practices, and effectiveness of programs associated with NERC's Compliance Monitoring and Enforcement Program (CMEP), as well as the Organization Registration and Certification Program (ORCP). The report supports the responsibility of the CCC to provide such feedback to the NERC Board of Trustees, the Board's Compliance Committee (BOTCC), the Board's Enterprise-wide Risk Committee (EWRC), and NERC staff. Topics addressed in 2022 included Compliance Guidance Policy, Compliance Oversight Plans, COVID-19 Impacts, and Align through release 3. More detail regarding the report can be found in the MRC package.
  - Also approved were two CCC procedures, both of which will undergo the Rules of Procedure revisions process as they are included in Appendix 4E:
    - CCCPP-004-3: NERC Compliance and Certification Committee Hearing Procedures, and
    - CCCPP-005-2: NERC Compliance and Certification Committee Hearing Procedures for use in Appeals of Certification Matters.
  - The CCC held a focused discussion addressing Program Alignment and Consistency issues, in support of the ERO Program Alignment Initiative established by the NERC Board in 2017. The ERO Enterprise Program Alignment Effort is "intended to enhance efforts to identify, prioritize, and resolve alignment issues across the ERO Enterprise." A Consistency Reporting Tool Task Force has been established to consider actions that could be taken to improve the value of the Consistency Reporting Tool that is available to industry.
- In coordination with efforts being undertaken by the Standing Committees Coordination Group (SCCG), three members of the CCC (CCC Chair, CCC Vice - Chair, and MRC Chair) have been actively engaged in efforts to implement key deliverables associated with the Standards Process Improvement initiative. Areas being addressed include but are not

limited to: 1) revisions to the Standard Authorization Request Form, and 2) enhancements to the Framework to Address Known and Emerging Reliability and Security Risks (Risk Framework) with specific focus on Residual Risk.

Highlights from the Third Quarter 2023 Meeting

The CCC held its third quarter meeting at the offices of MRO in St. Paul, Minnesota on July 18-20. As materials were due for the Board package prior to the CCC meeting dates, the CCC Chair will provide key takeaways as part of the oral report to the Board on August 17. In addition to conducting its regular CCC business, the CCC met jointly with the Standards Committee, allowing the two committees an opportunity to coordinate activities of mutual interest. As an example, based on discussion from the 2022 joint CCC-Standards Committee meeting, CCC members are now participating directly in a joint task force with the Standards Committee in evaluating the value of the Standards Grading Process.

As has been the case throughout 2023, a major portion of the conversation will address the level of support needed by the CCC to implement Board directives related to the Standards Process Improvement effort and enhance the value of the Risk Framework.

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Reliability and Security Technical Committee Report

Board of Trustees Meeting
August 17, 2023

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June 2023 Meeting Highlights

- The RSTC Approved or Endorsed:
  - Reliability Assessments Subcommittee Scope
  - Reliability Guideline: Generating Unit Winter Weather Readiness
  - Reliability Guideline: Performance, Modeling, and Simulations of BPS-Connected Battery Energy Storage Systems and Hybrid Power Plants
  - Implementation Guidance: Usage of Cloud Solutions for BES Cyber System Information (BCSI)
  - Whitepaper: Zero Trust
  - Probabilistic Assessment Working Group 2022 ProbA Regional Risk Scenarios Report
  - White Paper – Overview of Energy Reliability Assessments – Volume 1
  - Reliability Guideline: Integrating Reporting ACE with the NERC Reliability Standards
  - Reliability Guideline: Operating Reserve Management

June 2023 Meeting Highlights

- The RSTC Approved or Endorsed:
  - SAR for Revisions to MOD-031 Standard
  - Reliability Guideline: DER Data Collection and Model Verification of Aggregate DER
  - Time Monitoring Reference Document
  - System Protection and Control Working Group Order 881-A Position Paper
- The RSTC Retired:
  - Reliability Guideline: BPS-Connected Inverter-Based Resource Performance
  - Reliability Guideline: Improvements to Interconnection Requirements for BPS-Connected Inverter-Based Resources
  - Reliability Guideline: DER Data Collection for Modeling in Transmission Planning Studies
  - Reliability Guideline: Model Verification of Aggregate DER Models used in Planning Studies

June 2023 Meeting Highlights

- The RSTC elected its Chair and Vice Chair
  - Rich Hydzik – Chair
  - John Stephens – Vice Chair
- The RSTC Established a review team to review the 2023 ERO Reliability Risk Priorities Report and update the RSTC Strategic Plan and RSTC Work Plan Priorities (December 2023 completion)
- Requested comments on:
  - White Paper: Security Risks Posed by DER and DER Aggregators
  - SARs for Revisions to EOP-004 Standard and EOP-005 Standard
    - Note: These SARs were posted for a 30-day public comment period running concurrent with the RSTC comment period
  - Draft RSTC SAR Development process

Strategic Risk Priorities

Risk Priorities (RISC Priorities Report)

- Critical Infrastructure Interdependencies
- Extreme Events
- Grid Transformation
- Security Risks

RSTC Strategic Risk Priorities

1. Energy Security
2. Inverter-Based Resources
3. Distributed Energy Resources
4. Supply Chain Security

2023 Priorities

- Reliability Guideline Effectiveness Metrics
  - https://www.nerc.com/comm/Pages/Reliability-and-Security-Guidelines.aspx
- Annual update of Strategic Plan
- Annual Sunset Review of Working Groups and Task Forces
- Increased collaboration with the Standing Committees Coordinating Group (SCCG)
  - Compliance and Certification Committee
  - Personnel Certification and Governance Committee
  - Reliability Issues Steering Committee
  - Reliability and Security Technical Committee
  - Standards Committee

Future Meetings

- September 20-21, 2023 (WECC – limited attendance)
- October 10-11, 2023 Work Plan Summit Texas RE – limited attendance)
- December 6-7, 2023 (virtual)

Questions and Answers

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Agenda Item 5d
Board of Trustees Meeting
August 17, 2023

Reliability Standards

Semi-Annual Report

August 17, 2023

RELIABILITY | RESILIENCE | SECURITY




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

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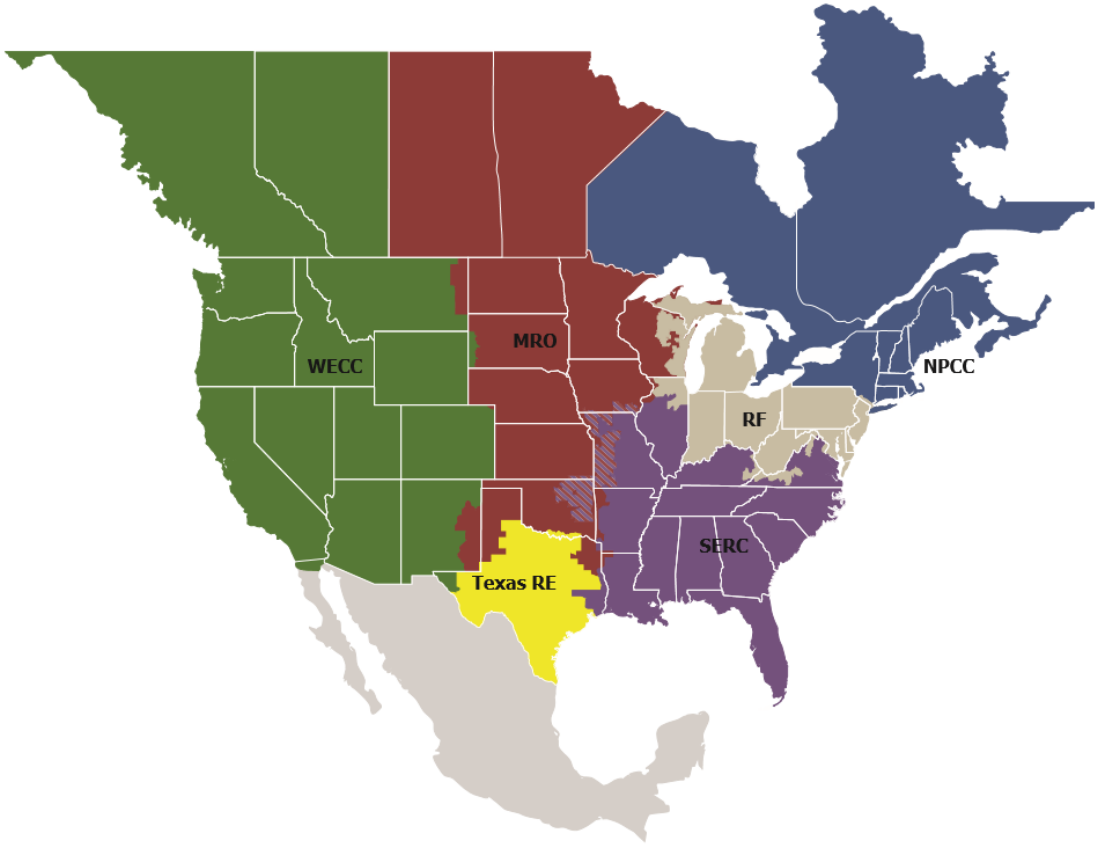
Preface

Electricity is a vital component of the fabric of modern society, and the Electric Reliability Organization (ERO) Enterprise serves to strengthen that fabric. The vision for the ERO Enterprise, which is comprised of the North American Electric Reliability Corporation (NERC) and the six Regional Entities (REs), is a highly reliable and secure North American bulk power system (BPS). Our mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.

Reliability | Resilience | Security

Because nearly 400 million citizens in North America are counting on us

The North American BPS is divided into six RE boundaries, as shown in the map and corresponding table below. The multicolored area denotes overlap as some load-serving entities participate in one Region while associated Transmission Owners/Operators participate in another.



MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
RF	ReliabilityFirst
SERC	SERC Reliability Corporation
Texas RE	Texas Reliability Entity
WECC	Western Electricity Coordinating Council

Chapter 1: Standards Development Forecast

Board Forecast for Standard Projects in Active Development

The following projections reflect anticipated Board of Trustees (Board) adoption dates for continent-wide Reliability Standards.

August 2023 or after

- Project 2016- 02: Modifications to CIP Standards (virtualization)
- Project 2017-01: Modifications to BAL-003-1.1 (phase 2)
- Project 2019-04: Modifications to PRC-005-6
- Project 2020-02: Modifications to PRC-024 (Generator Ride-through)
- Project 2020-04: Modifications to CIP-012-1
- Project 2020-06 Verifications of Models and Data for Generators
- Project 2021-01 Modifications to MOD-025 and PRC-019
- Project 2021-02 Modifications to VAR-002
- Project 2021-03 CIP-002 Transmission Owner Control Centers
- Project 2021-04 Modifications to PRC-002-2
- Project 2021-06 Modifications to IRO-010 and TOP-003
- Project 2021-08 Modifications to FAC-008
- Project 2022-01 Reporting ACE Definition and Associated Terms
- Project 2022-02 Modifications to TPL-001-5.1 and MOD-032-1
- Project 2022-03 Energy Assurance with Energy-Constrained Resources
- Project 2022-04 EMT Modeling
- Project 2022-05 Modifications to CIP-008 Reporting Threshold
- Project 2023-01 EOP-004 IBR Event Reporting
- Project 2023-02 Performance of IBRs
- Project 2023-03 Internal Network Security Monitoring (INSM)
- Project 2023-04 Modifications to CIP-003

ANSI Reaccreditation

NERC filed for reaccreditation as a Standards Developer in accordance with the accreditation processes of the American National Standards Institute (ANSI) on July 1, 2019. While NERC's request remains pending, NERC is still considered an accredited developer.

Projects with Regulatory Directives

Table 1 below lists the current projects with regulatory directives. As of June 30, 2023, there are five standards-related directives to be resolved through standards development activities (not including non-standards related directives).[1]

Table 1: Projects with Regulatory Directives

Project	Regulatory Directives	Regulatory Deadline
Project 2020-04: Modifications to CIP-012-1	1	N/A
Project 2021-07 Extreme Cold Weather Grid Operations, Preparedness, and Coordination	2	February 16, 2024
Project 2023-03 Internal Network Security Monitoring (INSM)	1	July 9, 2024
Project [# TBD] Modification of TPL-001-5.1 – Transmission System Planning Performance Requirements	1	December 23, 2024

The Trend in Number of Reliability Requirements

As NERC Reliability Standards continue to mature, NERC analyzes the trend in the total number of requirements in the United States since 2007, when Reliability Standards became enforceable.

The *US Effective Date Status/Functional Applicability*[2] spreadsheet was used to analyze the number of requirements based on the U.S. Effective Date for each requirement shown in the charts below. Figure 1 displays the Trend in Number of Requirements for Continent-Wide standards, while Figure 2 displays Regional Reliability Standards.[3] Standards with variances were not included in the requirement count. Projections from projects that include standards currently under development, the board adopted standards, and board approved retirements are also included in the total number of requirements based on their projected effective or inactive date.[4]

The trend for the total number of requirements indicates a constant flat trend line for the last four years, with a significant decline from 2017 to 2021 for Continent-wide standards and a significant decline in total number of requirements from 2019 to 2021 for Regional Reliability Standards. Figure 1 indicates 445 continent-wide requirements; Figure 2 indicates 70 Regional Reliability standards forecast for 2027.

[1] A fourth, ongoing directive requires NERC to file quarterly updates in the project schedule for Project 2016-02 Modifications to CIP Standards until completed.

[2] Available from the Standards section of the NERC website: http://www.nerc.com/pa/Stand/Pages/default.aspx

[3] Charts were developed using Q2 2023 data.

[4] These projects include the following: Project 2015-09 (FAC-010-4, FAC-011-4, FAC-014-3), Project 2016-02 (CIP-003-7(i)), Project 2018-03 SER Retirements.

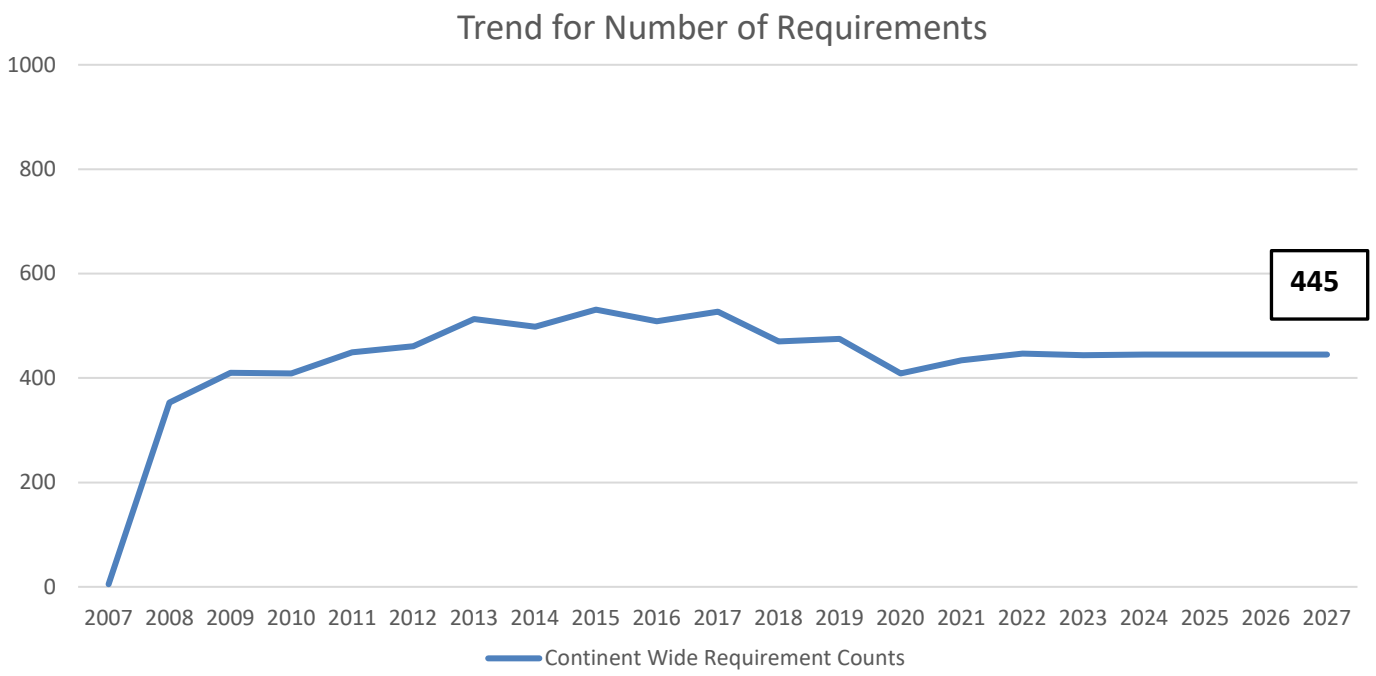
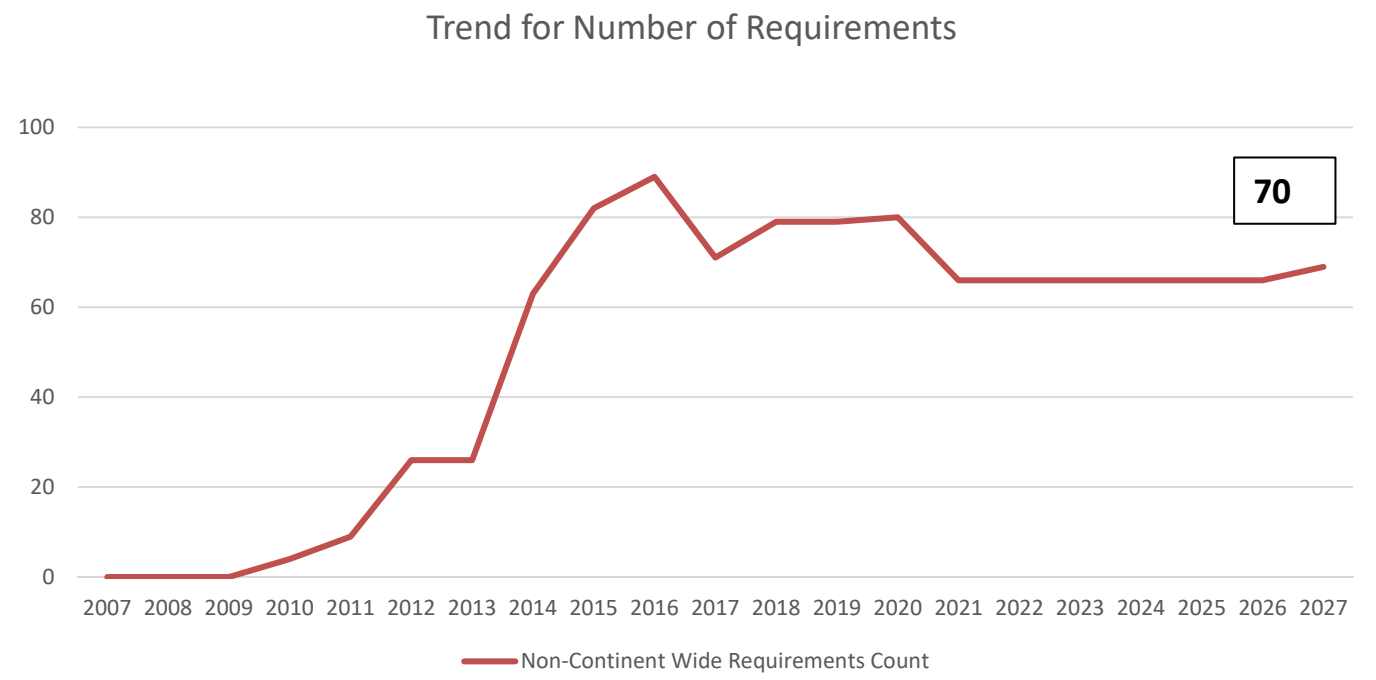


Figure 2: Trend for Number of Requirements for Regional Reliability Standards



Chapter 2: Regulatory Update

NERC FILINGS
April 1, 2023 – June 30, 2023

FERC Docket No.	Filing Description	FERC Submittal Date
RD23-2-001	NERC Report on CIP-014-3 NERC submitted to FERC an Evaluation of the Physical Security Reliability Standard and Physical Security Attacks to the Bulk-Power System. This report was directed by FERC in December 2022.	4/14/2023
RR23-1-000	Petition for Approval of Revisions to Texas RE Regional Reliability Standards Development Process (RSDP) NERC submitted a petition for approval of revisions to the Texas Regional Standards Development Process.	5/15/2023
EL23-69-000	Motion to Intervene and Comments in Opposition to Petition for Rulemaking NERC submitted a Motion to Intervene and Comments in Opposition to the Petition for Rulemaking to Require Enhanced Standard for Determining Critical Infrastructure, Using Engineering Models to Define Critical Infrastructure Assets to be Subject to Enhanced Protection filed by the Secure-the-Grid Coalition.	6/13/2023
RR23-1-000	Reply Comments to Public Citizen, Inc. NERC submitted reply comments to comments of Public Citizen, Inc. regarding the Petition for Approval of Revisions to the Texas RE Regional Reliability Standards Process (RSDP).	6/15/2023
RD20-2-000	CIP SDT Schedule June Update Informational Filing NERC submitted an informational filing as directed by FERC in its February 20, 2020 Order. This filing contains a status update on one standard development project relating to the CIP Reliability Standards.	6/15/2023

FERC ISSUANCES
April 1, 2023 – June 30, 2023

FERC Docket No.	Issuance Description	FERC Issuance Date
RD23-4-000	Order Approving PRC-002-4 FERC issued a letter order approving Reliability Standard PRC-002-4.	4/14/2023
RD23-1-001	Notice of Denial of Rehearing FERC issued a Notice of Denial of Rehearing by Operation of Law and Proving for Further Consideration regarding a request for rehearing on the Extreme Cold Weather Reliability Standards (EOP-011-3 and EOP-012-1) approved by FERC on February 16, 2023.	4/20/2023
RD22-4-000	Order Approving Registration Work Plan FERC issued an order approving the Inverter Based Resources Work Plan as directed by FERC in its November 17, 2022 Order.	5/18/2023
RM22-10-000	Final Rule on Transmission System Planning Performance Requirements for Extreme Weather FERC issued a Final Rule directing NERC to develop a new Reliability Standard or modifications to TPL-001-5.1 that addresses concerns pertaining to transmission system planning for extreme weather within 18 months of publication of the Final Rule in the Federal Register.	6/15/2023
RD23-1-001	Order Addressing Arguments Raised on Rehearing FERC issues an order addressing arguments raised on rehearing regarding Extreme Cold Weather Reliability Standards (EOP-011-3 and EOP-012-1) approved by FERC on February 16, 2023.	6/29/2023

Chapter 3: Standards Committee Report

Summary

This report highlights some of the key activities of the Standards Committee (SC) during the second quarter of 2023.

At its April meeting, the SC:

- Accepted the Project 2020-02 Modifications to PRC-024 Ride Through Standard Authorization Request (SAR), as revised by the Project 2020-02 SAR Drafting Team (DT); authorized drafting revisions to the Reliability Standards identified in the SAR; and appointed the Project 2020-02 SAR DT as the Project 2020-02 Standard Drafting Team (SDT).
- Appointed chair, vice chair, and members to the Project 2023-01 EOP-004 Inverter-Base Resources (IBR) SAR DT.
- Authorized drafting a new proposed Reliability Standard consistent with the revised SAR for Project 2021-04 Modifications to Disturbance Monitoring and Reporting Requirements Phase 2.
- Authorized initial posting of proposed Reliability Standard PRC-005-7, the associated Implementation Plan, and the related revised definition for a 45-day formal comment period, with ballot pools formed in the first 30 days, and parallel initial ballots and non-binding polls on the Violation Risk Factors (VRFs) and Violation Severity Levels (VSLs), conducted during the last 10 days of the comment period.

The May meeting, the SC:

- Accepted two SARs: a SAR to revise NERC Reliability Standard FAC-001-4 and a SAR to revise NERC Reliability Standard FAC-002-4, submitted by the System Performance Impacts of Distributed Energy Resources Work Group (SPIDERWG) that were endorsed by the Reliability and Security Technical Committee (RSTC); authorized posting of the SARs for a 30-day informal comment period; and authorized solicitation of SDT members.
- Accepted the SAR to modify CIP-002-5.1a – Cyber Security — Bulk Electric System (BES) Cyber System Categorization submitted by AESI, Inc.; authorized posting of the SAR for a 30-day formal comment period; and assigned the SAR to the current Project 2021-03 – CIP-002 SDT.
- Accepted the revised Project 2023-01 EOP-004 IBR Event Reporting SAR; appointed the Project 2023-01 SAR Drafting Team (DT) as the Project 2023-01 SDT; and authorized drafting revisions to EOP-004-4.
- Postponed action on the Project 2022-05 Modifications to CIP-008 Reporting Threshold SAR with guidance to the SDT to provide a summary response to the industry comments submitted.
- Authorized initial posting of proposed Reliability Standard MOD-032-2 and the associated Implementation Plan for a 45-day formal comment period, with ballot pools formed in the first 30 days, and parallel initial ballots and non-binding polls on the Violation Risk Factors (VRFs) and Violation Severity Levels (VSLs), conducted during the last 10 days of the comment period.

At its June special call, the Standards Committee Executive Committee:

- Authorized initial positing of proposed Reliability Standard EOP-012-2 - Extreme Cold Weather Preparedness and Operations and the associated Implementation Plan for a 45-day formal comment period, with ballot pools formed in the first 30 days, and parallel initial ballots and non-binding polls on the Violation Risk Factors (VRFs) and Violation Severity Levels (VSLs) conducted during the last 10 days of the comment period.

At its June meeting, the SC:

- Accepted the CIP-014-3 – Physical Security Standard Authorization Request (SAR) submitted by the NERC technical and compliance staff; authorized posting of the SAR for a 30-day formal comment period; and authorized solicitation of the SDT members.
- Appointed chair, vice chair, and members to the Project 2023-02 Performance of Inverter-Based Resources (IBRs) SDT.
- Appointed chair, vice chair, and members to the Project 2023-03 Internal Network Security Monitoring (INSM) SDT.
- Appointed chair, vice chair, and members to the Project 2023-04 Modifications to CIP-003 SDT.

North American Transmission FORUM

Community *Confidentiality* *Candor* *Commitment*

To: NERC Board of Trustees (BOT)

From: Thomas J. Galloway, NATF President and CEO

Date: July 19, 2023

Subject: NATF Periodic Report to the NERC BOT (August 2023)

Attachments: NATF External Newsletter (July 2023)

The NATF interfaces with the ERO as well as other external organizations on key reliability, resiliency, security, and safety topics to promote improvement, while reducing duplication of effort. Some examples are listed below and in the attached NATF external newsletter, which is also available on our public website: www.natf.net/news/newsletters.

NATF-ERO Leadership Meetings

To promote effective coordination, NATF and ERO leadership meet periodically to discuss topics and activities. July 13 topics included the E-ISAC update, August NERC-FERC physical security technical conference, draft RISC report, standards process changes and compliance monitoring approaches, grid transformation (in particular, inverter-based resources), and cross-regional transfer capability.

Joint NERC, FERC Physical Security Technical Conference

NATF members and staff will participate in the August 10 conference and have offered support with planning and post-conference activities.

The NATF focuses on security in its Practice Program, with specific groups dedicated to sharing information and developing best practices. Some of this information, related to CIP-013 and -014, has been shared on the NATF public site.

Inverter-Based Resources

Both the NATF and NERC are working on aspects of the grid's changing resource mix. During the recent leadership meeting, NATF and NERC leadership discussed options for coordination related to the increase of inverter-based resources, a key part of grid transformation.

RISC Report

NATF work planning factors in electric-system risks, such as those identified in the ERO reliability risk priorities reports developed by the Reliability Issues Steering Committee (known as the RISC).

The NATF has encouraged members to submit comments on the draft 2023 report, and the NATF and NERC plan to use the report to help guide future discussions and coordination.

Special NATF Webinar: ISA Product Certifications

On September 26, the NATF will host a half-day webinar open to both members and the broader industry that will overview the ISASecure certifications offered for products, the assurances these certifications can offer to

entities for supply chain security, and how the certifications provide validations for supplier information gathered through the NATF criteria and questionnaire.

Additional information, including the agenda and registration information, will be published closer to the event.

North American Transmission Forum External Newsletter

July 2023

New Video Highlights NATF RESTORE Program (Equipment Sharing) Benefits

The NATF has posted a new video highlighting the benefits of the RESTORE Program (see the linked image below and the bottom of our Programs page).

RESTORE, or Regional Equipment Sharing for Transmission Outage Restoration, is designed to enhance grid resilience and reliability by identifying sources and facilitating replacement of equipment following disastrous events. This optional, self-funded program is available to any transmission-owning NATF member.

Participation in the RESTORE Program can be a key component of a member's overall resilience program and spare equipment strategy to enhance its ability to recover from an event with significant transformer damage.

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NATF-EPRI-NERC Transmission Resilience Summit

The North American Transmission Forum (NATF), Electric Power Research Institute (EPRI), and North American Electric Reliability Corporation (NERC) held a transmission resilience summit on May 17 in Tempe, Arizona, hosted by Salt River Project.

The summit theme was climate resilience, with topics focused on lessons learned from past extreme weather events, planning and preparing for future events, emerging technologies, and examples of how resilience is a team sport.

Former FERC Commissioner Colette Honorable provided a virtual keynote address highlighting the significance of electric system resilience and stressing the important role served by the attendees. Former FEMA Administrator Brock Long spoke about the importance of advanced coordination and collaboration by utilities

with customers, regulators, first responders, and local government prior to a resilience event and the importance of continuity of communications for effective restoration.

NATF CEO Tom Galloway commented, "We've done over a dozen resilience summits and this was the best. We had great speakers and an engaged audience, and it was obvious tremendous progress has been made. But it's clear that resilience challenges have increased, and the industry must continue to collaborate and persevere."

Meeting materials from the summit are posted on the NATF website.

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NATF Supply Chain Criteria and Risk Questionnaire Updated for Industry

Updated *NATF Supply Chain Security Criteria* and *Energy Sector Supply Chain Risk Questionnaire* (version 4.0) documents have been posted for industry use on the Supply Chain Cyber Security Industry Coordination page of the NATF public website. The "Version History" link includes all prior versions and redlines of the NATF criteria and risk questionnaire.

The updates were reviewed and accepted by the ERO Enterprise to ensure its continued endorsement of the two NATF CIP-013 Implementation Guidance documents: *NATF CIP-013 Implementation Guidance: Independence Assessments of Vendors* and *NATF CIP-013 Implementation Guidance: Supply Chain Risk Management Plans*.

Revisions for the 2023 annual cycle include a new detailed change log for the NATF criteria and risk questionnaire. In particular, the security frameworks identified in the NATF criteria were revised and one new supplier criteria was added. The questionnaire is now available in one format merging the previous unformatted, formatted, and scorable options. Other minor changes include additional notes, references, and terminology updates to provide clarity.

Industry and supplier convergence on the use of the NATF criteria and risk questionnaire provides a streamlined, effective, and efficient industry-accepted approach for entities to assess supplier security practices, which, if adopted widely, will reduce the burden on suppliers, provide entities with more information, improve supply chain security, and (when executed and documented appropriately) assist entities with compliance.

***

Redacted Operating Experience Reports

We recently posted a new operating experience report to the "Documents" section of our public site for members and other utilities to use internally and share with their contractors to help improve safety, reliability, and resilience.

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For more information about the NATF, please visit https://www.natf.net/.

Proposed Revisions to the NERC Rules of Procedure – Reliability Standards

Action

Approve the following revisions to the NERC Rules of Procedure and authorize staff to file with applicable regulatory authorities:

- **Section 300, Reliability Standards Development**

  Clean

  Redline to last approved

- **Appendix 3A, Standard Processes Manual (version 5)**

  Clean

  Redline to last approved (version 4)

Background

Since 2007, mandatory Reliability Standards have played an integral role in addressing new and emerging risks to the reliability and security of the grid. Given the pace of change taking place on the bulk power system, NERC must continually improve its standard development processes to ensure that they are nimble and agile enough to keep pace with the speed at which novel risks are emerging. With the importance of addressing the challenges of the transforming grid in mind, the NERC Board of Trustees (Board) directed NERC staff at its February 10, 2022, meeting to examine the body of rules regarding Reliability Standards development and, considering the feedback of stakeholders, recommend such changes that would improve NERC's ability to address urgent reliability needs with appropriate agility, while also maintaining reasonable notice and opportunity for public comment, due process, openness, and balance of interests.

NERC staff developed preliminary recommendations and convened a Standards Process Stakeholder Engagement Group (SPSEG) to provide feedback and develop consensus recommendations for improving agility of the process while maintaining the key role of stakeholders in producing consensus standards. This group included representatives from the Board, NERC staff, Member Representatives Committee, Standards Committee (SC), Compliance and Certification Committee, Reliability and Security Technical Committee, and Reliability Issues Steering Committee with representation from U.S. and Canadian entities.

The SPSEG developed recommendations to propose to the Board that fall into the following categories: revisions to Section 300 of the NERC Rules of Procedure, revisions to the *Standard Processes Manual*, recommendations for standing committees, and a review of the Registered Ballot Body criteria.

As directed by the Board at its November 2022 meeting, NERC staff initiated the usual processes to implement the recommended revisions to Section 300 of the NERC Rules of Procedure and *Standard Processes Manual* in early 2023:

- **Rules of Procedure Revision Process.** In accordance with Section 1400 of the Rules of Procedure, the revisions to Section 300 of the NERC Rules of Procedure were posted for

a 45-day public comment period from January 18, 2023 through March 6, 2023. The comments are available here. NERC staff's consideration of the comments is available here. A redline showing changes made in response to comments is available here.

- ***Standard Processes Manual* Revision Process.** The proposed revisions to the *Standard Processes Manual* were developed in accordance with Section 15.0 of the *Standard Processes Manual,* as summarized below. More information on the development process, including the Consideration of Comments, is available on the project page (here).

Work continues under the standing committees to implement the SPSEG recommendations aimed at their activities.

Summary

NERC staff thanks its stakeholders for their support of NERC's standards efficiency efforts and for their constructive feedback through the commenting processes. This feedback played an integral role in shaping the final proposals before the Board.

NERC proposes the following revisions to Section 300 and Appendix 3A, *Standard Processes Manual*:

Section 300, Reliability Standards Development

Section 309: Revised to restore certain language that was approved by FERC in 2011 and that remains applicable, but was not reflected in subsequently approved revisions to this section.

Section 316: Removed the requirement for American National Standards Institute ("ANSI") accreditation. The essential principles of openness, transparency, consensus-building, fair balance of interests, due process, and timeliness in standards development are maintained in Section 304.

Section 322: New process to provide the Board with the authority to direct the development of a Reliability Standard in extraordinary circumstances where the Board finds that issuing a directive is essential to address an urgent reliability issue. This process would make clear that NERC has the authority in the Rules of Procedure to meet its fundamental responsibility under Section 215 of the Federal Power Act to develop, establish, and enforce Reliability Standards to ensure the reliability of the Bulk-Power System (BPS) The proposed process would provide for openness, transparency, and opportunity for public comment prior to the issuance of the directive and stakeholder involvement in standards development. It is modeled on the process currently in place under Rule 321 that enables the Board to ensure that NERC complies with a regulatory standards directive.

In response to comments on the first draft, proposed Rule 322 was further revised to clarify the process for issuing directives and to enhance transparency and due process. These changes include:

- Revising the introductory text to better track the language of Section 215 of the Federal Power Act relating to NERC's responsibility as the ERO to develop standards that provide for an adequate level of reliability for the BPS.
- Expanding the list of factors to be considered by the Board in issuing a directive to include consideration of past stakeholder-initiated efforts to address a reliability issue, as well as

to clarify that the Board should consider why a specific matter cannot be adequately or timely addressed through a stakeholder-initiated project or one initiated by NERC staff.

- Clarifying that the Board's directive shall take the form of a written determination that includes consideration of the factors identified in the notice issued preceding the directive, as well as a description of how the Board considered any advice or comments submitted by any stakeholder or regulatory authority on the proposed directive.
- Adding a provision allowing any impacted party to request the Board reconsider or clarify its determination to issue a directive.

Section 321: Revisions to this section include revisions to correspond to the proposed Rule 322, to include projects to address Board directives. Other revisions include: (1) removing reference to ANSI processes (Rule 322.5.4); and (2) restoring certain language regarding stakeholder participation that was approved by FERC in 2011 but not reflected in subsequently approved revisions to this section.

Appendix 3A, Standard Processes Manual (version 5)

Section 1.4: Removes reference to ANSI accreditation. Revised, consistent with comments received during the development process, to state that: (1) NERC has a statutory obligation to maintain a standards process that "provide[s] for reasonable notice and opportunity for public comment, due process, openness, and balance of interests in developing reliability standards" under Section 215 of the Federal Power Act; and (2) NERC continues to incorporate the core attributes of an ANSI process as set forth in this section a means of satisfying its statutory obligation to have a fair and open process. Conforming changes to remove reference to ANSI requirements are proposed in other sections (e.g., Sections 10.0, 13.0, 16.0).

Section 3.5: Revised, in response to comments received during the development process, to clarify NERC staff's role in ensuring complete Standard Authorization Requests (SARs).

Section 4.2: Revised, consistent with comments received during the development process, to clarify that the Standards Committee determines when a SAR "has had some vetting in industry" and may therefore be posted for informal comment, with no requirement to provide a formal written response to the comments received. The Standards Committee will be asked to address what it means for a SAR to have "had some vetting in industry" as part of its work to address the SPSEG recommendations relating to SARs.

Section 4.12: Revised to implement a tiered comment structure for posted standards, consistent with comments received during the development process. Initial formal comment periods would remain at 45 days, as is the current procedure. However, subsequent comment periods, when the issues are likely to have narrowed, may be as few as 30 days. Consistent with comments received during the development process, this section would also provide that the drafting team consider, at a minimum, the nature of the changes from the previous draft, the comments received, the technical complexity of the subject matter, and the number of standards affected in determining whether to use a shorter comment period. Conforming changes are also proposed to the Figure 1 flowchart and clarifying changes are proposed in Section 4.7. Further revisions in Section 4.12 provide clarity on the circumstances under which the Standards Committee may end an unsuccessful project.

Section 4.13: Revised to provide that a drafting team has the option to conclude a standards action without conducting a final ballot to confirm the results of the previous successful ballot. Consistent with comments received during the development process, this option is limited to only those cases where there is a high degree of consensus for the standard as written. Specifically, the drafting team may choose to terminate a standards action without a final ballot only when: (1) the previous ballot achieved an 85% or greater approval rating; (2) the drafting team made a good faith effort at resolving objections; (3) the drafting team has responded in writing to comments; and (4) the drafting team is proposing no further changes. Public notice would be provided of this outcome. For all other cases, the current final ballot procedure would remain the same. Conforming changes are made to other sections of the Standard Processes Manual and the Figures to note the alternative option.

Section 4.14: Revised to accommodate the option to conclude a standards action without a final ballot in qualifying cases.

Section 4.15: Revised to specify that the Board may direct further work on a proposed standard presented for its adoption in accordance with the Rules of Procedure.

Section 13.0: Clarified to provide that reaffirmed standards that are adopted by the Board are submitted to the regulators for "appropriate action", the nature of which (e.g., a formal re-approval proceeding or received for informational purposes only) is determined by the regulator.

Other changes include correcting capitalization of non-defined terms and updating figures to better reflect current and proposed standards processes and other conforming changes throughout.

Development Process – *Standard Processes Manual*

In accordance with Section 15.0 of the *Standard Processes Manual*, the first draft of the *Standard Processes Manual* (version 5) was posted for an initial 45-day formal comment period and ballot from January 18-March 6, 2023. The initial ballot received 37.7 percent approval with 83.46 percent quorum. The draft was revised based on comments received and posted for a second 45-day formal comment period and additional ballot from April 13, 2023 through May 30, 2023. The additional ballot received 97.49 percent approval with 83.85 percent quorum. The final ballot of the proposed *Standard Processes Manual* (version 5) was conducted from June 6-15, 2023 and received 96.83% approval with 86.92% quorum.

Minority Issues

A commenter expressed concern that removing the requirement for continued ANSI accreditation would negatively impact NERC's obligation to maintain a standards development process that is open, transparent, and fair to all industry participants.

Some commenters expressed concern that the Board should not have the authority to direct the development of Reliability Standards in extraordinary circumstances under proposed Rule 322, or that the Board's authority to direct standards should not extend to the development of standards under the special processes for addressing regulatory directives under Rule 321.

Staff's consideration of these minority issues is reflected in the Consideration of Comments.

Pertinent FERC Directives
None

Additional Information
A link to the *Standard Processes Manual* project history and files is included here for reference:
Standard Processes Manual Revisions to Address SPSEG Recommendations (nerc.com)

Project 2021-06 Modifications to IRO-010 and TOP-003

Action

Adopt the following standards documents and authorize staff to file with applicable regulatory authorities:

- Reliability Standard – TOP-003-6 - Transmission Operator and Balancing Authority Data and Information Specification and Collection

  TOP-003-6 Transmission Operator and Balancing Authority Data and Information Specification and Collection - Clean

  TOP-003-6 Transmission Operator and Balancing Authority Data and Information Specification and Collection- Redline to last approved

- Reliability Standard – IRO-010-5 – Reliability Coordinator Data Specification and Collection

  IRO-010-5 Reliability Coordinator Data and Information Specification and Collection - Clean

  IRO-010-5 Reliability Coordinator Data and Information Specification and Collection - Redline to last approved

- Implementation Plan

  IRO-010 and TOP-003 Implementation Plan (nerc.com)

- Violation Risk Factors (VRFs) and Violation Severity Levels (VSLs)

  VRF_VSL_Justifications_(nerc.com)

- Retirements

  TOP-003-5 Operational Reliability Data

  IRO-010-4 Reliability Coordinator Data Specification and Collection

Background

Project 2021-06 originated from recommendations following Phase 2 of the Standards Efficiency Review (SER). The SER was a multi-phase project that began in 2017 to capture effectiveness, efficiency, and continuous improvement opportunities. Phase 1 resulted in the Federal Energy Regulatory Commission approving the retirement of 18 standard requirements. Phase 1 discussions identified additional efficiency opportunities as an alternative to outright retirement of requirements. These opportunities and concepts evolved into SER Phase 2, which sought to identify standards-based solutions applicable to all Reliability Standards instead of further unconditional retirements.

The primary purpose of Project 2021-06 is to simplify the administrative burdens identified by the SER Phase 2 Team associated with the IR0-010 and TOP-003 Reliability Standards by limiting unnecessary data requirements that do not contribute to Bulk Electric System reliability and resilience. Specifically, Project 2021-06 would enhance the “data specification” approach to reduce the administrative burdens of excessive data retention while ensuring that Registered

Entities with operational responsibilities continue to request and receive data necessary to support the four tasks identified in IRO-010-4 and TOP-003-5. Project 2021-06 also evaluated removing data exchange requirements dispersed in other Reliability Standards while ensuring that a Registered Entity with responsibilities to perform the tasks identified in IRO-010-4 and TOP-003-5 maintain the ability to request and receive any information needed from other Registered Entities to perform those tasks.

Summary

The standard drafting team modified Reliability Standards TOP-003 and IRO-010 to address the SER Phase 2 Team's recommendations, as outlined in the Standard Authorization Request (SAR), to reduce the administrative burdens of excessive data retention and ensure that Registered Entities maintain the ability to request and receive any information needed from other Registered Entities to perform the tasks required under TOP-003 and IRO-010. TOP-003 contains the requirements to ensure that the Transmission Operator and Balancing Authority have the data and information it needs to plan, monitor, and assess the operation of its Transmission Operator Area or Balancing Authority Area. IRO-010 includes the corresponding requirements that ensure that the Reliability Coordinator has the data and information it needs to plan, Monitor and assess the operation of its Reliability Coordinator Area.

To address the SAR, the standard drafting team modified TOP-003 Requirement R1, Part 1.1, 1.4, and 1.5, and Requirement R2 Part 2.1, 2.4, and 2.5 relating to Transmission Operator and Balancing Authority data and information specifications to include conflict resolution provisions governing the exchange of data. This includes adding the Requirement R5 subparts into Requirements R1 and R2. The standard drafting team made corresponding changes in proposed Reliability Standard IRO-010-5 Requirement R1 Parts 1.4 and 1.5 relating to Reliability Coordinator data and information specifications.

Changes are also proposed throughout IRO-010-5 and TOP-003-6 to clarify the "data and information" language and outline performance criteria, methods, and formats.

Standards Development Process

The proposed Reliability Standards TOP-003-6 and IRO-010-5 were posted for an initial 45-day formal comment period and ballot from November 30 - December 15, 2022. The initial ballot for the proposed IRO-010-5 standard received a 52.32 percent approval and 88.36 percent quorum, the proposed TOP-003-6 standard received a 51.26 percent approval and 88.36 percent quorum, and the proposed implementation plan received 61.14 percent approval and 88.93 percent quorum.

The standard drafting team conducted an additional 45-day formal comment and ballot from May 4 - June 20, 2023, which was extended to June 21, 2023 to reach quorum. The additional ballot for the proposed IRO-010-5 standard received a 74.89 percent approval and 82.88 percent quorum, the proposed TOP-003-6 standard received a 74.43 percent approval and 83.56 percent quorum, and the proposed implementation plan received 83.39 percent approval and 78.38 quorum.

The standard drafting team conducted a final ballot from July 21 to July 31, 2023. The final ballot results will be reviewed with the Board at the meeting.

Minority Issues

Several commenters commented that the proposed changes did not go far enough to achieve the stated goals of reducing administrative burdens. They felt that the administrative burdens were not eliminated even with the conflict resolution revisions to help facilitate data exchange. In addition, one commenter expressed concerns that this project was overreaching and that the changes needed to be more extensive and alleviate administrative burdens. The standard drafting team concluded that the proposed conflict resolution provisions and clarifying changes simplify the exchange of data and balance industry concerns.

Pertinent FERC Directives

None

Cost Effectiveness

No comments were received regarding cost concerns, and the standard drafting team does not anticipate significant costs.

Additional Information

A link to the project history and files is included here for reference:
Project 2021-06 Modifications to IRO-010 and TOP-003 (nerc.com)

Cold Weather Standards Status

Action
Information

Background
From February 8 - 20, 2021, extreme cold weather and precipitation affected the south central United States. During this time, large numbers of generating units experienced outages, derates, or failures to start, resulting in energy and transmission emergencies and load shed across the Electric Reliability Council of Texas (ERCOT), Southwest Power Pool (SPP), and Midcontinent Independent System Operator (MISO) footprints. System conditions during this event referred to as the February 2021 Event, resulted in the largest controlled firm load shed event in U.S. history. The system experienced the third largest quantity of outaged megawatts (MW) of load after the August 2003 northeast blackout and the August 1996 west coast blackout.

In response to the February 2021 Event, a joint inquiry team consisting of staff from the Federal Energy Regulatory Commission (FERC), NERC, and the six Regional Entities, investigated the causes of the event and made recommendations to prevent future reoccurrence. In its November 2021 report, the joint inquiry team made 10 recommendations for NERC Reliability Standards revisions to address cold weather preparedness and operations, along with a recommended two-phase timeline for the completion of standards. In November 2021, the NERC Board of Trustees (Board) approved a resolution directing the development of Reliability Standards in two phases to address the recommendations of the Joint Inquiry team, in accordance with the Joint Inquiry team's recommended timelines. Project 2021-07 was initiated to address the Joint Inquiry team recommendations.

In October of 2022, the Board adopted EOP-011-3 and EOP-012-1 to mark the conclusion of phase 1 of work under Project 2021-07. On February 16, 2023, FERC issued an order approving EOP-011-3 and EOP-012-1, and directed NERC to modify EOP-012-1 to address the following:

1. **Applicability**: The Commission directed NERC to revise the applicability of the standard to ensure that it captures all BES generation resources needed for reliable operation and excludes only those generation resources not relied upon during freezing conditions, consistent with the drafting team's stated intent. The Commission deferred its decision on whether to approve the proposed effective date of EOP-011-3 until NERC submits the revised applicability section of EOP-012 to ensure all entities currently required to identify cold weather operating parameters in cold weather preparedness plans under the EOP-011-2 standard would remain covered under the revised EOP-012 standard.
2. **Generator Constraints to Implementing Winterization Requirements** (Requirements R1, R2, and R7): The Commission directed NERC to develop modifications to Requirements R1 and R7 to address concerns related to generator-defined declarations of technical, commercial, or operational constraints that preclude a generator owner from implementing the appropriate freeze protection measures. Specifically, the Commission directed NERC to include auditable criteria on permissible constraints and to identify the

appropriate entity that would receive the generator owners' constraint declarations under EOP-012-1 Requirements R1 and R7.

3. **Generator Capability Requirements** (Requirements R1 and R2): The Commission directed NERC to modify EOP-012-1 Requirement R1 to ensure that generators that are technically incapable of operating for 12 continuous hours (e.g., solar facilities during winter months with less than 12 hours of sunlight) are not excluded from complying with the standard. The Commission also directed NERC to modify the one-hour continuous operations requirement of Reliability Standard EOP-012-1 Requirement R2 to better align with the stated purpose of the Reliability Standard EOP-012-1.
4. **Corrective Action Plan deadlines**: For any requirement requiring the development of a corrective action plan to address capability or cold weather performance issues, the Commission directed NERC to include a deadline or maximum period for the completion of corrective action plan measures.
5. **Implementation Plan**: The Commission directed NERC to require a shorter implementation period than five years post approval, as well as a staggered implementation for unit(s) across a generator owner's fleet (e.g., 30% compliant by Year X, 60% compliant by Year Y, 100% compliant by Year Z).

The Commission directed NERC to submit revisions to EOP-012-1 by February 15, 2024 (within 12 months of issuance of the order). Additionally, the Commission directed NERC to submit a work plan describing how it will report on entity implementation of the EOP-012 standard.

The drafting team conducted an initial ballot from February 28 – April 13, 2023 for EOP-011 and TOP-002, which received an approval of 45.64% for EOP-011-4 and 44.59% for TOP-002-5. The drafting team has revised the standards for an additional ballot which will be posted in early August. An initial ballot for EOP-012-2 was conducted from June 2- July 20, 2023 which received an approval of 43.47%. The drafting team is deciding on next steps.

Additional Information

A link to the project history and files is included here for reference:
[Project 2021-07 Extreme Cold Weather Grid Operations, Preparedness, and Coordination]

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Proposed Revisions to the NERC Rules of Procedure – Reliability Standards

Soo Jin Kim, Vice President of Engineering and Standards
Board of Trustees Meeting
August 17, 2023

RELIABILITY | RESILIENCE | SECURITY




Background

- Standards Process Stakeholder Engagement Group ("SPSEG") made process improvement recommendations in four areas:
  - Rules of Procedure
  - Standard Processes Manual
  - Standing Committees
  - Registered Ballot Body (*deferred*)
- SPSEG:
  - Leadership and representatives of SC, MRC, RSTC, RISC, CCC
  - NERC Trustees
  - NERC staff
- The Board directed NERC staff to take further action to implement the recommendations at the November meeting

Standard Processes Manual (SPM) Development Process

- Revision process ran from January – June 2023
- Two 45-day comment periods and ballots
  - Initial SPSEG-recommended proposals revised in response to comments
- Final ballot concluded June 15, 2023: 96.83% approval / 86.92% quorum

https://www.nerc.com/pa/Stand/Pages/Standards-Process-Stakeholder-Engagement-Group-2022.aspx

SPM Revisions: Overview

- Focus on targeted improvements to enhance efficiency while preserving meaningful stakeholder engagement
- Consensus work product
- SPM revisions are only one part of a comprehensive effort to improve the agility of NERC's standards processes
- Work is currently underway by standing committees to address SPSEG recommendations aimed at their activities:
  - SAR form improvements
  - SAR prioritization
  - Increasing QR participation
  - Administrative efficiencies

Introductory Sections

- Section 1.4: Removes reference to ANSI accreditation
  - States that NERC has a statutory obligation to maintain a standards process that "provide[s] for reasonable notice and opportunity for public comment, due process, openness, and balance of interests in developing reliability standards" under Section 215 of the Federal Power Act
  - States that NERC incorporates the core attributes of an ANSI process as a means of satisfying its statutory obligation to have a fair and open process
- Section 3.5: Clarifies NERC staff's role in ensuring complete Standard Authorization Requests (SARs)

SAR Postings Section 4.2

- Clarifies that the Standards Committee will determine if a SAR has had “industry vetting” and eligible for informal posting, consistent with current practice
- Related work:
  - Standards Committee will look at further defining in a process document what it means for a SAR to have had “industry vetting” and be eligible for informal posting
  - RSTC looking to improve transparency and awareness of its SAR-vetting process

Tiered Comment Periods Section 4.12

- Implements a tiered structure for comment periods
  - First formal comment period: remains at 45 days
  - Second/subsequent formal comment periods: may be as few as **30 days**
  - Revisions to include complexity-type factors that should be considered in selecting a shorter vs. longer comment period
    - More complex/widespread changes would have longer comment periods
    - Less complex changes may have shorter comment periods
  - SC's waiver authority to shorten comment periods further has not changed
- Provides clarity on the circumstances under which the SC may end an unsuccessful project

Final Ballot Section 4.13

- Provides an option to conclude a standards action without a final ballot for high-consensus standards
- Consistent with stakeholder feedback, option limited to where:
  - the previous ballot achieved an 85% or greater approval rating;
  - the drafting team made a good faith effort at resolving objections;
  - the drafting team has responded in writing to comments; and
  - the drafting team is proposing no further changes

Other Changes

- Section 4.15: Specifies that the Board may direct further work on a proposed standard presented for adoption in accordance with the ROP
- Section 13.0: Clarifies that standards reaffirmed through periodic review are submitted to regulatory authorities for "appropriate action"
  - Specific action depends on the regulatory authority
- Additional changes
  - Updates flow charts
  - Corrects capitalization of non-defined terms

Rules of Procedure

- Posted for comment January 18, 2023 -March 6, 2023
- Additional revisions made in response to stakeholder comments
- Consideration of comments on ROP page:
  - https://www.nerc.com/AboutNERC/Pages/Rules-of-Procedure.aspx

Section 309: Filing of Standards

- Restores certain language that was approved by FERC in 2011 and that remains applicable, but was not reflected in subsequently approved revisions to this section
- *No change from posted draft*

Section 316: Accreditation

- Reserves (i.e. removes) the requirement for ANSI accreditation
  - Section 304 maintains the essential principles of openness, transparency, consensus-building, fair balance of interests, due process, and timeliness in standards development
  - SPM Section 1.4 provides that the core attributes of an ANSI process continue to be incorporated into the SPM
  - Changes to NERC's process will continue to be assessed against statutory requirements:
    - Reasonable notice and opportunity for public comment
    - Due process
    - Openness
    - Balance of interests
- *No change from posted draft.*

Section 322: Special Board Authority

- New process to provide the Board with the authority to direct the development of a Reliability Standard in extraordinary circumstances where the Board finds that issuing a directive is essential to address an urgent reliability issue
- This process would make clear that NERC has the authority in the Rules of Procedure to meet its fundamental responsibility under Section 215 of the Federal Power Act to develop, establish, and enforce Reliability Standards to ensure the reliability of the Bulk-Power System
- Provides for reasonable notice and opportunity for public comment, due process, openness, and balance of interests in issuing directives

Section 322

- Intended as a “failsafe” to preserve the ERO model in extraordinary circumstances
- Not intended to replace the stakeholder model
- Contemplates continued stakeholder involvement in developing responsive standards
- Does not replace other authorities the Board has over standards, e.g.:
  - Set deadlines for development
  - Direct staff to submit SARs

Section 322: Process Overview

- Board issues a preliminary notice, in writing, explaining Board's intent to issue a directive and the reasons why
  - Considers all relevant factors, including past, current, or future planned projects, to address the same reliability matter
- Public comment period (min. 45 days)
- Board issues a final determination in writing
  - Includes a written consideration of comments
- Opportunity for stakeholders to timely seek rehearing or clarification from the Board

Section 322 – Response to Comments

- **Final proposal reflects several improvements made in response to comments**
- Better tracks the statute:
  - Revises the introductory text to better track the language of Section 215 of the Federal Power Act relating to NERC's responsibility as the ERO to develop standards that provide for an adequate level of reliability for the Bulk-Power System
- Expands the list of factors to be considered by the Board of Trustees in issuing a directive:
  - Includes consideration of past stakeholder-initiated efforts to address a reliability issue, as well as current and future planned projects
  - Clarifies that the Board should consider why a specific matter cannot be adequately or timely addressed through a stakeholder-initiated project or one initiated by NERC staff, absent the directive

Section 322 – Response to Comments

- Clarifies that the Board's directive shall take the form of a written determination that includes:
  - Consideration of the factors identified in the notice issued preceding the directive, and
  - A description of how the Board considered any advice or comments submitted by any stakeholder or regulatory authority on the proposed directive
- Allows any impacted party to timely request the Board reconsider or clarify its determination to issue a directive

Section 321: Special Rule to Address Directives

- Includes corresponding revisions to the proposed Rule 322 to include projects to address Board directives within the scope of the special rule.
- Removes reference to ANSI processes (Rule 322.5.4)
- Restores certain language regarding stakeholder participation that was approved by FERC in 2011 but not reflected in subsequently approved revisions to this section.
- *No change from posted draft*

Next Steps

- NERC staff to file with regulatory authorities
- Revised SPM, ROP effective upon FERC approval
- Work continues to address remaining SPSEG recommendations

Questions and Answers

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Standards Actions

Latrice Harkness, Director of Standards Development
Board of Trustees Meeting
August 17, 2023

RELIABILITY | RESILIENCE | SECURITY




Project 2021-06 Modifications to TOP-003 and IRO-010

- Background
  - Project 2021-06 originated from recommendations following Phase 2 of the Standards Efficiency Review (SER) to simplify the administrative burdens by limiting unnecessary data requirements and enhances the "data specification" approach to reduce the administrative burdens of excessive data retention
- Revisions
  - Modified TOP-003 Requirement R1, Part 1.1, 1.4, and 1.5, and Requirement R2 Part 2.1, 2.4, and 2.5 relating to Transmission Operator and Balancing Authority data and information specifications to include conflict resolution provisions governing the exchange of data. Added the Requirement R5 subparts into Requirements R1 and R2.
  - Made corresponding changes in proposed Reliability Standard IRO-010-5 Requirement R1 Parts 1.4 and 1.5 relating to Reliability Coordinator data and information specifications.

Project 2021-06 Modifications to IRO-010 and TOP-003

- Reliability Benefits
  - To provide a reliability-related benefit by modifying TOP-003-6 and IRO-010-5 Requirement R1 to more effectively clarify protocol and add a dispute resolution when appropriate to improve BES reliability related to administrative burden and mitigate Zero Defect.
- Action
  - Adopt
    - Reliability Standard – TOP-003-6 – Transmission Operator and Balancing Authority Data and Information Specification and Collection
    - Reliability Standard – IRO-010-5 - Reliability Coordinator Data Specification and Collection

Questions and Answers

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Cold Weather Standards Update

Soo Jin Kim, Vice President of Engineering and Standards
Board of Trustees
August 17, 2023

RELIABILITY | RESILIENCE | SECURITY




Project 2021-07 Extreme Cold Weather

- Background
  - The purpose of Project 2021-07 Phase 2 was to address 6 Key Recommendations (1a, 1b, 1c, 1g, 1h, and 1i) from the Joint Inquiry Report
  - On February 16, 2023, FERC issued an order approving EOP-011-3 and EOP-012-1 and directed modifications to EOP-012-1 in five areas

Project 2021-07 Extreme Cold Weather

- Project Updates – EOP-011-3 and TOP-002-5
  - Revised EOP-011-3 and TOP-002-5 to meet the phase 2 recommendations initial ballot ended on April 13, 2023
    - EOP-011-3, 45.64% approval
    - TOP-002-5, 44.59% approval
  - Additional Ballot expected beginning of August
  - Working towards September 20, 2023 NERC Board deadline

Project 2021-07 Extreme Cold Weather

- Project Updates – EOP-012-2
  - Revised EOP-012-2 to meet the phase 2 recommendations and FERC directives from February 2023 initial ballot ended on July 20, 2023
    - EOP-012-2, 43.47% approval
  - Additional Ballot expected beginning of September
  - Working towards February 16, 2024 FERC deadline

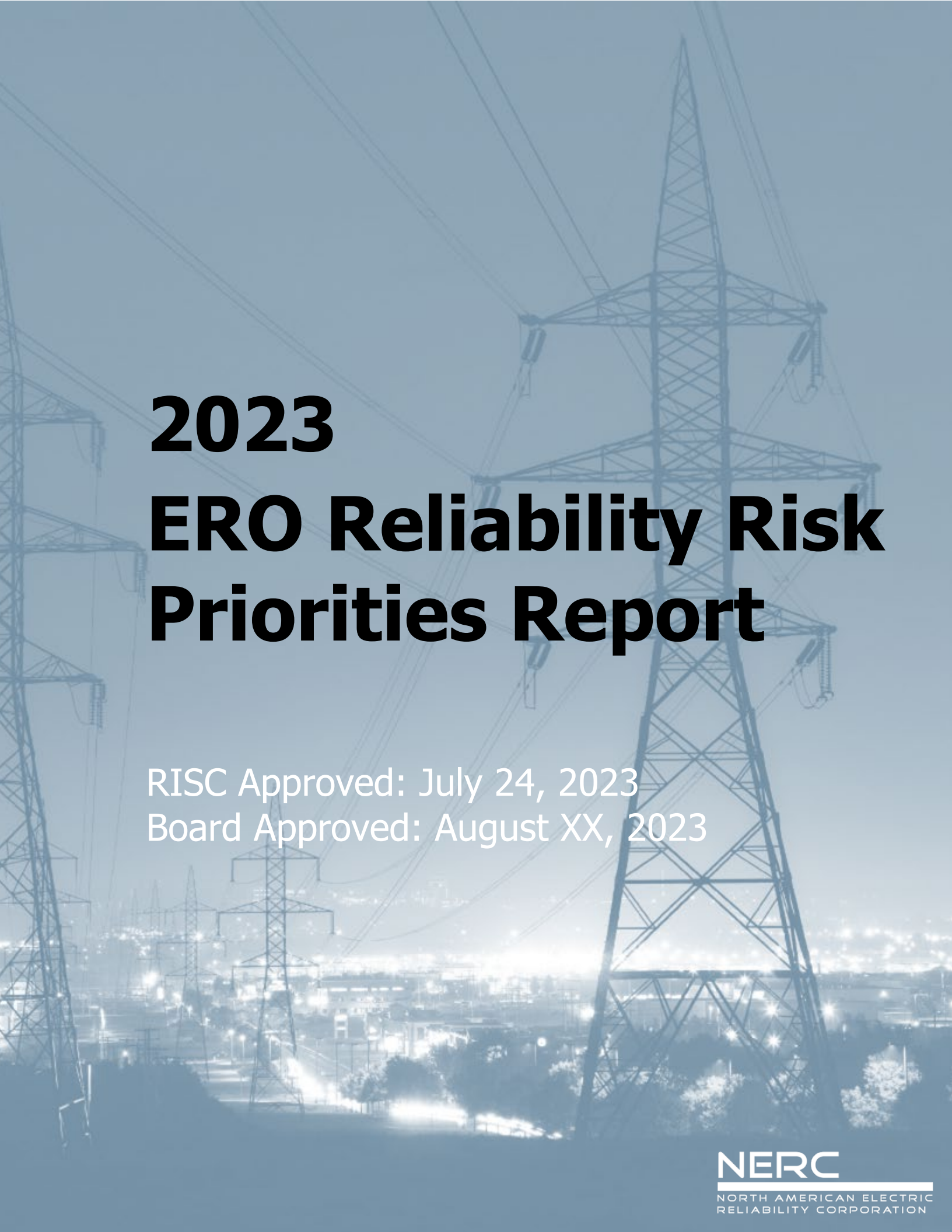
Questions and Answers

2023 ERO Reliability Risk Priorities Report

Action
Accept

Background
The RISC ERO Reliability Risk Priorities Report (RISC Report) is published every two years and is intended to inform regulators, policy makers and industry on existing and emerging risks as well as proposed and implemented mitigating strategies. The report builds off the 2021 ERO Reliability Risk Priorities Report, initial risk identification and mitigation framework, the Emerging Risks survey, the NERC/RISC hosted 2023 Reliability Leadership Summit, as well as additional input from the RISC members and individual industry leaders. The RISC works diligently to leverage all information to build a cogent report. It is also incumbent on the RISC to measure the effectiveness and progress toward resolution of identified risks and the efficacy of mitigating activities.

Summary
Specific industry groups reviewed the draft RISC report and recommended minor adjustments, as well as general comments for consideration for future reports. Brian Slocum, RISC Chair, will present the report for Board of Trustees (Board) consideration and acceptance at the August 17, 2023 Board meeting.



2023 ERO Reliability Risk Priorities Report

RISC Approved: July 24, 2023
Board Approved: August XX, 2023

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

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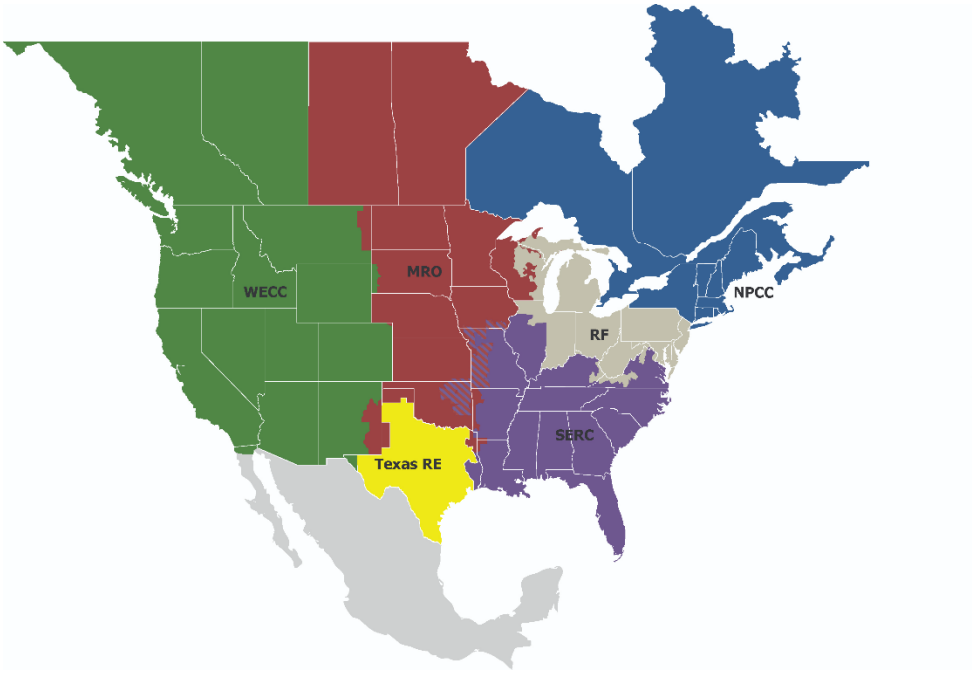
Preface

Electricity is a key component of the fabric of modern society and the Electric Reliability Organization (ERO) Enterprise serves to strengthen that fabric. The vision for the ERO Enterprise, which is comprised of NERC and the six Regional Entities, is a highly reliable, resilient, and secure North American bulk power system (BPS). Our mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.

Reliability | Resilience | Security
Because nearly 400 million citizens in North America are counting on us

The North American BPS is made up of six Regional Entities as shown on the map and in the corresponding table below. The multicolored area denotes overlap as some load-serving entities participate in one Regional Entity while associated Transmission Owners/Operators participate in another.



MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
RF	ReliabilityFirst
SERC	SERC Reliability Corporation
Texas RE	Texas Reliability Entity
WECC	WECC

RISC

The Reliability Issues Steering Committee (RISC) advises the NERC Board of Trustees (Board) and provides key insights, priorities, and high-level leadership for issues of strategic importance to BPS reliability. Additionally, the RISC advises NERC committees, NERC staff, regulators, Regional Entities, and industry stakeholders to establish a common understanding of the scope, priority, and goals for the development of solutions to address emerging reliability issues. The RISC provides guidance to the ERO Enterprise[1] and the industry to effectively focus resources on the critical issues to improve the reliability of the BPS.

This ERO *Reliability Risk Priorities Report* (*2023 RISC Report*) presents the results of the RISC's continued work to strategically define and prioritize risks to the reliable operation of the BPS and thereby provide recommendations to the Board regarding the approach that NERC, the ERO Enterprise, and industry should take to enhance reliability and manage those risks.

[1] ERO Enterprise is interpreted to mean NERC, the Regional Entities, and NERC's technical committees.

Executive Summary

Introduction

This *2023 RISC Report* primary objectives are to identify key risks to the BPS that merit attention and to recommend mitigating actions that align with those risks; it differs from other NERC reports in that it provides industry with strategic direction to plan for imminent risks and their mitigation. This is in contrast to the State of Reliability report or event analysis reports that review data from previous years or events to draw objective conclusions about events, emerging risks, and the appropriate monitoring for their mitigation. This report compliments NERC's Long-Term Reliability Assessment, which is a data-driven assessment of potential future scenarios during the next 10 years.

This 2023 RISC Report reflects the collective opinion and conclusions drawn from RISC membership regarding present and emerging risks and their respective priorities. The RISC assembled and reviewed information from ERO Enterprise stakeholders and policymakers. Focused subgroups then worked to determine and evaluate the current set of risk profiles, added descriptors for each, and recommended mitigating activities. Additional risks and potential mitigating activities were identified during the 2023 Reliability Leadership Summit (Leadership Summit) that NERC and the RISC hosted in January 2023. The Leadership Summit participants were comprised of industry leaders, executives, regulators, policymakers, and subject matter experts with keen perspectives on the inherent and trending risks that affect BPS reliability.

This 2023 RISC Report includes a new risk profile, titled "Energy Policy." Energy Policy, much like "Grid Transformation," has broad implications across the risk profiles as it catalyzes changes and often amplifies their effects. Energy Policy can drive change in BPS planning and operations in short time periods, affecting reliability and resilience. Consequently, Energy Policy should consider potential impacts on the reliability and resilience of the BPS, and it can create potential risks when it does not. For example, Energy Policy decisions regarding decarbonization and electrification are some of the driving factors of grid transformation.

Risk Profiles

The five risk profile sections of this report each provide a statement, descriptors, and recommendations for mitigating each risk type:

- **Risk Profile #1: Energy Policy**
- **Risk Profile #2: Grid Transformation**
- **Risk Profile #3: Resilience to Extreme Events**
- **Risk Profile #4: Security Risks**
- **Risk Profile #5: Critical Infrastructure Interdependencies**

The RISC recommends actionable mitigating activities that enable the ERO Enterprise and industry to use the risk profiles and the mitigating activities map for baseline and recurring evaluations. When possible, the RISC also identified the group or organization that it believes should lead the mitigating action. However, some recommendations do not present a clear owner or responsible party. In these cases, the recommendation is presented as a more generalized action item that can

apply to numerous entities, including policymakers, regulators, industry, and the ERO Enterprise. The RISC did not assess resource needs for the mitigating actions. These are addressed with industry during the annual ERO Enterprise business plan and budget activities.

Additionally, the RISC evaluated each risk based on its impact to the BPS regardless of the source or location of the risk. Recognizing that BPS operators and planners require a wide-area view of the system to provide them awareness of external conditions that could affect them, the RISC broadened the risk profiles to include risks associated with grid infrastructure impacting energy deliverability (e.g., telecom and water systems), natural gas delivery systems, and resources located on the electricity distribution system, such as distributed energy resources (DER) and customer distributed resources. Recommendations for potential mitigations of these external risks are also provided.

Common Themes and Emerging Trends

For the risks recommended for active monitoring, there is a convergence of centralized themes and emerging trends. These themes and trends underscore not only the increasing interdependencies between identified BPS risks but also an increase in the potential magnitude of emerging risks. Common themes and emerging trends are indicated as follows:

- **Collaboration is key to future BPS reliability:**
  - NERC needs to be an advocate for BPS reliability by increasing communication, collaboration, and coordination with federal, provincial, and state policy makers, owners, and operators of the BPS.
- **The BPS depends on and is impacted by other infrastructure providers:**
  - Interdependencies between other industries (e.g., water and communications) and fuel types for generation are vital for reliability.
  - The increase in natural gas and renewable variable energy generation and the simultaneous decline in nuclear, natural gas, oil, and coal-fired generation have implications on the resource adequacy and the dynamic performance of the BPS.
- **Security threats continue to increase:**
  - Increased security risks (both cyber and physical) and the evolving nature of these risks are developing and changing quickly.
- **Grid transformation is happening quickly, and reliability considerations must align with the pace of change:**
  - Emerging technologies and how to best plan and incorporate those into a reliable, resilient, and secure BPS remains important.
  - With the accelerated pace of integrating new resources on the BPS, sufficient effort is needed to develop new system models, more advanced tools, and grid infrastructure improvements for their reliable and resilient integration.
  - Development of credible and centralized data sharing along with the right tools to proactively analyze system conditions towards development of mitigations is becoming more critical.

Background and Introduction

RISC Activities

This *2023 RISC Report* documents the results of the RISC's continued work to identify key risks to the reliable planning and operation of the BPS and provide recommendations to mitigate those risks; this includes recommendations regarding priorities to assist the Board and NERC management as well as industry and its stakeholders. The RISC's efforts are both responsive to and in support of the Board's resolutions on RISC's initial 2013 recommendations. The RISC continues to define and prioritize risks, develop mitigating activities, and identify accountable parties for those risks. The RISC acknowledges and appreciates the increased reliance of the Board and ERO Enterprise leadership on the results of the RISC's activities as an input for the ERO Enterprise's Long-Term Strategy Plan, the Reliability and Security Technical Committee's (RSTC) Work Plan, and NERC's Business Plan and Budget.

New Risk Profile

A new risk profile has been created this year on Energy Policy. Given the increased legislation focus and mandates on decarbonization, decentralization, and electrification, the Energy Policy will drive many rapid changes in the energy sector. There is an undeniable need to increase coordination and collaboration among all policy makers and regulators as well as on the owners and operators of the BPS. The need for this collaboration is highlighted as a risk because there is no single jurisdiction that regulates or owns all policy directives or implications and state, federal, provincial—and private jurisdictions are to be respected. Although there are numerous policy issues to mitigate, there should be a priority focus on three policy areas for reliability purposes: energy adequacy, natural gas and electric industry coordination, and DERs.

Overlapping Risk Profiles

Policy risk areas will overlap with the other risk profiles, and certain themes are repeated throughout this report at times. There are important linkages between the risk priorities and the recommended actions for the ERO Enterprise, policy makers, and industry. While the risk mitigation recommendations in each of the risk profiles of this report are presented individually, there are interdependencies acknowledged in this report between many of the risks that present unique challenges to the electric industry. Furthermore, many of these risks have been long recognized with commensurate NERC and industry monitoring for proper mitigation; however, other risks are newly emerging and require active management with a more aggressive immediate approach being necessary for the effective foresight and mitigation.

The RISC participants include representatives from the NERC committees, the Member Representatives Committee, and "at large" industry executives. The observations, findings, and guidance presented in this report include input from industry forums, trade associations, and other industry groups through multiple channels. The RISC also received feedback through both the Leadership Summit and the RISC Emerging Risks Survey.

This report relies on and extends the comprehensive assessment and corresponding recommendations to the Board made in August 2021 that have been updated and refined. This *2023 RISC Report* reflects and subsequent recommendations will

address discussions with representatives from the NERC standing committees and technical reports and assessments conducted by NERC and industry.

ERO Collaboration

Reliability Risk Framework

The RISC supports a reliability risk framework, *Framework to Address Known and Emerging Reliability and Security Risks*, and communicates with the RSTC on identified risks and mitigating activities. The RSTC works with industry to implement work plans as described below for executing those plans and developing commensurate timelines around those activities. Moving forward, the RSTC work plans will ensure that mitigating tasks and work plans will be tracked through a risk registry where ERO Enterprise projects will be tracked over time.

This reliability risk framework guides the ERO Enterprise and industry in the prioritization of risks and provides guidance on the application of ERO policies, procedures, and programs to inform resource allocation and project prioritization in the mitigation of those risks. Additionally, the framework accommodates measuring residual risk after mitigation is in place, enabling the ERO Enterprise and industry to evaluate the success of its efforts in mitigating risk and providing feedback necessary for future prioritization, mitigation efforts, and program improvements.

Collaborative Process

The successful reduction of risk is a collaborative process between the ERO, industry, technical committees, the RSTC and RISC as well as regulators and policy makers. The framework provides a transparent process that uses industry experts in parallel with ERO experts throughout the process—from risk identification to deployment of mitigation strategies to monitoring the success of these mitigations.

Process Steps

Six specific steps have been identified that are consistent with risk management frameworks used by other organizations and industries:

1. Risk Identification and Validation
2. Risk Prioritization
3. Remediation Mitigation Identification and Evaluation
4. Mitigation Deployment
5. Measurement of Success
6. Monitoring Residual Risk

Each of these steps will require process development, including stakeholder engagement, validation/triage approaches, residual risk monitoring, and the ERO's level of purview over a risk, etc. The following provides additional detail for each specific step:

1. **Risk Identification and Validation:** The ERO identifies risks by using both leading and lagging approaches. This RISC biennial risk report and the ERO's long-term and seasonal reliability assessments (leading) have successfully brought together industry experts to identify and prioritize emerging risks as well as to suggest mitigation activities. A partnership between the ERO leadership and both the RISC and RSTC enables input from the ERO program areas as well as industry forums and trade associations to provide additional context in risk identification.

   Once the ERO and its committees, forums, and/or industry subject matter experts identify and validate a risk, it is critical that the corresponding recommendation(s) for mitigation describe, explain, and provide basis support for selecting the particular approach to mitigation. A template will be created that mirrors the standards authorization request template and requires an explanation of the risk, approach(es) for mitigation, and estimate of residual risk.

   Risk Identification: The following are the various means the ERO identifies risks:

   - Stakeholder supported technical organizations, industry forums, and associated subject matter experts
   - Focused compliance monitoring activities
   - Reliability and risk assessments
   - Event analyses
   - State of reliability reports, including the analysis of availability data systems (e.g., battery energy storage systems, TADS, GADS, DADS, MIDAS)
   - Frequency response, inertia, and other essential reliability service measurements
   - Interconnection simulation base case quality and fidelity metrics
   - RISC biennial risk report
   - Regional risk assessments
   - Communication with external parties, such as the Department of Energy (DOE), the Department of Homeland Security, Natural Resources Canada, Canadian Electricity Association, and Electric Power Research Institute (EPRI)
   - Shared public and/or government intelligence with special emphasis on cyber security

   Risk Validation: The ERO and industry subject matter experts continuously work together to validate risks to the reliable and secure operation of the BPS based on analysis of ongoing performance of the system (lagging). Validation of the magnitude and priority of the risks includes analysis from the ERO databases of system performance and event analysis. These outputs are generally covered in NERC's State of Reliability reports. In addition, the risks are further validated through the work of NERC's committees and socializing the risks with forums, government, and research organizations. Leading risk validation requires analysis of system simulations, forecasts, and performance projections.

2. **Risk Prioritization:** Risk prioritization is accomplished through an analysis of their exposure, scope, and duration as well as impact and likelihood. The primary sources of data used to support this analysis come from Step 1. Deciding if the risk requires near-term mitigation or continued monitoring is informed by technical expertise. Depending on the complexity of the risk, new models, algorithms, and processes may need to be developed to

better understand the potential impacts of the risk, a necessary step to develop risk mitigation tactics. The process would be consistent with other risk management frameworks used by other industries; it was recently successfully tested in collaboration with industry through a survey issued by the RISC that was based upon the risks that the group prioritized in early 2019.

The ERO Risk Registry was developed in 2023, and encompasses RISC report findings, ongoing technical committee activities, and the risks being monitored. The Registry will be updated periodically and shared with the technical committees twice a year as their works plans are developed. The Registry will track the projects detailed in the RSTC work plans and any other projects across the ERO Enterprise that mitigates an identified risk. In the future, the Registry will allow the ability to track mitigations identified in this report as they progress over time. Work plans of the technical committees will then be periodically reviewed to ensure that ongoing activities are tied to identified risks in the Registry. Furthermore, new risks can be added to the Registry and moved to the monitored portion if it is deemed that the risks are sufficiently mitigated. Following publication of the RISC biennial risk report, the RISC and RSTC will review the Registry to perform the following:

- Evaluate how ongoing and completed work addresses these identified risks
- Determine if any new risks have been identified by either committee that need to be added to the Registry
- Document monitored risks that require no additional mitigation

This review of the Registry by the RSTC will fuel the development of the RSTC's annual work plan.

3. **Remediation and Mitigation Identification and Evaluation:** The right mix of mitigation activities is balanced against both the effective and efficient use of resources and the potential risk impact and likelihood. Furthermore, the risk tolerances need to be balanced against potential impacts so that the remediation/mitigation plans can be developed accordingly. Determining the best mix depends on a number of factors:

    - What is the potential impact or severity of the risk?
    - How probable is the risk? Is it sustained, decreasing, or growing?
    - Is the risk here today or anticipated in the next 3–5 years?
    - How pervasive is the risk?
    - Is mitigation expected to be a one-time action or ongoing?
    - Have we had experience with events being exacerbated by the risks, or there is no experience, but the probability is growing (i.e., cyber or physical security)?
    - Have previous mitigation efforts been deployed and by what means? If so, were they effective? Why or why not?
    - What is an acceptable residual risk level after mitigating activities have been deployed?
    - Is the risk man-made or by natural causes?
    - Does the mix of mitigations vary based on jurisdictional or regional differences?
    - Is the risk fully or partially within the purview of the ERO?

    Input from and allocation of subject matter expertise through multiple sources is part of this consideration, including resources within the ERO Enterprise and its stakeholders, such as standing technical committees and their subgroups or standard drafting teams. External parties are important sources of input as well, such as the

North American Transmission (NATF) and Generation Forums, the North American Energy Standards Board, the Institute of Electrical and Electronic Engineers, and EPRI to name a few.

Once a risk to the BPS has been prioritized according to its impact and likelihood, the ERO, NERC committees, forums, and industry subject matter experts can recommend and take on potential mitigation activities and assess their anticipated effectiveness. Coordination is key to avoid duplication and provide supportive rather than conflicting actions.

The ERO remains responsible for risks to the reliable and secure operation of the BES. Risk mitigation should still be followed by the ERO no matter which organization takes on activities. Examples of mitigation efforts include, but are not limited to, the following:

- Mandatory Reliability Standards with compliance and enforcement for risks
  - Sustained, moderate to severe impact, and likely
  - Sustained, severe impact, and unlikely
  - Focused monitoring based on risk and in response to major events
- Reliability guidelines for risks
  - Sustained, low to moderate impact, and likely
- Lessons Learned for risks
  - Sustained, low impact, and likely
- Assist visits for risks
  - Compliance-related
  - Focused on a very specific situation or configuration
  - Generally on specific industry or entity practices or conditions
- Analysis of major events for risks
  - Identified after a major event (e.g., Category 3 or higher, definitions can be found in the *2020 State of Reliability Report*)
  - Discreet/one-time, severe impact, unlikely
  - Identified through recommended reliability improvements or best practices and lessons learned
- Analysis of "off-normal" events for risks
  - Identified after an unusual operational condition has occurred and likely not a categorized event
  - Discreet/one-time, moderate impact, unlikely
  - Identified through recommended reliability improvements or best practices and lessons learned
- Advisories, Recommendations or Essential Actions[2]
- Alerts[3]

[2] LEVEL 1 (Advisories): Purely informational, intended to advise certain segments of the owners, operators, and users of the BPS of findings and lessons learned; LEVEL 2 (Recommendations): Specific actions that NERC is recommending be considered on a particular topic by certain segments of owners, operators, and users of the BPS according to each entity's facts and circumstances; LEVEL 3 (Essential Actions): Specific actions that NERC has determined are essential for certain segments of owners, operators, or users of the BPS to take to ensure the reliability of the BPS. Such essential actions require NERC Board approval before issuance.

[3] ALERT 1: Industry Action Requested—Fast moving or recently detected, impacts moderate, ALERT 2: Industry Action Required—Fast moving or recently detected, impacts moderate to severe, ALERT 3: Industry Action Mandatory—Fast moving or recently detected, impacts moderate to severe.

- Technical Conferences and Workshops

When reviewing the type and/or depth of remediation and mitigation, a form of cost-effectiveness analysis may be considered to understand industry impacts and potential burdens. This analysis can then be compared to potential impacts of the risk.

4. **Mitigation Deployment**: Mitigation projects will be deployed by the ERO and/or industry stakeholder groups as determined by the Mitigation Identification and Evaluation Step 3. A specific mitigation plan would involve a suitable mix of the ERO policies, procedures, and programs discussed in Section I of the *Framework to Address Known and Emerging Reliability and Security Risks.* These mitigations would be coordinated with industry partners, and stakeholders.

   Occasionally, the Federal Energy Regulatory Commission (FERC) may order the development of Reliability Standards; this can occur in this step.

5. **Measurement of Success:** Once a set of solutions has been deployed, the effectiveness of the mitigation must be measured to determine if the residual risk has been reduced to an acceptable level. Effectively, if the desired level of risk mitigation is not met, the risk is fed back to Step 1, enabling a new risk prioritization while factoring in historic mitigation and ensuring resource allocation is adapted to the changing risk landscape. This measure of success step also informs future mitigation efforts as industry and the ERO learn from the effectiveness of mitigation mixes for reducing risk. A partnership between the ERO leadership and the RISC and RSTC will enable input from the ERO program areas, industry Forums, and trade associations to provide additional context in the measurement of success. That said, criteria and other related processes should be developed for determining risk severity, likelihood, and mitigation activity effectiveness.

6. **Monitoring Residual Risk:** Once the level of residual risk is at an acceptable level, the risk is monitored through ongoing performance measures to ensure that risk remains at acceptable risk levels. The residual risk should be monitored for progress and to ensure that the mitigations that are in place continue to address the risk (Step 5). At times, mitigations need to be deployed on a periodic basis (e.g., annual workshops, reliability guideline updates) to ensure continued success (Step 4). If the risk levels heighten or increased mitigation efforts are necessary due to the changing nature of the BPS, the risk can be fed back (Step 1) for prioritization and the development of additional mitigation approaches. The ERO—working with its industry partners, technical committees, stakeholders, and forums—would determine if the residual risk was acceptable or if additional mitigations required.

Sometimes, risks are identified and validated that require accelerated industry attention. The ERO risk framework can support quick implementation of industry awareness and mitigation activities. **Figure 1** provides a pictorial flow chart of the ERO's risk management process.

Figure 1: ERO Risk Management Process

The ERO risk framework serves to ensure effective collaboration within the ERO and industry (see **Figure 2**[4]), and it provides appropriate identification of critical industry risks; it also provides an effective establishment of work plans that ensure mitigating activities are implemented, measured, evaluated, and reevaluated in a strategic and effective manner.

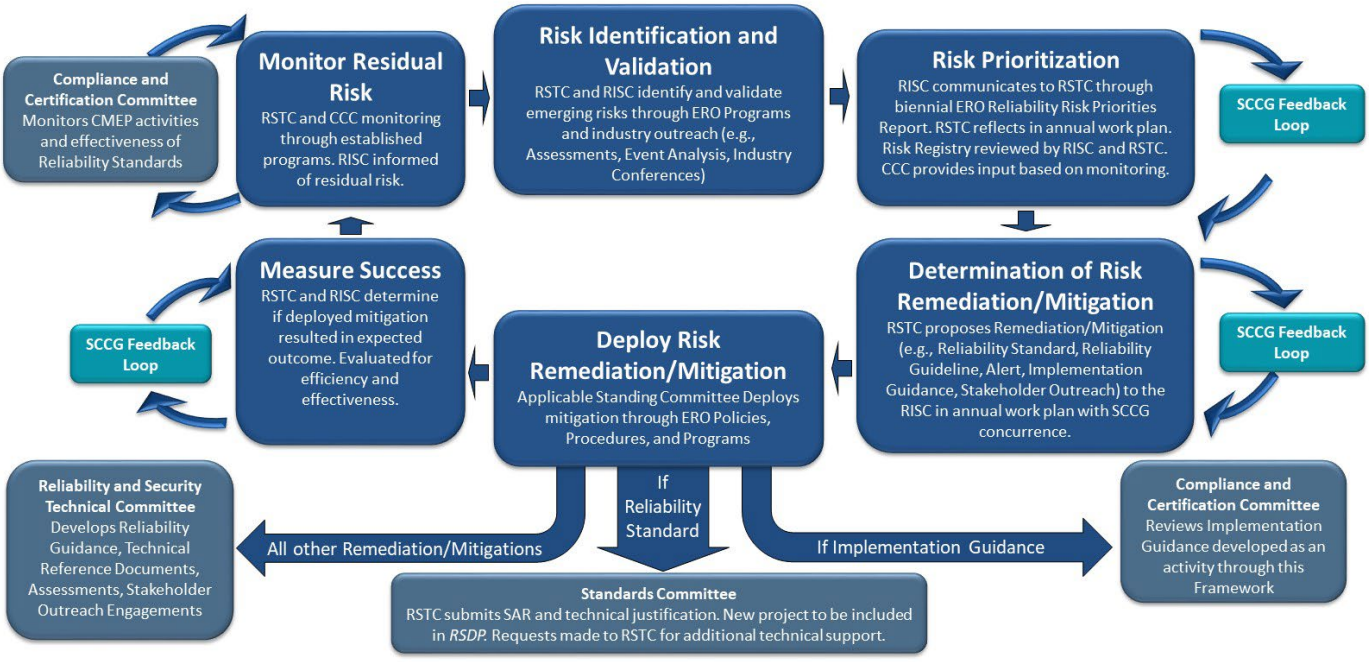


Figure 2: ERO and Industry Collaboration

[4] Graphic is from the *Framework to Address Known and Emerging Reliability and Security Risks*

Reliability Leadership Summit

On January 25, 2023, NERC and the RISC hosted its first in-person summit since the pandemic with leaders of the reliability community, including top industry executives; state, provincial, and federal regulators; and ERO Enterprise senior leadership. The summit focused on four specific areas: Energy Policy, Security, Grid Transformation and Impact on Resiliency, and New Technologies. An open panel discussion was held at the end of the day to address these and any other risks that required deeper discussion.

The panel discussions underscored the importance of conducting cross-sector coordination with other industries, and covered the transformation of the grid; reliability and security impacts and considerations; lessons learned and unique challenges posed by cyber and physical security risks, their evolution, and potential impacts that could cause damage; and implications of the increased critical infrastructure interdependencies and how to address the jurisdictional issues that need to be tackled to address the risks they present.

2022 RISC Emerging Risks Survey

A refined Emerging Risks Survey was issued in October 2022 (with responses due early-January 2023) that sought stakeholder input on the continued relevancy of the 11 individually identified risks in the *2021 RISC Report*, the overall risk profile groups (in the next section), and the mitigating activities within each of the profile groups as detailed in the *2021 ERO Reliability Risk Priorities Report (2021 Risk Report).*[5] The objective of this year's survey was to gauge if the RISC reports are providing the correct recommendations and level of information to ultimately have an effect on the likelihood and impact of the BPS risks.

As part of the 2022 Emerging Risks Survey, respondents were asked if each of the 11 identified risks from the *2021 RISC Report* were still relevant and to rank them on a scale of 1–11. Each risk was identified as still relevant, and the responses were classified as Low (1–4), Moderate (5–8), and High (9–11) to provide an overall view of each risk (see **Figure 4**).

Risk Categories and Rankings

The following chart reveals that risks associated with the Changing Resource Mix followed by Resource Adequacy and Performance lead industry's perception on the criticality of these risks. Although Extreme Events was the fourth item ranked as a critical risk by industry, this contrasts with the most recent *2023 State of Reliability* report, which noted that Extreme Events pose the greatest risk to reliability and stability (see **Figure 3**). This information is useful for industry as a whole to prioritize and dedicate resources and budget.

[5] *2021 ERO Reliability Risk Priorities Report*: https://www.nerc.com/comm/RISC/Documents/RISC%20ERO%20Priorities%20Report_Final_RISC_Approved_July_8_2021_Board_Submitted_Copy.pdf

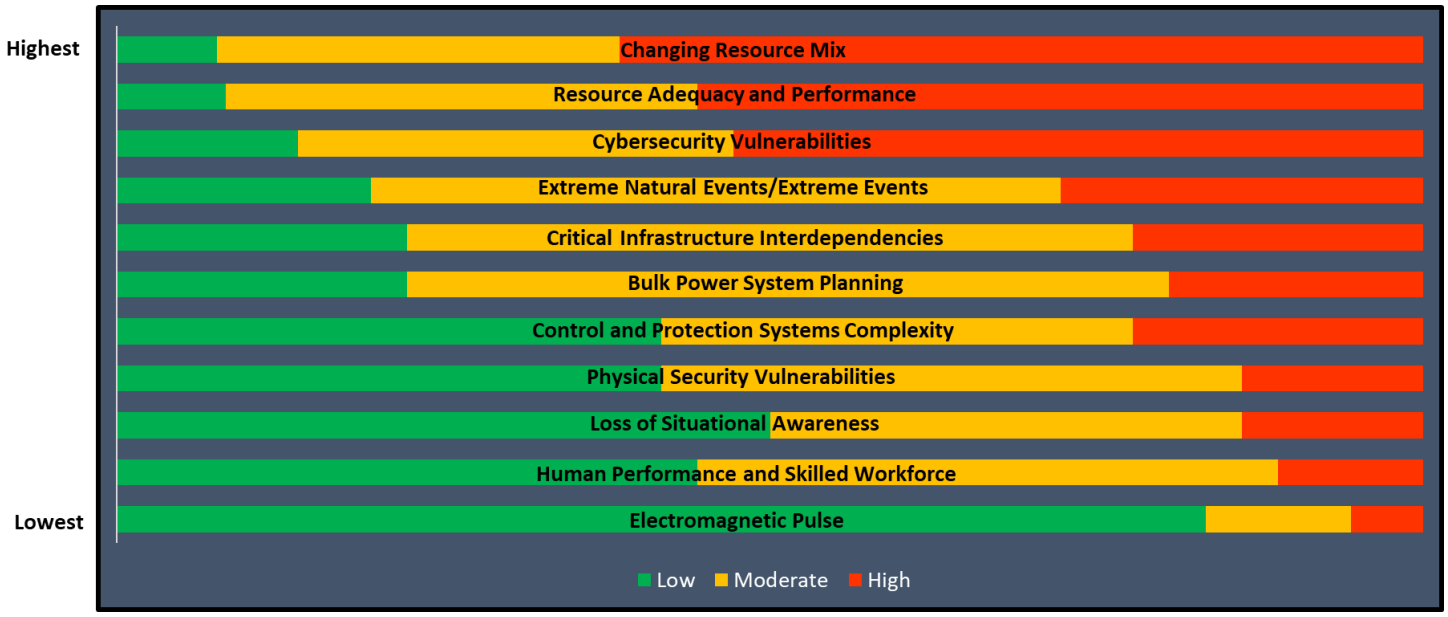


Figure 3: 2023 Risk Ranking

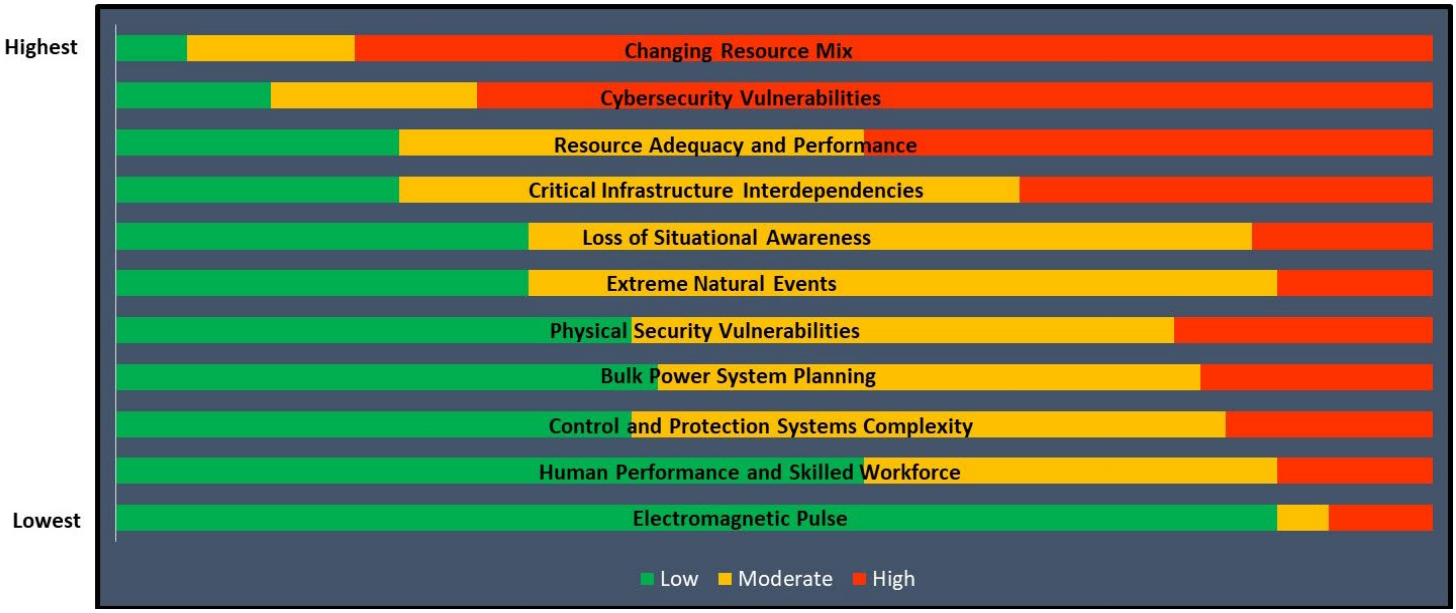


Figure 4: 2021 Risk Ranking

Figure 5 depicts the classification of manage or monitor for each of the identified risks. These risks identified as "**Manage**" are emerging, imminent, pose significant threats, and require thorough strategic planning and industry collaboration to mitigate. The risks identified as "**Monitor**" are risks that are of critical importance to BPS reliability but are considered well managed with established industry practices to mitigate and lessen potential impacts on BPS reliability.

Figure 5 also indicates that extreme events should be monitored going forward, which may seem counterintuitive with recent events. However, the Extreme Events category is comprised of events that the industry has a great deal of experience dealing with, such as hurricanes, tornadoes, or derechos by implementing emergency operating plans, mutual aid programs, drills, and studies. Recent events, such as hurricanes, show a distinct difference between the

performance of BPS and the distribution system. As a result, many organizations are hardening the BPS and applicable distribution systems, so the risk is labeled "**Monitor - 2023**."

With the recent grid transformation, the resource mix is increasingly characterized as one that is sensitive to extreme, widespread, and long duration temperatures as well as wind and solar droughts. For example, having sufficient capacity does not necessarily mean that adequate energy will be available as widespread extreme temperatures are experienced.

Figure 5: Risk Classifications

Electromagnetic pulse was not individually surveyed as **Manage vs. **Monitor** in the *2019 Risk Report.*

Stakeholder Comments

The report was posted for stakeholder comment in June 2023, and the comments received were reviewed and incorporated as applicable.

Risk Profiles

Energy Policy

A. Federal
B. State
C. Provincial

Grid Transformation

A. Bulk Power System Planning
B. Resource Adequacy and Performance
C. Increased Complexity in Protection and Control Systems
D. Situational Awareness Challenges
E. Human Performance and Skilled Workforce
F. Changing Resource Mix

Resilience/ Extreme Events

A. Extreme Natural Events, Widespread Impact
- GMD

B. Other Extreme Natural Events

Security Risks

A. Physical
B. Cyber
C. Electromagnetic Pulse

Critical Infrastructure Interdependencies

A. Communications
B. Water/Wastewater
C. Oil
D. Natural Gas

Changing Resource Mix

The resource mix is transforming from large coal-fired and nuclear power plants toward natural-gas-fired, renewable, and distributed energy resources. The changing resource mix has resulted in a large amount of weather-dependent renewable variable energy resources, distributed energy resources, micro- and smart-grids, and demand response technologies as well as an increasing reliance on just-in-time delivery of natural gas to fuel new generating capacity. This transformation is resulting in a different use of the power lines and changing the system's dynamic. In parallel, the potential for cyber and physical attacks has increased as the adoption of advanced technologies compounds the reliance on digital controls and communication systems.

The electrification of many sectors, such as transportation and technology, increases demand for electricity and the importance of reliability and resilience of generation energy supply. Effective management of the significant changes the grid is presently undergoing, coupled with this electrification, is critical. There are three main characteristics of these changes: decarbonization, digitalization, and decentralization. Decarbonization is occurring as a result of improved technologies and governmental mandates. Increased digitalization poses potential challenges from a cyber-security standpoint. Decentralization, including the proliferation of microgrids and behind-the-meter-generation, is another grid development that necessitates proper system planning and effective deployment of risk mitigation strategies.

The Five Significant Evolving Risk Profiles

The five significant evolving risk profiles, which are not independent from each other, result from the previous mentioned electric industry developments. Given the rate of change and increase in regulations and policies that drive industry activities, there is need to address policy matters that impact the grid.

Energy Policy at the federal, province, state, provincial and local levels is providing incentives and targets for resource changes and end-use applications of electricity. It is further contributing to the **Grid Transformation**, which includes the shift away from conventional synchronous central-station generators toward a new mix of resources that include natural-gas-fired generation; unprecedented proportions of non-synchronous resources, including renewables and energy storage; demand response; smart- and micro-grids; and other emerging technologies which will be more dependent on communications and advanced coordinated controls that can increase the potential **Security Risks**. Collectively, the new resource mix can be more susceptible to long-term, widespread **Extreme Events,** such as extreme temperatures or sustained loss of wind/solar, that can impact the ability to provide sufficient energy as the fuel supply is less certain. Furthermore, there is an associated increase in **Critical Infrastructure Interdependencies**. For example, for natural-gas-fired generation, there is increased interdependency on delivery of fuel from the natural gas industry that also depends on electricity to support its ability to extract and transport gas.

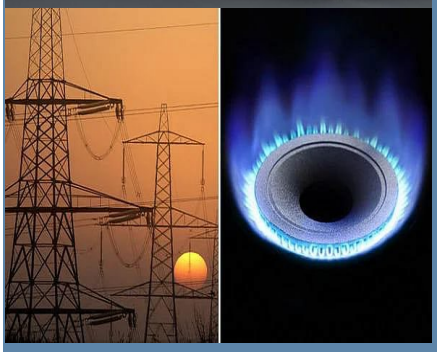
Each of these five evolving risk profiles requires diligent awareness and steps to mitigate or control their impacts to ensure the continued reliable planning and

operation of the BPS. In this way, the industry can meet its goals to ensure a reliable, secure, and resilient BPS. These mitigating activities and controls are further detailed in the individual profile sections.

Heat Maps

The RISC has adjusted the heat maps in each individual profile section (except Energy Policy) to reflect the current state as opposed to a past state. In the prior reports, the heat maps were based on the Emerging Risks Survey results, which provided a visual demonstration of the potential or actual effects that the mitigating activities from the prior year report could have if implemented (or did have when implemented) on both the likelihood and impact of baseline risks. In the *2023 RISC ERO Reliability Priorities Report*, the heat maps are based on the Committee's recommended ranking of the mitigating activities within each risk profile (except Energy Policy). This can be used as a potential tool for industry to compare mitigating activities, their individual potential effects, and resource allocation and budget.

Risk Profile #1: Energy Policy



Reliability Impacts of Energy Policy

Policy as a Reliability Risk Factor

Energy Policy can drive changes in the planning and operation of the BPS. Accordingly, policy can affect BPS reliability and resilience and could present risks to its reliable operation. Ensuring reliability during and after policy driven transitions should be a key consideration in setting Energy Policy. The implementation of policy decisions can significantly affect the reliability and resilience of the BPS. Decarbonization, decentralization, and electrification have been active policy areas. Implementation of policies in these areas is accelerating, and, with changes in the resource mix, extreme weather events, and physical and cyber security challenges, reliability implications are emerging. Demonstrated risks, such as energy sufficiency as well as natural gas and electric interdependence, are becoming increasingly critical. Emerging potential risks, such as aggregate DERs, are increasingly concerning. Due to the interdependency of critical infrastructures (i.e., electricity, natural gas, water, transportation, and communications), potential reliability risks are magnified when cross industry segments and agencies act independently to create or implement policy. Development of reliability standards and processes recognizes and respects the jurisdictional authorities setting and implementing policy decisions. It will take strong collaboration and partnerships across a multitude of boundaries to mitigate the emerging risks we face today – state, federal, provincial and private – ensuring reliability of the grid is a prioritized tenet of critical infrastructure.

Consider Reliability Impacts in Active Policy Areas

- **Energy Sufficiency is Increasingly Critical**
  Existing resource sufficiency requirements and underlying studies are based on a pre-decarbonization paradigm that traditionally focused on peak capacity requirements and assumed energy sufficiency would result; traditional resource adequacy planning is capacity focused. Energy sufficiency is when the resources meeting the capacity requirement are able to produce enough energy to meet demand at any given time. With a higher proportion of variable and renewable fueled resources evolving, this aspect of resource adequacy must be more specifically assessed.

  As the resource mix continues to rapidly change from one that was limited by rated capacity to one that is more fuel/energy-constrained, new approaches are needed to assess and ensure energy sufficiency for all hours throughout the year. Broadly impactful, long-term, and widespread weather events (geography, duration/time of year, generation technologies) are highlighting energy sufficiency issues related to changing characteristics of the resource mix and technology lag. Policy implementation timelines should actively consider the ability to ensure energy sufficiency.

  Additionally, as the resource mix evolves with new and different resources being brought into the system, upfront planning is needed to ensure that sufficient associated infrastructure, both transmission and distribution, is built to support the interconnection and delivery of the new resources.

- **Natural Gas and Electric Interdependency Increasing Impacts**
  Natural gas and electricity markets are significantly out of synchronism. Natural gas access is further challenged by multiple priority uses, including home heating and industrial processes. Coordination should focus on increased alignment of natural gas and electric nominations and the challenges electric generators face in accessing natural gas during critical periods, such as severe winter weather events.

  The electric reliability and resilience impacts resulting from the ongoing challenges between natural gas and electricity markets must be better accounted for in risk assessment, planning, and operations. These natural gas and electric coordination challenges can benefit from increased cross-industry and cross-jurisdictional communication, coordination, and collaboration. Because the electric and natural gas infrastructures arguably have a higher degree of critical infrastructure interdependencies, increased policy collaboration and coordination should occur between these sectors.

- **Resources From All Sides: Reliably Incorporating Aggregate DERs**
  DER growth is projected to continue at an increasing rate. Aggregate DERs can impact BPS reliability under certain circumstances and in some areas. NERC's role regarding distribution system resources should continue to focus on the impacts to the BPS due to the aggregate behavior of DERs and loads at the interface with the BPS. Progress is needed to better capture, communicate, and plan for the increasingly complex, dynamic nature of aggregated DERs, and loads at the interface with the BPS.

  State, provincial, and utility level implementation of updated interconnection standards, such as IEEE 1547-2018, is underway. Continued timely deployment of updated interconnection standards is important. Better understanding and planning for the impacts of aggregate DERs would benefit from improved cross-jurisdictional and cross-industry communication, coordination, and collaboration.

  The modeling of demand-side resources may require a similar level of inputs used to model supply-side resources. The rapid growth of energy storage, demand response, electric vehicles, and dynamic rate design bring new options for load flexibility that are changing the demand-side equation rapidly. As load becomes more flexible, the options to balance both the supply and demand sides of the resource adequacy calculation becomes much more dynamic and complex. More information is needed on this significant source of flexibility.

Recommendations for Mitigating the Risk

Increased coordination and collaboration between federal, provincial, and state policy makers, regulators, owners, and operators of the BPS as well as with the critical interdependent sectors is needed. Communication, coordination, and collaboration should be early, consistent, and clear to bridge increasingly complex jurisdictional lines. Education for policymakers and regulators to increase awareness of the reliability implications of policy decisions is a critical need. In addition, education for the industry, as the developers of reliability standards, is needed to better understand the processes and implications of policy decisions.

Power system reliability requires many actively engaged, closely coordinated partners. NERC and state commissions share common goals in ensuring a reliable, resilient, safe, affordable electricity system that serves all customers. States, and the utilities they regulate, are responsible for the distribution systems, including DERs, and with some utilities responsible for resource acquisition and adequacy. As economic regulators, state commissions review and approve utility investment proposals which have long term impacts on power system reliability. State perspectives are important to NERC's success – translating BPS considerations to state-level needs, experience, and policy objectives. Concurrently, NERC's perspectives are important to the States' success. NERC should continue and build on its outreach and collaboration with state commissions and with the National Association of Regulatory Utility Commissioners (NARUC).

Summary

1. Energy Policy, including time lines for implementation, can be a reliability risk factor.
2. Traditional resource adequacy approaches need to be amended to ensure energy sufficiency throughout the year.
3. Natural gas and electricity policymakers should work together with interactive infrastructure reliability in mind.
4. Resources coming from all parts of the grid require new considerations to integrate reliably.
5. Increased communication, coordination, and collaboration are needed.

Risk Profile #2: Grid Transformation

Statement of the Risk

Transformation of the grid continues to accelerate toward generation and load resources that are increasingly non-synchronous, diverse, digital, and dynamic—while dependence on uninterrupted electric energy increases. At the same time, electricity demand for homes, transportation, commerce, and industry has been increasing for decades. This rapid transformation results in an array of nontraditional operating conditions and risks.

While progress on the recommendations from the prior *Reliability Risk Priorities Report* has been made, several aspects of the grid transformation risk landscape are rapidly evolving and will require additional attention:

- Grid transformation is accelerating in all dimensions. Rapid resource deployments—on both transmission and distribution systems and with both centralized and distributed resources—are resulting in BES operating conditions that were not within the original planning criteria. Resource types are also getting more complex and difficult to categorize in traditional ways with "private use networks" that incorporate loads, generation, and transmission already common and growing in ERCOT.
- Energy adequacy or sufficiency is increasingly important. Broader and scenario-based analyses are needed to illustrate potential reliability impacts and inform energy policies and associated time lines. The interrelated contributions to system adequacy and reliability from generation, loads, fuel supplies, electricity storage, on-site fuel storage, and transmission must be incorporated in all time horizons of planning and operations. Collaborative studies, standards and protocols across interdependent energy systems and infrastructures are needed to ensure situational awareness and reliability throughout the transforming grid.
- Load growth will be large and rapid. Driven by electrification, hydrogen production, changing load characteristics, data centers, and crypto mining, these demands can emerge and grow faster than generation and transmission can be built. System operators and asset owners must coordinate infrastructure expansion and view new loads as sources of useful and necessary reliability services. Coordinating existing and new loads with grid additions may be important for reliability but require multiparty agreements and collaboration.
- The BPS is becoming more complex, and the need to model, analyze, and operate the BPS at higher fidelity further exacerbates training, staffing, and workforce issues. Competition for available skilled workers is becoming a roadblock and an emerging risk.
- The cadence of innovation and deployment is overwhelming traditional grid operation software platforms, interconnection processes, and performance standards. Today, new renewable and storage projects can be completed in eighteen months and the next generations of inverters with valuable capabilities are released every two years. The multi-year cycles for clearing interconnect queues and updating grid management and market software platforms are becoming reliability risks.

It is no longer sufficient to assume that the system will be adequately planned by comparing the peak load hours with the generation capacity plus a planning reserve margin. To ensure reliability and resilience in all conditions under this grid transformation, assessments must consider the magnitude, duration, and impact across all hours and many years while considering that future events and operations may be outside of historical patterns. Assessments must also consider that load resources, neighboring grids, and transmission can increasingly be viewed as contributors to reliability. The highest system risk periods may no longer be peak load hours, and energy availability and real-time performance during periods of risk will be of paramount importance.

As is further emphasized in the new Energy Policy section of this report, the regulatory and socioeconomic policies driving grid transformation continue to grow in impact. Looking forward, with additional Energy Policy requirements and associated schedules to decarbonize the energy systems may further accelerate the pace and extend of grid transformation. Changes in the economics of energy sources, deployment of storage in many configurations, participation of distribution-connected energy resources and large variable loads, and the aging of existing infrastructure will all alter the nature and dispatch of generation. Grid transformation has broad implications across the other risk profiles as it catalyzes other changes and often amplifies their effects. Therefore, grid transformation challenges, opportunities, risks, and recommendations are broad in nature and provide a framework for all recommendations in this report.

Descriptors of the Risk

- **Energy Adequacy or Sufficiency—Questioning the Sufficiency of Planning Reserve Margins:** The grid has been actively transforming since the *2021 RISK Report* with accelerating changes in resource mix and performance coming from renewables-driven dispatch. Resource adequacy assessments have historically focused on ensuring generation and transmission capacity to serve peak demand, and it was assumed that energy from those peak planned resources would be sufficient to meet demand in all other hours of the year. Recent extreme events show energy sufficiency to be a significant dimension of risk given the changing resource mix and actual performance of the grid versus assumptions used in previous assessments. It is now insufficient to assume that the system is adequately planned by comparing the peak load hours with the generation capacity. Assessments must look at the magnitude, duration, and impact of resource adequacy across all hours and many years while considering that future events may be outside of historical patterns. Grid planners must realize that all resources, including load resources, neighboring grids, and transmission, have limitations and contributions to reliability. Traditional dispatchable resources will not be present in similar proportions as in the past, and resources on the path to retirement will not be able to perform at historical levels of availability and reliability. Periods of highest system risk may no longer be peak load hours, and energy availability and real-time performance during periods of risk will be of paramount importance. Effective and coordinated planning through the long-term planning, operational planning, and operating time horizons will be essential.

- **Resource Adequacy—Network Realities vs. Political Boundaries and Benefits of Improved Interregional Connection**: Resource planning, resource adequacy assessments, and operating practices are sometimes constrained by political or utility boundaries that do not fully consider the potentially significant benefits, impacts, and interactions from the interconnected nature of the BPS. The *2021 RISC Report* noted that this may result in resource, energy, and/or transmission capacity insufficiencies in an operational time frame and that remains true. However, recent extreme events and studies have highlighted the significant benefits of interregional transmission and cooperation as a capacity resource. While assessments must consider situations where neighboring areas could simultaneously experience critical energy shortage conditions, these assessments should also consider the important contributions of increased interchange and cooperation between and across areas for the many periods when resources are available.

- **Increasing Demand from Large Flexible Loads:** Rapid growth of data centers, crypto mining, and emerging green hydrogen (with significant incentives under the Inflation Reduction Act of 2022, Pub. L. No. 117-169,

Stat. pg. 1,818) is resulting in many interconnection requests for large loads that, in addition to significant incremental demand, could also be sources of grid services and flexibility. Such large loads may also be paired with significant amounts of new generation, perhaps in a "behind the point of interconnection" or "behind-the-meter" configuration. The Inflation Reduction Act and related DOE Hydrogen Hub opportunities are very real, very big, and under aggressive time lines to interconnect and energize. Timely integration of large flexible loads into reliable BPS operations will be challenging and important.

- **Increasing Demand from Electrification and DER:** Government drivers like the IRA and 2021 Infrastructure Investment and Jobs Act (Pub. L. No. 117-58, Stat. 429) are further accelerating load growth from electrification and electric vehicles, the amount of DERs, and the need for coordination with distribution system operators. The BPS will see significant increases in demand from electrification of transportation (including large and rapid fleet electrification) and broad residential, commercial, and industrial electrification. The rate of growth in electricity demand is entering a new era.

- **Consideration of Weather, Forecasting, and Combined Effects**: With the changing resource mix, traditional analytical methods do not fully account for system characteristics associated with the uncertainty of variable resources, interactions of inverters and dynamic power system devices, the declining performance of fossil-fueled resources that are nearing retirement, uncertainties associated with emerging technologies, and increased sensitivity to widespread weather situations (e.g., extreme temperatures). The result may be resource, energy, and/or transmission capacity insufficiencies in the operational horizon. Forecasts of weather and energy demand as well as the implications of such forecasts on the increasingly interrelated combined effects between resources, fuel supplies, and extreme events (e.g., natural gas production/transport and generation plus heating load under extreme cold conditions) must be more explicitly incorporated into planning and operational methodologies to ensure ongoing BPS reliability.

- **Deeper Understanding of Essential Reliability Services and Newer Technologies:** Transformation of the resource mix can alter the provision of and need for essential reliability services, interconnection capabilities and settings, and other ancillary services for BPS reliability and system operations, such as voltage control and reactive support, frequency response, ride-through, ramping/balancing, and stability. It is important to understand the grid-supporting capabilities and potential interactions of all technologies and resources (including conventional resources, inverter-based resources in their grid-following and grid-forming versions, and loads) and accurately include them in planning and operating analyses. Restoration services, such as blackstart capabilities and procedures, must also be considered. For services that may become scarce in the future, both organized markets and bilateral markets must anticipate and procure sufficient services to ensure reliable operations.

- **Equipment Standards and Settings:** Detailed information on equipment characteristics, capabilities and settings, and limitations must be incorporated into the long-term planning, operational planning, and operating time horizons. This is particularly true for digital controls and inverter-based resources. For example, future inverters connecting at transmission voltages must comply with the IEEE 2800 standard. The system planner must specify the parameter settings for the desired performance characteristics for a given resource, the resource operator must set the parameters accordingly, and the commissioning process and performance monitoring must be able to verify the desired operation of the resource. Planning and operational challenges can result if these resource addition attributes are not observable, predictable, or otherwise accounted for. Parallel development of control systems and operational models should match the pace of resource development.

- **Grid Management System and Modeling Gaps:** The speed of deployment of new resource technologies and innovative combinations of existing technologies is outpacing the cadence and timing of updates to grid management software, planning models, and operational models. In some cases, these new resource types are being delayed or even prohibited from interconnecting even though their services would be useful to the grid because legacy grid management and market software platforms are onerous and expensive to update, or it may not even be feasible to update them at all. Currently, this gap is especially true when technology is associated with energy storage and hybrid resources. The reliable, wide-spread interconnection of new

resource technologies will require parallel development and innovation in grid management software and operational/planning models at a pace that is comparable to the innovation rate of emerging technologies. This can be difficult to accomplish with legacy grid management systems and may require some innovative rethinking of roles and responsibilities of market participants and the system operator. When combined into one interconnected grid, the interactions between increasing numbers of separate new resources and load control systems with their varying operating characteristics may also create new system risks and analytical complexities.

- **Fuel Supply Considerations:** Fuel sourcing and disruption, such as from weather events and other extreme natural events, are driving new scenarios and case studies as well as broadening the range of dependencies for reliability planning and operations. Fuel constraints and environmental limitations might not be sufficiently reflected in current assessments of resource adequacy. While NERC and system operators have devoted substantial efforts to fuel/electricity interdependencies and risks, as illustrated by actual events, these issues are not resolved and will require considerable ongoing attention and effort.
- **Transition Timeline Considerations—Lead Times and Sequencing:** In addition to fuel sourcing, other elements of resource adequacy (e.g., transmission development, generator retirements, pipeline construction, environmental permitting, and right-of-way acquisition) may require long and/or uncertain lead times to assure future reliability and resource adequacy of the system. Various elements may also need to be carefully sequenced to ensure reliability throughout the transition, and the interrelated nature and contribution of transmission, generation, and fuel sources must be appreciated and considered in resource adequacy assessments, energy reliability assessments, time lines, and deployments. This has been further exacerbated by a problematic supply chain, international trade, and import tariff issues that continue to be disruptive to plans and schedules.
- **Integrating Energy Storage Technologies:** Storage is disruptive to established models, markets, and the power systems because it does not fit neatly into any single category of generation, load, or transmission—it can simultaneously exhibit characteristics of any or all these categories. Storage is an energy limited resource that introduces complex concepts of opportunity cost and state of charge optimization. Storage capabilities and uses continue to transform both distribution and BPS operations even as current systems and practices struggle to fully comprehend and exploit its potential. Whether in combination with renewable or conventional resources or connected to distribution systems or the BPS, storage, and hybrid technologies will further magnify the pace of innovation and the evolution of resource capabilities during both steady state and transient conditions.
- **Transition Considerations for Flexible Resources:** With the massive deployment of variable wind and solar resources and the characteristics of other resources that may constrain their near-term ability to respond, sufficient flexible resources will be needed to balance instantaneous supply and demand. Growing levels of storage and demand-side flexibility may contribute to intra-day flexibility needs, but multi-day energy considerations will need additional attention. Also, with societal goals to completely decarbonize energy systems in future decades, new sources of carbon-free energy will be needed to meet this additional demand. This presents a risk and challenge because there will be a series of transitions in what will be most needed and valued as societal decarbonization proceeds, and all transitions must be performed in a planned and careful manner.
- **Coordination of DERs with the BPS:** Distributed generation and storage (including behind-the-meter DERs and other DER technologies) currently follow local interconnection requirements and operational protocols that pose potential challenges to the BPS from a planning and forecasting perspective as penetration levels increase. This could be exacerbated by the “large flexible loads” noted above if these resources connect through distribution interconnection processes due to utility jurisdictional rights under state law rather than through the BES processes and NERC registrations used by large generators. New visibility, control and performance requirements may be needed to ensure BPS situational awareness and reliability.

- **Inconsistency in Interconnection Processes and Data Requirements**: Many entities still rely on rudimentary interconnection requirements, such as FERC pro forma interconnection agreements, that may not provide adequate specificity regarding detailed performance of resources (conventional, inverter-based, or others). Often the interconnection requirements are not consistent across areas or entities and may lack performance and modeling requirements. The lack of consistency and performance/modeling requirements within the interconnection processes may not only lead to under or abnormal performance of resources but also high levels of ambiguity for prospective resource owners who are looking to integrate new resources (large flexible loads, IBR resources, storage, etc.).
- **Human Performance and Skilled Workforce Adequacy Concerns:** The BPS is becoming more complex, and the industry will have difficulty staffing and maintaining necessary skilled workers as it faces turnover in technical expertise. The proliferation of entities providing services and grid transforming technologies will compete for available skilled workers. For example, the increasing demand for electromagnetic transient studies and models in many regions is an exacerbating problem for entities as the complexity and computational requirements of developing, testing, and maintaining such models are high, and there is very limited expertise in this area.

Recommendations for Mitigating the Risk

Grid transformation will continue to require new and innovative approaches, tools, methods, and strategies to be used in planning and operating the BPS. To address these challenges and opportunities, the RISC encourages the following actions in order of evaluated criticality to have the most impact and likelihood of mitigating the risk:

1. **Develop and include energy sufficiency approaches in planning and operating the grid:** Traditional resource adequacy approaches that assume the system is adequately planned if there is enough generation capacity during peak load hours have become insufficient given the accelerated changes in resource mix, extreme weather events, and fuel dependencies. NERC and the industry should collaborate to better understand and define energy sufficiency and develop approaches that examine the magnitude, duration, and impact across all hours and many years while also considering limitations and contributions to reliability from all resources (including load resources), neighboring grids, and transmission. The RISC encourages the Energy Reliability Assessment Task Force to continue its work in this area. The RSTC should consider additional bookend analyses to help inform policy makers about the implications and pace of grid transformation.
2. **Ensure sufficient operating flexibility during resource and grid transformation:** System operators and planners should ensure that sufficiently flexible ramping/balancing capacity is available to meet the needs of changing patterns of variability and new characteristics of system performance. In future decades, growing storage and demand-side flexibility may help mitigate the concerns for flexibility and attention will turn to multi-day energy concerns, but intraday flexibility remains important during this transition.
3. **Further consider the impacts and benefits of DER resources, electrification, energy storage, hybrid resources, and other emerging technologies:** NERC and the RSTC should work with industry stakeholders to support creative benefits and "out of the box" thinking while evaluating these rapidly emerging and evolving technologies. It is important that the operators of these emerging technologies participate in the ERO process to provide input and information, including at the distribution level. Ongoing innovation and deployment are inevitable, and they can provide many benefits through sufficient education, creativity, and collaboration.
4. **Plan for large and rapid load growth:** Driven by electrification, hydrogen production, data centers, crypto mining, and other computational and energy-intensive methods such as artificial intelligence (AI), new loads can emerge and grow faster than generation and transmission can be built. System operators and asset owners must coordinate infrastructure expansion and encourage new loads to also be sources of useful and necessary reliability services. Coordinating existing and new loads with grid additions may be important for reliability, but they require complex multiparty coordination and collaboration.
5. **Expand marketing to and development of the workforce of the future:** The BPS is becoming more complex, and the need to model, analyze, and operate the BPS at higher fidelity further exacerbates training, staffing,

and workforce issues. Competition for available skilled workers is a roadblock and risk. NERC and the industry must attract "the best and the brightest" to work on the challenges of grid transformation and decarbonization, support development and training of both the current workforce and those making mid-career transitions to our industry, and dramatically grow the educational and training pipeline for new students at all levels from vocational training to advance graduate degrees. Some workforce needs are quite specific as well as highly technical; and therefore, they require specific attention from NERC and the ERO Enterprise, such as the work of the Electromagnetic Transient Modeling Task Force as the demand for electromagnetic transients and more complex models will only increase for the planning and operation of the BPS.

6. **Expect and be open to dramatically new grid operation approaches and platforms:** The cadence of innovation and deployment is overwhelming traditional software platforms, interconnection processes, and performance standards. The multi-year cycles for clearing interconnection queues and updating grid management and market software platforms are becoming reliability risks. While physical interconnection requirements and standards will always be important, with the power grid becoming a central pillar of societal decarbonization, it will also become increasingly necessary to advance software platforms and operating paradigms to encompass a much larger population of complex and interacting entities. At the higher levels, grid management and operational platforms must evolve in new ways to accommodate these roles.

Heat Map

In this and subsequent heat maps (see **Figure 6**), successful mitigating activities would result in the risk migrating away from the red area and toward the green area (as shown by the direction of the arrow). Implementing Mitigating Activity 1 in each heat map is proposed to have the most likelihood and impact on moving the risk down. The numbers correspond to the mitigating activities as ranked in the Recommendations for Mitigating the Risk sections. By implementing successful mitigation activities, the ranking should ideally confirm that both the likelihood and impact of the risk is reduced.

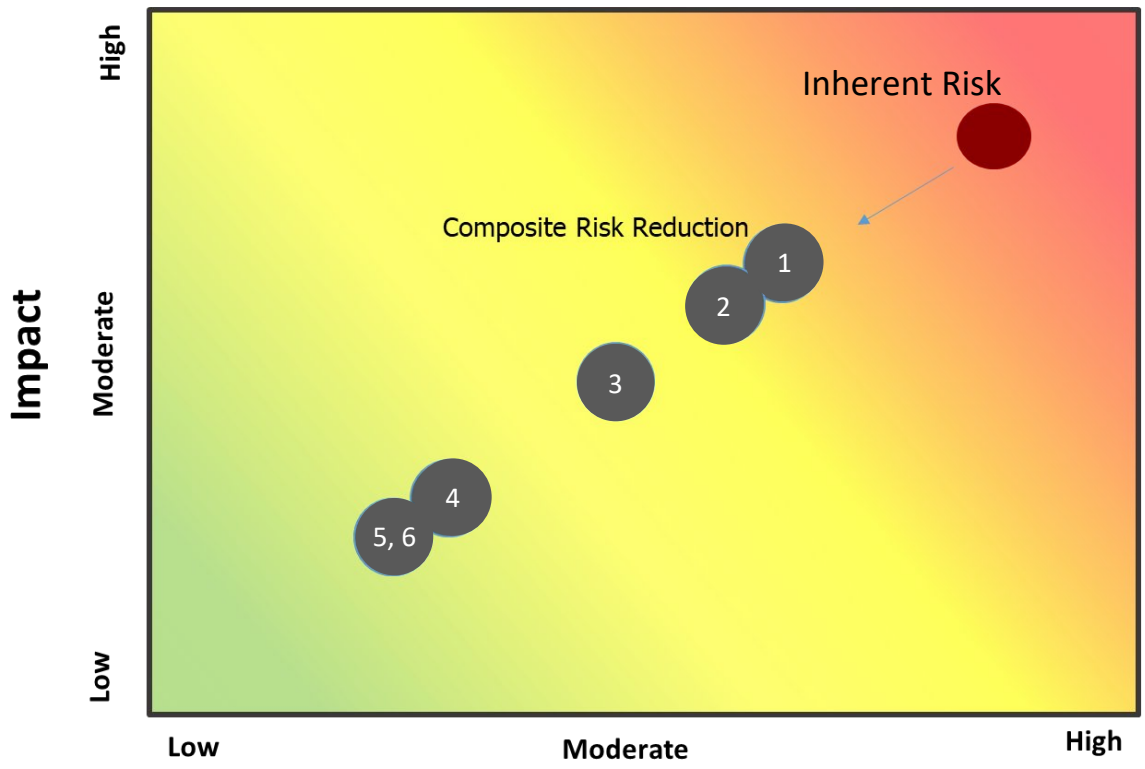
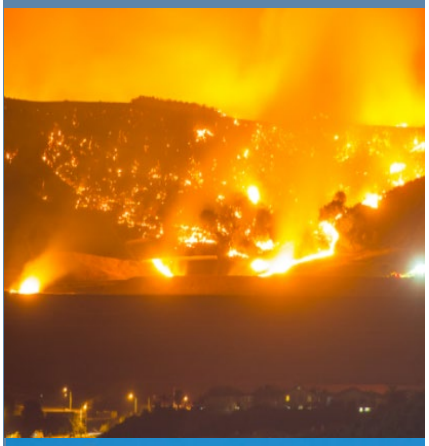
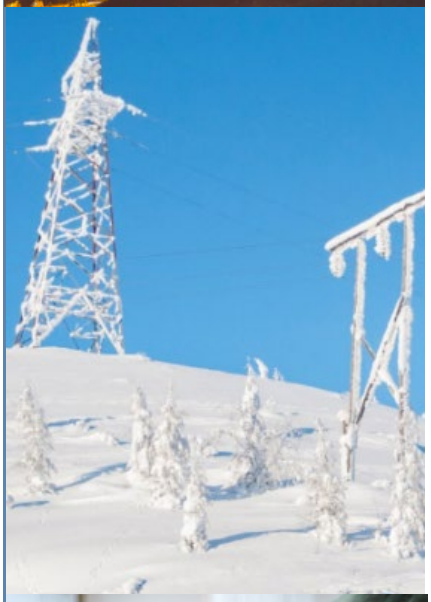


Figure 6: Grid Transformation Heat Map

Risk Profile #3: Resilience to Extreme Events





Statement of the Risk

Over the last several yearly Risk Reports, this profile's name has evolved from extreme natural events to extreme events and then to the current form—Resilience to Extreme Events. This rebranding was intended to make the profile more precise and actionable for several reasons described in this section. Therefore, the *2023 Risk Report* focuses on resilience to extreme events rather than specifically focusing on extreme natural events as identified in earlier risk reports.

BPS resilience to extreme events is an area of increasing focus. Reliability and resilience are related but distinct concepts:[6] BPS reliability involves performance consistency under various reasonably expected known or historical operating conditions. Resilience, on the other hand, involves the ability of the BPS to absorb and recover quickly from significant abnormal conditions or extreme events.

Put simply, resilience involves BPS risks with the potential to affect a broad geographic area and last an extended time.

NERC assessments over the last several years indicate that extreme ***natural*** events (e.g., storms, extreme temperatures) have caused a significant proportion of major BPS impacts. These extreme natural events can impact BPS resilience in several ways including:

- Increased intensity or frequency of events historically typical to a given area
- Instances of historically atypical events in a given area
- Longer term trends (e.g., higher average temperatures impacting ratings)
- Impacts on supply chain due to geographically larger events

Extreme natural events may affect the BPS equipment, resources, or infrastructure required to operate the BPS. Certain events are unique to the regions they impact, while others may occur in any area of the BPS. Planning studies confined to regional boundaries may not account for events that cross these boundaries. Recent cold weather events (like in ERCOT, MISO, and SPP) as well as heat events, such as the 2020 California event, underscore that extreme events pose challenges due to their nature, breadth, duration, and frequency. Also, aspects and characteristics of the grid transformation underway heighten the effects of these events and complicate mitigation. Each event type brings unique challenges from energy sufficiency, spare-parts availability, delivery, and restoration perspectives. Impacts from recent weather-related events have resulted in longer duration load loss and exacerbated consequences for customers. Preparation and proactive planning, procedures, and protocols are critical to assess and determine appropriate steps for both reliability and resiliency.

[6] Reference NATF/EPRI Resilience definition and NERC Resilience Framework.

More recently, other non-weather-related extreme events have posed challenges to BPS resilience. Most notably, the Covid-19 Pandemic altered all aspects of BPS management—increasing the probability of a severe impact while increasing the complexity of recovery (e.g., through staffing shortages, added challenges managing personnel in a remote mode, and supply chain impacts). Additionally, physical attacks have produced tangible impacts to the BPS.

For instance, reliance on natural gas generation is challenging due to the just-in-time nature of the fuel supply. While battery storage extends to 12-hour capacities, batteries do not provide the same level of resilience that multi-day or multi-week onsite fuel storage provide. To support the decarbonization of the economies, there is an active transition to electric vehicles, electric heating, etc. This will increase demand and call for higher levels of reliability as society becomes more tethered to a single clean energy source. This increasing dependence will further the ongoing shift of customer expectations regarding the reliability, resilience, and overall availability of electricity.

Historical planning and operations techniques cannot assure desired current and future performance as indicated by recent events and associated outages. For example, the BPS has increasing amounts of new technologies and resources that have not fully experienced extreme weather phenomena and may be more sensitive to extreme events in some cases. Furthermore, the new technologies have a significant digital component and represent an increased cyber-attack surface as such. Industry awareness of these changes and prospective performance deficits is being raised by NERC issuances (e.g., Level 3 Extreme Winter Weather Alert and Standards changes, such as EOP-11 and 12 updates). As further experience is gained with the evolving fleet of an active lessons-learned, the Reliability Standards program will be needed to ensure that the risks are appropriately managed.

While new technologies performance does not signal that these technologies and resources are incapable of operating in extreme conditions, it does underscore the need for added integrated system analysis to address them when inverter-based resources, distributed energy resources, and behind-the-meter generation become more prevalent. This evolving resource availability during extreme conditions must be considered, such as lack of wind during extreme temperatures or lack of solar during winter conditions. The precise risk of these having widespread impacts cannot yet be proven because the full penetration of these resources is yet to be realized; however, from a planning and preparation perspective, this cannot be ignored. Other risks described in this report can be “driven” by extreme events: grid transformation, cyber threats, and critical infrastructure interdependencies all have underlying issues that can be exacerbated with the advent of extreme events.

Descriptors of the Risk

Various North American regions routinely incur severe natural events, such as hurricanes and extreme cold weather. While the risk of these events in those regions is high, to date the relative impact on the BPS has been low:

- **Hurricanes** can cause widespread destruction to BPS equipment, degradation of communication capabilities, loss of load, and damage to generation resources. Recovery and restoration efforts can be hampered due to the size or scope of the storm as well as damage to interdependent infrastructure.
- **Tornados/Derecho** can cause localized destruction to BPS equipment, local degradation of communication capabilities, loss of load, and damage to generation resources. Recovery and restoration efforts can be hampered due to local damage to interdependent infrastructure.
- **Extreme Heat and Drought** can cause higher than anticipated demand, overloading and failure of BPS equipment, and degradation of resource availability. There can be limited water available for operating hydroelectric generation or reduced cooling water capacity. Drought can also be a precursor to wildfire risk as described in the next bullet.
- **Wildfires** can be a direct threat to BPS equipment. Pre-emptive actions, such as de-energizing equipment, can be taken where wildfire risk is significant. Communication programs and applications, such as new sensing equipment, can address some of the risks. However, such action needs to be balanced against the added system risk from the associated reconfiguration. Furthermore, wildfires can reduce output from

variable energy resources such as solar, requiring operators to find alternative sources to make up for the loss of energy from these resources.

- **Flooding** can occur in any area and in any season of the year. The impacts from flooding include mechanical damage to BPS equipment, degradation of clearances, fuel infrastructure, personnel access, and communications capabilities.
- **Extreme Cold Weather (Polar Vortices)** can cause higher than anticipated demand, overloading and stress failure of BPS equipment, increased reliance on interdependent critical infrastructures, and degradation of energy availability via resource mechanical failure or fuel supply interruption.[7]
- **Ice Storms** can be a direct threat to BPS equipment. The impacts from these storms combined with high winds include infrastructure damage as well as limited personnel access and communication capabilities.

Added, going forward considerations regarding severe natural events that are historically atypical. This could include the above examples but with added intensity or frequency, gradual longer-term effects, or events atypical to a geographic area such as:

- **Extreme events,** such as Super Storm Sandy, which caused extensive flooding in Manhattan, New York. This type of storm was not especially large compared to storms seen in the Southeastern United States, but the storm surge combined with tidal conditions caused unprecedented flooding. This caused significant outages and required subsequent revision to design basis assumptions for flooding.
- **Increased average temperature,** such as those experienced in 2021 where temperatures rose to 120F, challenge facility ratings assumptions.[8]
- **Significant low wind conditions** that impact large amounts of wind generation over a large area can result in the loss of tens of gigawatts of capacity all at the same time. Recent experiences, such as that on June 7, 2023, in the Midwestern United States may signal the need for deeper analysis of these events when they happen and what resources need to be available to address them.

Other types of severe natural events, though less likely, could have a higher impact given the potentially broader geographic footprint. See the following examples:

- **Earthquakes** are possible in many areas of the United States and Canada. Depending on the scope and magnitude of the event, BPS facilities and interdependent critical infrastructure may suffer mechanical damage (e.g., communications, fuel, transportation). Earthquake recovery could be long and require further assessment and coordination among utilities and the ERO Enterprise.
- **Geomagnetic Disturbances** can induce harmonic currents in BPS circuits and equipment. In addition, the impacts of these disturbances result in induced direct currents that may overheat some older transformers, result in relay misoperations, and increased reactive demand or damage to reactive resources. Geomagnetic disturbance events can also affect communications capabilities, fuel delivery, and GPS systems.
- **Pandemics** can greatly alter the way the BPS is operated, specifically Covid-19. Effective telecommuting and cloud-based data exchanges enabled the grid to continue reliable operation and resulted in no major disruptions for power deliveries. However, this new paradigm also underscores the necessity to maintain proper controls and protocols for security around both systems and human capital.

[7] Cold Weather Project 2021-07: https://www.nerc.com/pa/Stand/Pages/Balloting.aspx
[8] In June 2021, a new maximum temperature of 120F was set in Washington State.

Man-made events could have a higher impact given the potentially broader geographic footprint and/or the potential for initiation in conjunction with a natural event See the following examples:

- **National Security Risks** such as civil unrest, riots, labor action/strikes, and other events could create potential issues around the physical security of the BPS as well as safety of critical personnel necessary to carry out the actions needed to maintain the reliable operation of the BPS.
- **Coordinated cyber and/or physical attack on the BPS or generation fuel sources,** especially in conjunction with another event (e.g., hurricane, severe cold), could be especially impactful.

Furthermore, there are events that pose added challenges for BPS resilience: concurrent significant increases in electrical demand (see Energy Policy); dramatic changes to BPS operating characteristics (see Grid Transformation); the growing prevalence and sophistication of security threats (Security); and de facto reliance on natural gas generation (Critical Interdependencies); and lagging construction of well-placed, highly resilient transmission. Insufficient integration of these considerations and harmonization of associated actions exacerbate the risk in the following situations:

- **Electrical demand** is expected to increase by approximately 30% by 2050 to meet de-carbonization and electrification goals.
- **Operating characteristics** are changing across North America, including changes in peak demand timing (e.g., intra-day, winter to summer, summer to winter, peaking overnight with electric vehicle charging) and increased sensitivity to small temperature changes due to penetration of electric heat pumps with resistive heating.
- **Security challenges** are continuing to evolve**.** As recently witnessed, even unsophisticated ballistic attacks can result in load loss. Cyber threats are increasing in frequency and sophistication and are benefitting from an increased attack surface as the grid becomes more digitized. Supply chain concerns at the component and subcomponent level introduce another dimension to the security challenge along with a growing deliverability concern that could impede restoration activities. Furthermore, while the recent acceleration of artificial intelligence provides prospective benefits to engineering and operating the BPS, it also likely adds another cyber security dimension for use by bad actors.
- **Reliance on natural gas generation is increasing** as traditional coal- and oil-fired generation is being retired faster than new renewable generation can come online. This is resulting in added de facto reliance on natural gas-fired generation as the interim “bridge” resource. This increases generation uncertainty given the just-in-time nature of that fuel supply and observed shortcomings in natural gas reliability.
- **Construction of well-placed, highly resilient transmission** is not keeping pace with other changes. Transmission siting and permitting is historically arduous, and this combined with jurisdictional issues may result in insufficient timely construction of resilient-design, cross-regional transmission.

Lastly, the cumulative set of above challenges increases the risk of a significant event impacting resilience. Better harmonization and pacing of the associated changes, more strategic deployment of transmission (both location and design) and further emphasis on restoration capabilities (e.g., formal Emergency Management Programs and Incident Command Structures) are among the needed mitigations.

Recommendations for Mitigating the Risk

Extreme events and their potential impacts on BPS should be monitored and addressed to maintain reliability and improve resiliency. Based on uncertainties predicting some events, it is important for operations and planning personnel to remain vigilant and prepare for high-risk seasons by learning from prior events, practicing recovery efforts, and anticipating impacts of an event to critical infrastructure. Seasonal reliability assessments should consider how more prolonged and widespread natural events may stress the system. Sufficient capacity and energy are

needed to prepare for, operate, or when necessary, restore the BPS. NERC and industry have taken actions to mitigate some of these risks by recent efforts in developing a Cold Weather standard for generators, the development of a joint NERC/WECC guide on effective management of wildfire, and the formation of the Energy Reliability Assessment Task Force /Working Group as well as the first Level 3 NERC Alert. Furthermore, certain regions may become more dependent on neighboring regions if greater than anticipated forced outages of generators occur. These dependencies should be identified.

The RISC encourages the following actions in order of evaluated criticality to have the most impact and likelihood of mitigating the risk from extreme events:

- Conduct special assessments of extreme event impacts, including capturing lessons learned, create simulation models, and establish protocols and procedures for system recovery and resiliency: The ERO Enterprise and industry should conduct detailed special assessments of extreme event impacts by geographical areas that integrate the following:
- Critical Infrastructure interdependencies (e.g., telecommunications, water supply, generator fuel supply)
- Analytic data and insights regarding resilience under extreme events
- Continue to address the root causes identified under the FERC/NERC joint inquiry(s) on cold weather outages in ERCOT, MISO, and SPP; and weather impacts related to Winter Storm Elliot. Augment those efforts by determining effects of the changing resource mix over time and the performance of those resources during these widespread extreme temperature events.

Based on those assessments, ERO Enterprise should develop detailed special assessments on possible mitigation plans and provide a roadmap for their implementation. The roadmap should include specific protocols and procedures for system restoration and system resiliency. Furthermore, the ERO Enterprise and industry should do the following:

- **Accelerate planning and construction of strategic, resilient transmission.** The ERO Enterprise should work with DOE, FERC, state regulators, Provincial, and others to enable timely and sufficient construction of resilient transmission. Such transmission should enable power routing from remotely located renewable sources to areas of high demand (even if cross-region); it should be planned, designed, and constructed with resilience in mind. For instance, prioritize transmission installation with the explicit objective of reducing resilience risk and ensuring "hardening" for anticipated risks (e.g., use of metal/concrete structures in areas of anticipated wildfire risk). Ensure the increased risk of physical attack from added circuit miles is more than compensated for given risk reduction benefits associated with added redundancy, diversity, and minimization of very high-risk assets.[9]
- **Development of tools for BPS resiliency:** DOE is performing analyses to evaluate both static, dynamic, and real time scenarios that affect BPS reliability and resilience including transmission needs and planning studies, and evaluation of asset performance under extremes. NERC should continue to work with DOE on these efforts to ensure robust tools that can be used industry wide to evaluate potential threats to generation, transmission, and fuel supplies.
- **Regional coordination:** States and any other applicable governmental authorities should meet collectively to discuss and understand impacts to ensure they are a part of the resiliency discussion. This regional coordination will ensure the acknowledgement of roles in understanding the impacts, resilience investments, and implementing mitigating activities, such as formal mutual aid agreements.
- **Workforce development:** Entities should continue to focus on attracting, developing, and retaining the skilled workforce needed to plan, construct, and operate the transforming BPS**.**

[9] Debt Ceiling Legislation: Interregional Transfer Capability Determination Study

- **Industry forums:** Forums should share and coordinate information sharing on best practices around resiliency efforts related to design considerations, supply chain deliverability issues, and identification and response to major storm events. Sharing experiences and best practices is critical.
- **Drills and emergency response:** BPS operators should have formal emergency management programs that include periodic drills and exercises. The intention is to prepare operators to respond quickly and effectively to potentially larger incidents impacting BPS reliability as well as help ensure appropriate coordination with applicable state and local resources.
- **Understanding of geomagnetic disturbance events on BPS:** The ERO Enterprise should monitor industry implementation of applicable actions to help reduce geomagnetic disturbance event risk to the BPS.

Heat Map

In this and subsequent heat maps (see **Figure 7**), successful mitigating activities would result in the risk migrating away from the red area and toward the green area (as shown by the direction of the arrow). Implementing Mitigating Activity 1 in each heat map is proposed to have the most likelihood and impact on moving the risk down. The numbers correspond to the mitigating activities as ranked in the Recommendations for Mitigating the Risk section. By implementing successful mitigation activities, the ranking should ideally confirm that both the likelihood and impact of the risk is reduced.

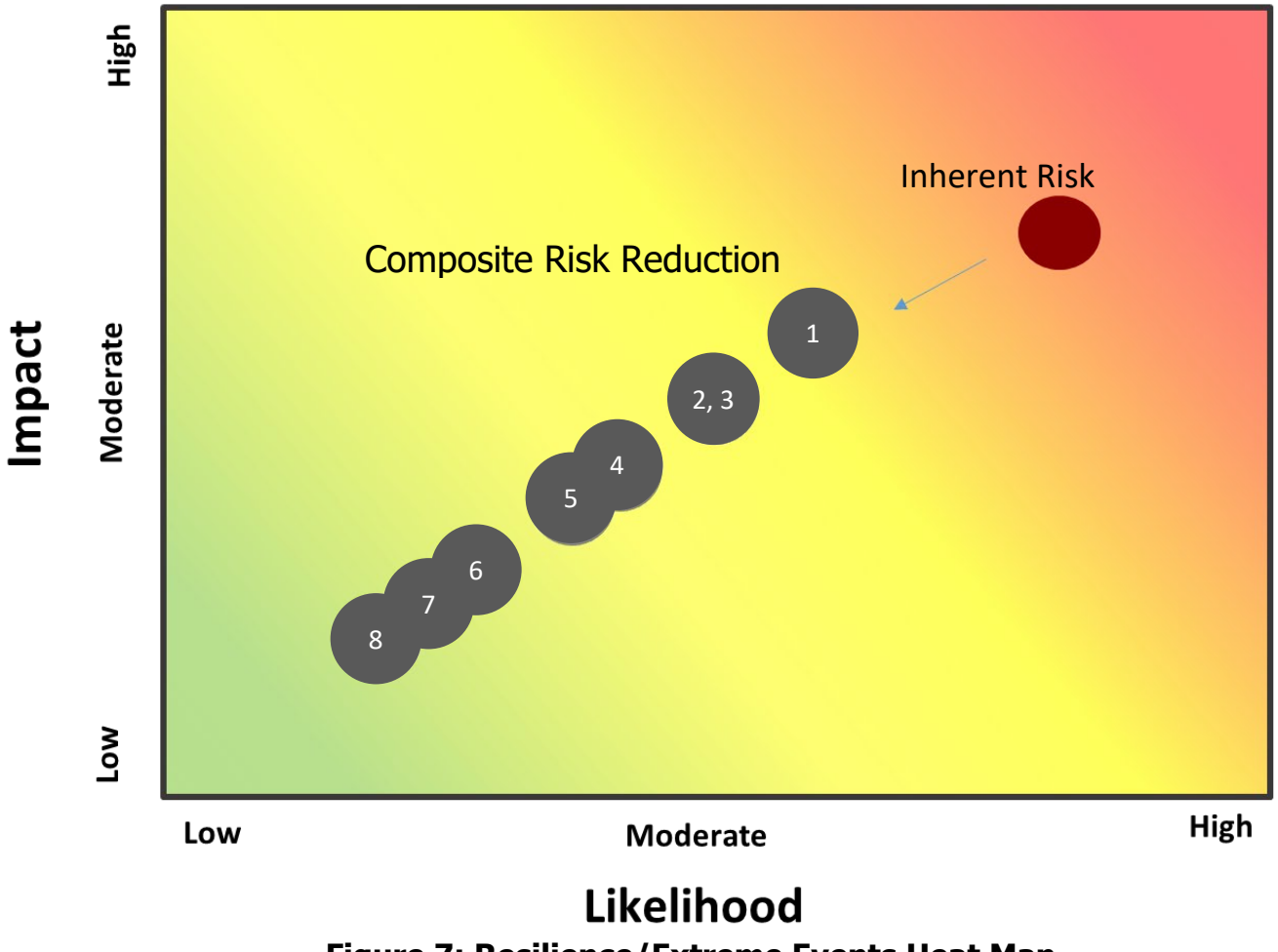
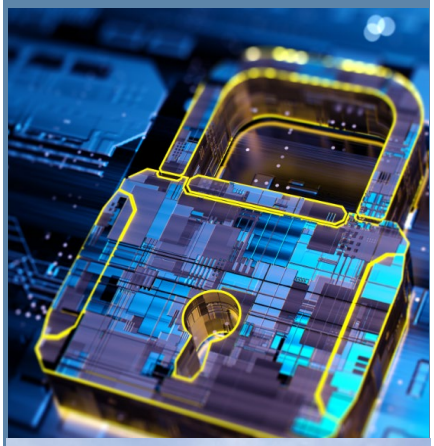
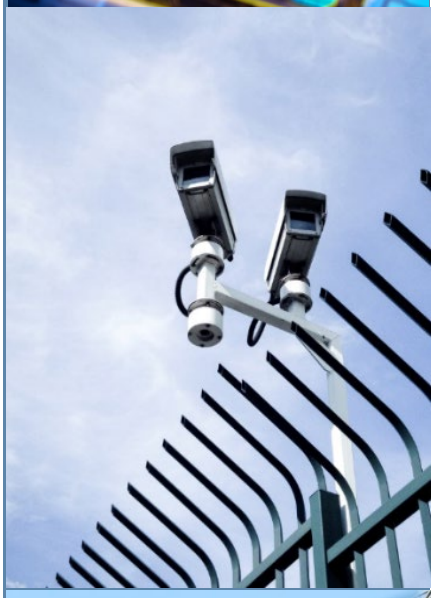
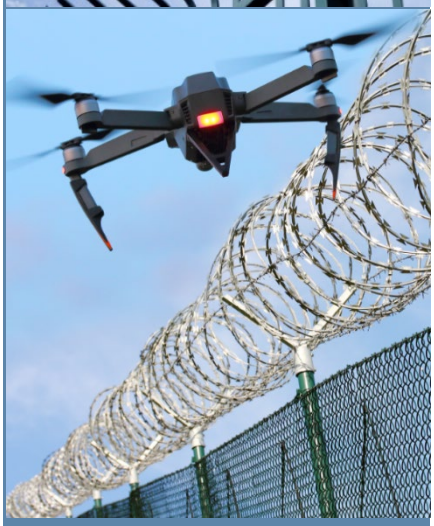


Figure 7: Resilience/Extreme Events Heat Map

Risk Profile #4: Security Risks







Statement of the Risk

The North American BPS is a vast, interconnected network that serves almost 400 million consumers across North America, and its security hinges on measures facilitated by the ERO. Over the past few years, BPS infrastructure is growing rapidly with new facilities, services, and technology integration. These all lead to many challenges for operational security, an essential element of a highly reliable and resilient BPS. This rapid expansion is increasing the potential cyber-attack surface and is raising the potential impact of coordinated attacks. Cyber and physical security are interdependent aspects as exploitation of either physical or cyber security vulnerabilities could be used to compromise the other dimension. Resultant impacts could cause asset damage, functionality loss, or limit the situational awareness needed to reliably and resiliently operate or promptly restore the BPS. These vulnerabilities are exacerbated by insider threats, poor cyber hygiene, equipment technical feasibility limitations, and supply-chain considerations. Sources of potential exploitation include increasingly sophisticated attacks by nation-state, terrorist, and criminal organizations.

These transformative changes include the convergence of information and operational technology, reliance on cloud-based technology, the emergence of (AI) technology, and potential workforce knowledge gaps. Additionally, dispersed management systems, such as those used by DER aggregators, Internet-of-Things devices, outage management systems, and increased automation/integration of operational technology networks are increasing the cyber-attack surface while the use of cloud-based hosting or services introduces the risk of code and/or data breach vulnerabilities through the use of third-party software and/or hardware. Equipment used to monitor, protect, and control the BPS as well as externally connected support systems (e.g., OMS, voice communications) could be directly exploited. Additionally, interdependent critical infrastructure sectors and subsectors (e.g., communications, water supply and natural gas used for electric power generation) can be exploited or infiltrated in a manner that impacts BPS reliability.

In recent years, there has been an uptick in physical security events, including copper theft and ballistic damage, against the BPS and specifically at distribution substations. Vulnerabilities to such events are exacerbated by commodity prices, supply chain constraints, environmental activists, and domestic violent extremists.

Descriptors of the Risk

Whereas the incidence of both cyber and physical security attacks specifically targeted against BES and distribution substations have not resulted in any significant impacts to BPS reliability to date, recent threats in other industries underscore a need for increased vigilance and concerted effort to continue development of counter-measures to prevent, detect, respond and recover from more serious attacks.

To continue the efforts toward mitigating the effects of security risks, the RISC is providing further details on the following:

- **Physical Security Risks:** The nature and impact of physical vulnerabilities are better understood than cyber security risks. The impacts from significant physical attacks are likely to be more localized geographically. Recent on-line chatter regarding (and disrupted efforts to perpetrate) coordinated attacks are concerning. There is an ongoing evolution of the physical security risk posed by drones and limitations on response capabilities with existing laws and regulations. Some of the largest risks are considered to be co-dependence with cyber security (e.g., computer controls for physical access) and the prospective impact of replacing long lead-time equipment (e.g., large power transformers) damaged during an attack.
- **Cyber Security Risks:** Exploitation of cyber security risks could arise from a variety of external and/or internal sources. Additionally, the operational and technological environment of the electric grid is evolving significantly and rapidly as well as potentially increasing the cyber-attack surface:
  - Cyber attacks across all critical infrastructure sectors have increased; for example, the 2021 Colonial pipeline attack, the 2021 Microsoft Exchange On-Premise Product Vulnerability Exploitation, the 2021 Log4J vulnerability, the 2023 Black & MacDonald attack, and numerous variations of ransomware attacks accentuate supply chain vulnerabilities and threats from both foreign and domestic adversaries.
  - AIand machine learning can also be used as tools that cyber criminals employ to increase the success probability of attacks.
  - The increasing trend towards the virtualization and hosting of critical systems in “the cloud” could expose the electric industry to additional risks.
  - Supply chains provide opportunities for nation-states, terrorists, and criminals to impact organizations through procurement of information technology, operational technology, software, firmware, hardware, equipment, components, and/or services.
  - The increased connection of DERs and DER aggregators may pose increased cyber risks to the reliable operation of the BES. There are currently no cyber security regulations that address the risks from all of these new industry participants.
  - The 2023 National Cybersecurity Strategy incorporates concepts like “Secure by Design” that promote security controls being implemented during installation and construction, not added later. This further reinforces the need to define, design, and encourage security controls for new entrants and participants at the time of implementation and interconnection.
  - Additionally, in the 2023 National Cybersecurity Strategy, developing “a diverse and robust national cyber workforce” needs to be a priority for government and industry going forward.
  - An electromagnetic pulse (EMP) is a man-made short-duration, high-energy burst that may be disruptive or damaging to electronic equipment. Grid operators need to understand and recognize the hallmarks of an EMP event. A high-altitude EMP is an electromagnetic pulse stimulated by a nuclear blast in the atmosphere; such an action would likely be initiated by a nation-state and thus have clear national security implications. High-altitude EMP concerns include the large geographic footprint susceptible to the pulse, range of electric grid equipment at risk (generation, transmission, distribution, and load), and a lack of definitive forewarning. Smaller portable devices are assumed to result in a relatively limited localized potential impact and can be considered analogous to the physical attack vector.

Recommendations for Mitigating the Risk

To continue the efforts toward mitigating the effects of the security risks, the RISC encourages the following actions in order of evaluated criticality to have the most impact and likelihood of mitigating the risk:

1. **NERC should develop guidance for industry on the best practices** to mitigate the risks from cloud adoption and the use of AI technologies.
2. **NERC should continue to facilitate the development of planning approaches, models, and simulation methods** that may reduce the number of critical facilities and thus mitigate the impact relative to the exposure to attack.
3. **The ERO should take the lead in encouraging government partners to create a supply chain certification system** that can be used by original equipment manufacturers, system integrators, and service providers to submit supply chain risk (SCR) qualifications, similar to the FedRamp program, which the industry can utilize prior to engagements or purchases. (How to Become FedRAMP Authorized | FedRAMP.gov)
4. **NERC should develop guidance to define best practices** for "Secure by Design" and "Adaptive Security" principles in information technology and operational technology systems development and implementation.
5. **The Electricity Information Sharing Analysis Center (E-ISAC) should continue to encourage industry efforts on workforce cyber education** to raise awareness of methods and tactics used by cyber attackers (e.g., email phishing, credential theft).
6. **NERC should highlight key risk areas that arise from the EPRI's EMP analysis** for timely industry action. Additionally, training should be provided to grid operators on the hallmarks and potential impacts of an EMP attack.
7. **NERC, while collaborating with industry, should continue to evaluate the need for additional assessments** of the risks from attack scenarios (e.g., vulnerabilities related to drone activity, attacks on midstream or interstate natural gas pipelines or other critical infrastructure). NERC's lessons learned exercises have been helpful and require additional focus through seminars that educate the industry on best practices in system security planning.
8. **E-ISAC should continue to execute its long-term strategy** to improve cyber and physical security information-sharing, protection, risk analysis, and increase engagement within the electric sector as well as with other ISACs.
9. **Supply chain risk management and the threats from components and sub-components developed by potential foreign adversaries should continue to be addressed** by the E-ISAC, other federal partners, and industry to continue diligently working to mitigate threats.
10. **The industry must continue to focus on early detection and response** to cyber attacks and adopt controls that can be executed to protect critical systems.
11. **GridEx:** NERC has been conducting a biennial industry exercise that helps industry both prepare and react to potential BPS security threats. This exercise, known as GridEx, is a distributed-play grid exercise that enables participants to engage remotely and simulates a cyber and physical attack on the North American electric grid and other critical infrastructure. NERC should continue to expand the scope of GridEx to include and collaborate with cross-sector industries, such as natural gas, telecom, and water as well as state, local, and tribal authorities. Future exercises should increase the focus on detection strategies while continuing to improve the ability to respond and expedite recovery.
12. **Efforts like the Cybersecurity Risk Information Sharing Program, Essence 2.0, and other similar programs similar in nature should continue**. Additional efforts to develop cyber security tools and frameworks are underway with various organizations, including National Institute of Standards and Technology, NATF, trade associations, and government partners.

Heat Map

In this and subsequent heat maps (see **Figure 8**), successful mitigating activities would result in the risk migrating away from the red area and toward the green area (as shown by the direction of the arrow). Implementing Mitigating Activity 1 in each heat map is proposed to have the most likelihood and impact on moving the risk down. The numbers correspond to the mitigating activities as ranked in the Recommendations for Mitigating the Risk section. By implementing successful mitigation activities, the ranking should ideally confirm that both the likelihood and impact of the risk is reduced.

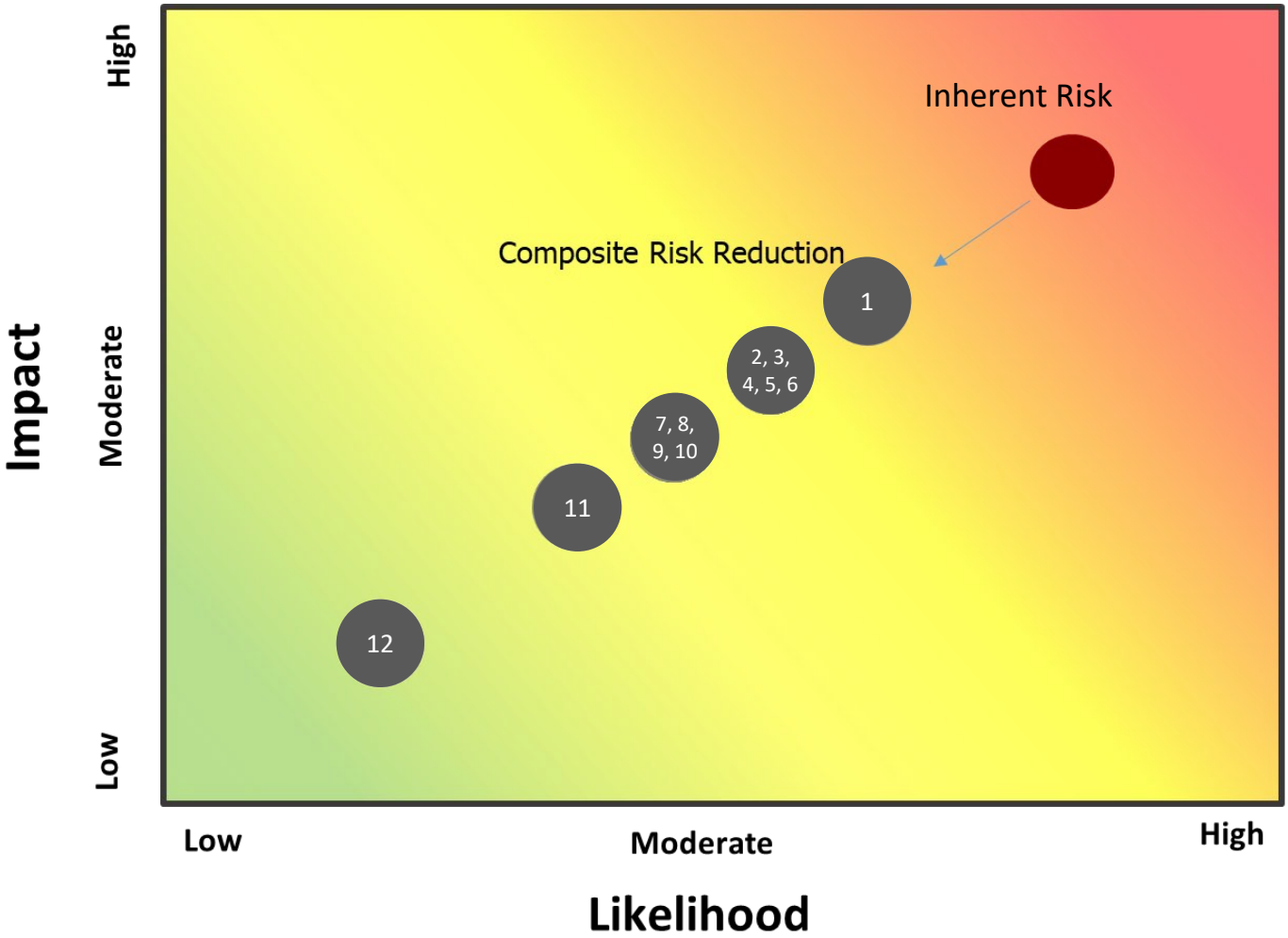


Figure 8: Security Risks Heat Map

Risk Profile #5: Critical Infrastructure Interdependencies

Statement of the Risk

Significant and evolving critical infrastructure sector (e.g., communications, water and wastewater, financial, critical manufacturing, transportation) and energy subsector (e.g., oil, natural gas) interdependencies are not fully or accurately characterized, resulting in incomplete understanding of the impacts of BPS disruptions on other infrastructure sectors or subsectors. Similarly, disruptions or compromise to other critical infrastructures may affect or disrupt reliable BPS operations. Furthermore, as there are increasing interdependencies between these critical infrastructures due to the transformation of the grid, impacts on one can have a rippling effect on others. These interdependencies are likely to increase significantly as the electrification of critical sectors, such as transportation increase. For example, electrified transportation will be challenged to bring materials and emergency services to areas with widespread outages (e.g., after a hurricane) that could hamper restoration efforts. Widespread and extended outages of electric and natural gas compressors can result in natural gas delivery issues across the system, impacting not only home heating, but also electricity generation. Widespread and extended outage of communication systems could potentially hamper situational awareness and real-time operation of the BPS. Furthermore, loss of electricity can impact all of these sectors/subsectors that are dependent on reliable, resilience, and secure energy.

Descriptors of the Risk

- Recent BPS events have highlighted that sector interdependence is becoming more critical, particularly during emergency events. Digital communications for electric system protection and control as well as for voice communications (particularly cellular) for emergency response and restoration are critical. Remote work arrangements by critical electric sector employees further underscores the need for seamless and uninterrupted communications during emergency events.
- Energy subsector interdependence continues to increase and has reached an inflection point with the natural gas subsector. Growing reliance on natural gas as an electric generation fuel source creates the potential for common-mode failures that could have widespread reliability impacts. The dependence of BPS reliability on natural-gas-fired generation does not always align with service priorities within the natural gas delivery system as well as with the weatherization requirements for natural gas gathering and delivery systems. Furthermore, the natural gas delivery system depends on reliable electric service to deliver natural gas at acceptable pressures; however, the foreseeable growth and dependence of BPS reliability on natural-gas-fired generation does not align with the expected pace of pipeline development. The financial sector could also be impacted by major outages, resulting in failure to approve everyday transactions and provide the necessary financial capital needed to ensure restoration.
- Cross-sector and energy subsector implications and coordination are not routinely socialized or thoroughly tested during drills or fully understood by both industry participants and regulators.

- State, provincial and federal governmental oversight and regulatory constructs differ widely among the sectors and energy subsectors, and this impedes information sharing and alignment on the criticality of service.

Recommendations for Mitigating the Risk

To continue the efforts toward mitigating the effects of critical infrastructure interdependencies, the RISC encourages the following actions in order of evaluated criticality to have the most impact and likelihood of mitigating the risk:

- **NERC should conduct a study** to determine the percent of available generation with on-site or firm fuel capacity in each Regional Entity.
- **As the interdependence is strong between the electric and natural gas sub-sectors, these sectors should jointly create weatherization standards**. In areas where weatherization standards already exist, benchmarking of performance versus those standards should be performed.
- **NERC and industry partners should continue to conduct meetings and conferences to highlight the importance of cross-sector and energy subsector interdependence and coordination**, such as the NERC Reliability Summit, NATF/EPRI resiliency summits, the North American Energy Standards Board Forum, and FERC/DOE technical conferences. These strategic interactions among critical infrastructure partners (e.g., industry and regulators) should focus on the identification of mutual priorities and mitigation actions. Traditional planning assumptions used by sectors independently no longer hold true going forward.
- **NERC, in collaboration with industry and industry partners, should continue to identify and prioritize limiting conditions and/or contingencies** that arise from other sectors that affect the BPS.
- **NERC and Reliability Coordinators should continue to conduct special assessments** that address natural gas availability and pipeline common mode failures.
- **NERC and industry partners should continue to increase emphasis on cross-sector coordination** in industry drills (e.g., NERC Grid-Ex, Public Safety Canada's Cy-Phy Exercise, DOE drills, utility exercises (e.g., Southern California Edison Resilient Grid Exercise)).
- **NERC should investigate the feasibility of potential infrastructure improvements,** such as feeder segmentation required to facilitate more pinpoint control of load during emergencies in order to increase the amount of load available for rotating outages.
- **The EPRI and DOE should continue their work on communication alternatives** but also the use of same or similar technologies for critical supervisory control and data acquisition data. New technologies should be explored that could assist in providing unique and hardened back-up telecommunication methods for the most critical data.
- **The ERO Enterprise should continue to communicate to state, provincial, and federal regulators of natural gas** about the critical interdependence of this fuel source with the other infrastructure sectors.
- **NERC and industry partners should continue to evaluate voice and data communication interdependencies and strategies** for ensuring continuous communications during an emergency event, particularly as remote working arrangements grow.
- **NERC should continue to encourage industry to consider the unavailability of other critical infrastructures**, such as water, sewer, roads, rails, and communications in their emergency plans.

Heat Map

In this and subsequent heat maps (see **Figure 9**), successful mitigating activities would result in the risk migrating away from the red area and toward the green area (as shown by the direction of the arrow). Implementing Mitigating Activity 1 in each heat map is proposed to have the most likelihood and impact on moving the risk down. The numbers correspond to the mitigating activities as ranked in the Recommendations for Mitigating the Risk section. By implementing successful mitigation activities, the ranking should ideally confirm that both the likelihood and impact of the risk is reduced.

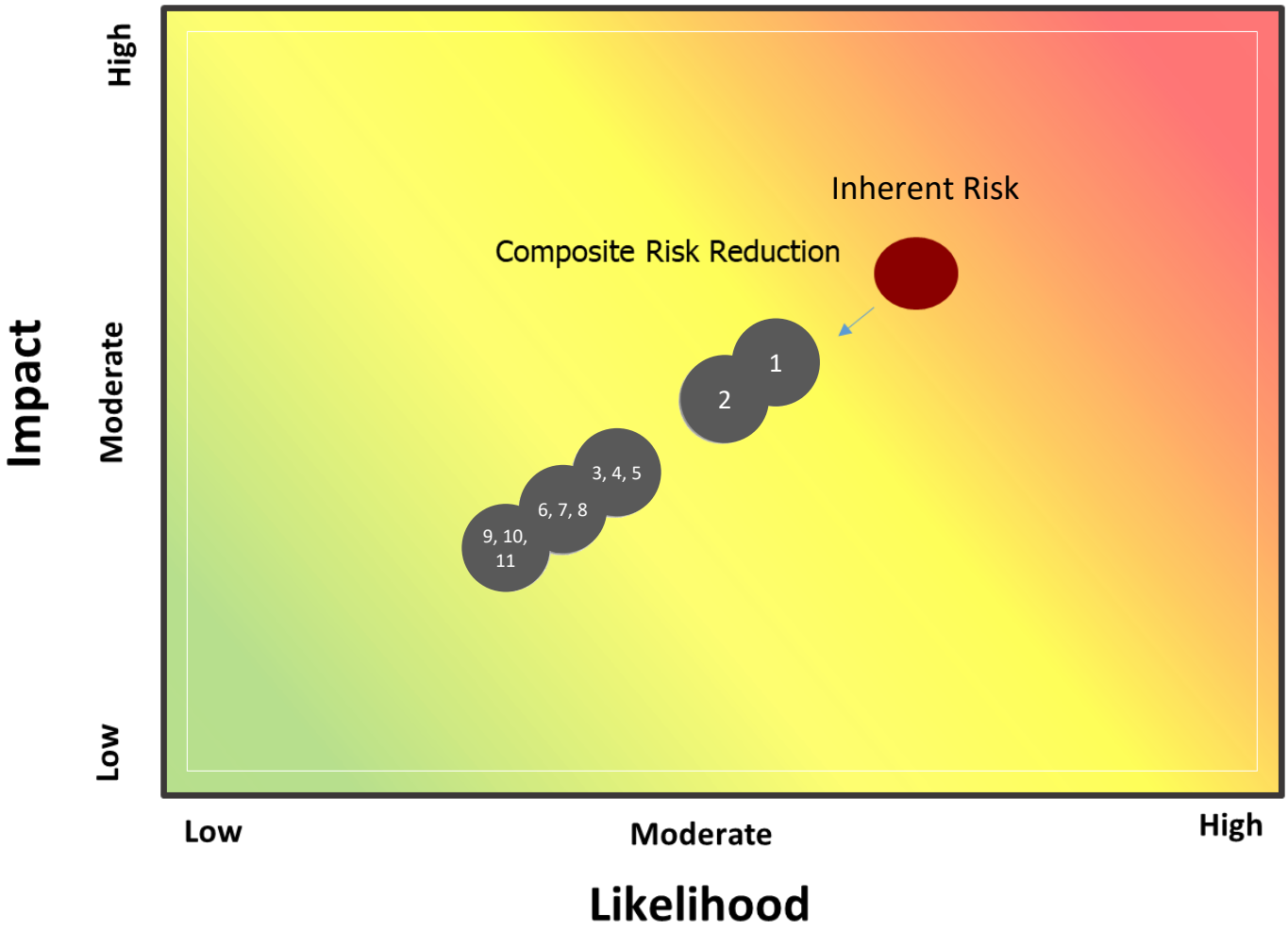


Figure 9: Critical Infrastructure Interdependencies Heat Map

2023 Work Plan Priorities

Action
Update

Summary
NERC Management will present the semi-annual update of the NERC Work Plan Priorities which cover the following areas of focus:

- **Energy:** Tackle the challenge of grid transformation; climate change-driven, extreme weather; and inverter performance issues;
- **Security:** Move the needle by focusing on supply chain, Information Technology (IT) and Operational Technology (OT) system monitoring, cyber-informed grid planning and design, and evolution of the Critical Infrastructure Protection (CIP) standards;
- **Agility:** Tool the company to be more nimble in key areas, particularly standards development, internal operational processes, technical deliverables, revisit the FERC settlement restrictions, and explore alternate funding mechanisms; and
- **Sustainability:** Invest in ERO systematic controls, eliminate single points of failure, strengthen succession planning, and ensure robust cyber security protections for all systems.

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

2023 Work Plan Priorities Midyear Update

Erika Chanzes, Manager of Business Planning
Board of Trustees Meeting
August 17, 2023

RELIABILITY | RESILIENCE | SECURITY




2023–2025 Strategic Areas of Focus

Energy: Tackle the challenge of grid transformation and climate change-driven, extreme weather

Security: Move the needle by focusing on supply chain, Information Technology (IT) and Operational Technology (OT) system monitoring, cyber design, and evolution of the Critical Infrastructure Protection (CIP) Standards

Agility: Tool the company to be more nimble in key areas, particularly standards development, internal operational processes

Sustainability: Invest in ERO systematic controls, eliminate single points of failure, strengthen succession planning, and ensure robust cyber security protections for all systems

Background

- **NERC's 2023 Business Plan and Budget (BP&B) was approved by the Board of Trustees in August 2022**
  - The 2023 BP&B laid out the areas of focus and supporting investments for the 2023 budget year and 2024 and 2025 projections
- **NERC's 2023 Work Plan Priorities (WPPs) were approved by the Board in November 2022**
  - There are 32 individual WPP items, broken down by program area
- **The 2023 WPPs are NERC's goalpost for executing Year 1 of the three-year plan**
  - Reporting on the 2023 WPPs and the associated benefits of investments is integrated throughout the year

Background

- **Since the 2023 WPPs were approved last November, NERC has received several directives/mandates from FERC related to:**
  - Registration of Inverter-Based Resources (IBRs)
  - Studies/standards related to Internal Network Security Monitoring (INSM)
  - Evaluation of physical security standards and security attacks on the BPS
  - Cold weather and transmission planning standards
- **And one mandate from Congress:**
  - Perform an Interregional Transfer Capability Study (ITCS) and deliver to FERC by December 2, 2024
  - The ITCS is an unprecedented, significant body of work to complete in 18 months, requiring additional resources and reprioritization of projects

Status Summary

32 Individual WPPs

3 – Complete

25 – Progressing/On Track

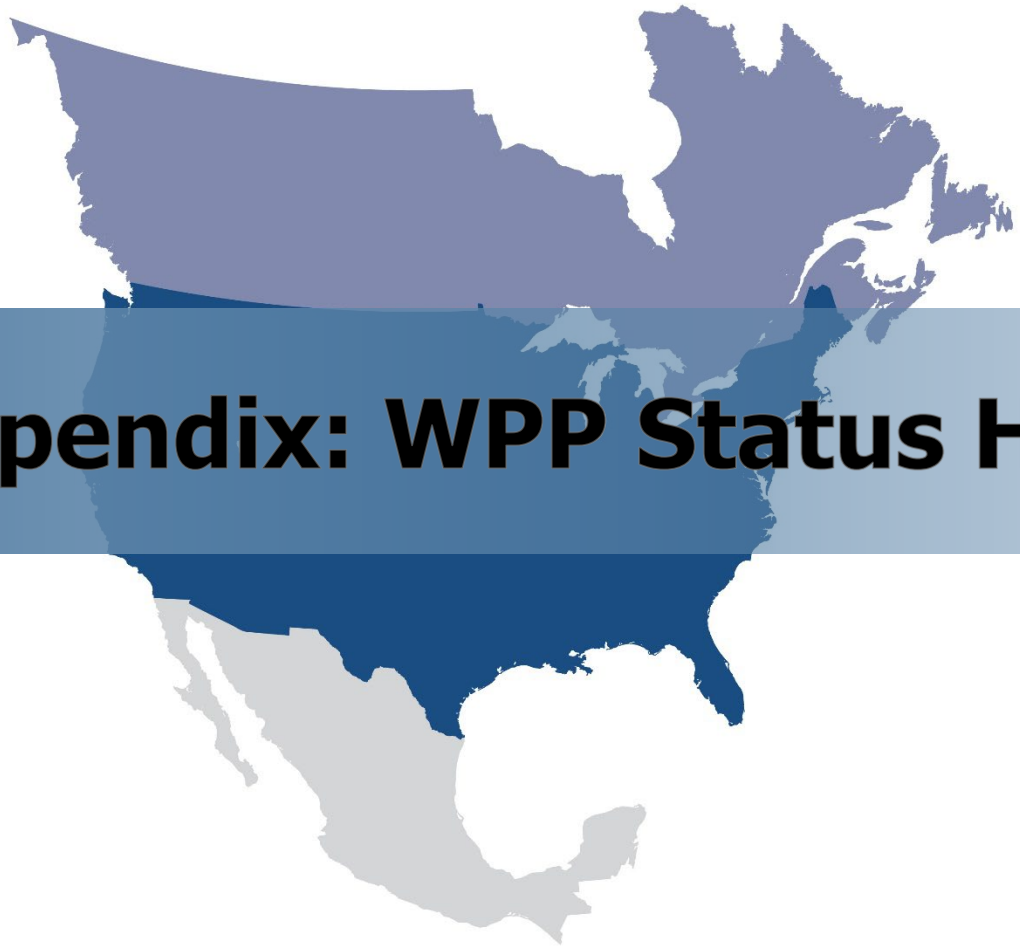
2 – At Risk

- Energy Assessment Reliability Standards in the operations timeframe on track, but planning will likely addressed in early 2024
- Cybersecurity Risk Information Sharing Program (CRISP) growth

2 – Will Not be Reached

- Special assessment on new and evolving electricity market practices deferred due to ITCS; will partially address in this year's *Long-Term Reliability Assessment* as well as in the ITCS
- Of the numerous standards projects to address IBRs, at least three projects will extend into 2024 due to higher priority FERC TPL directive

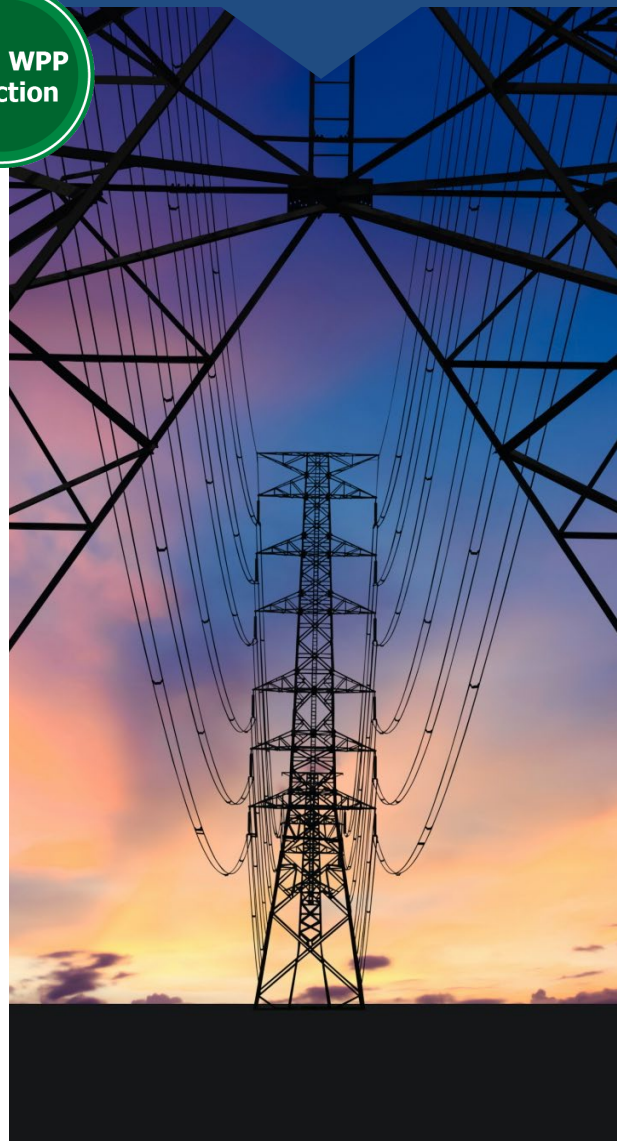
Questions and Answers



Appendix: WPP Status Highlights

Status Highlights: Energy

2023 WPP in Action



More in-depth BPS situation awareness

- Established a Level 3 Alert Essential Action Alert process
- Creating a process to track and trend energy emergency alerts

Expanded analytics and modeling

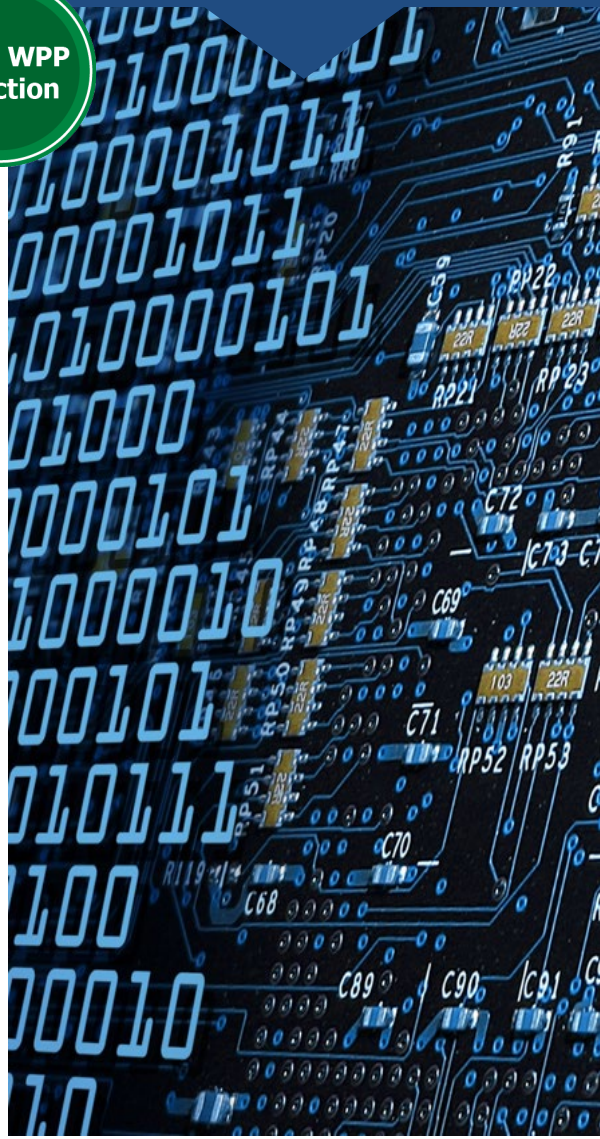
- Included probabilistic assessment section with evaluation of energy risks in *2023 Summer Reliability Assessment*

Responsive approaches to mitigating emerging risks

- Implementing work plan on registration of/criteria for generation to include BES-connected variable energy resources and distributed energy resources (DER)
- Standards Committee accepted Standards Authorization Request (SAR) related to normal and extreme events
- Progressing on Reliability Standard/SAR projects related to cold weather, IBRs, gas-electric interdependencies, and DER events

Status Highlights: Security

2023 WPP in Action



An expanded, stronger E-ISAC

- Collaborating with the Energy Threat Analysis Center (ETAC) and CISA Joint Cyber Defense Collaboration (JCDC) to advise sector on prominent threats and risks
- Providing monthly industrial control system (ICS)-threat trending highlights for utilities
- Increasing natural gas and other critical infrastructure sector participation in GridEx VII

A more secure, less vulnerable BPS

- Published the "Cyber-Informed Transmission Planning Framework," which lays the foundation for a more coordinated cyber-informed approach to transmission planning
- Developing a CIP Reliability Standard modification to accommodate virtualization

A more secure, less vulnerable NERC

- Enhancing AI and identity-centric protections

Status Highlights: Agility

2023 WPP in Action

➢ A more efficient standards development process

- Industry approved the revisions to Standard Processes Manual that support a more agile and responsive Reliability Standard development process

➢ Efficient Compliance and Enforcement Program

- Use of Compliance Monitoring and Enforcement Program (CMEP) tools to analyze engagements and internal control programs related to facility ratings

➢ Emerging risks mitigated BEFORE triggering a crisis

- Based on emerging risks, included supply chain in the 2023 ERO Enterprise CMEP Implementation Plan

Status Highlights: Sustainability

2023 WPP in Action

➢ Mature internal assurance programs

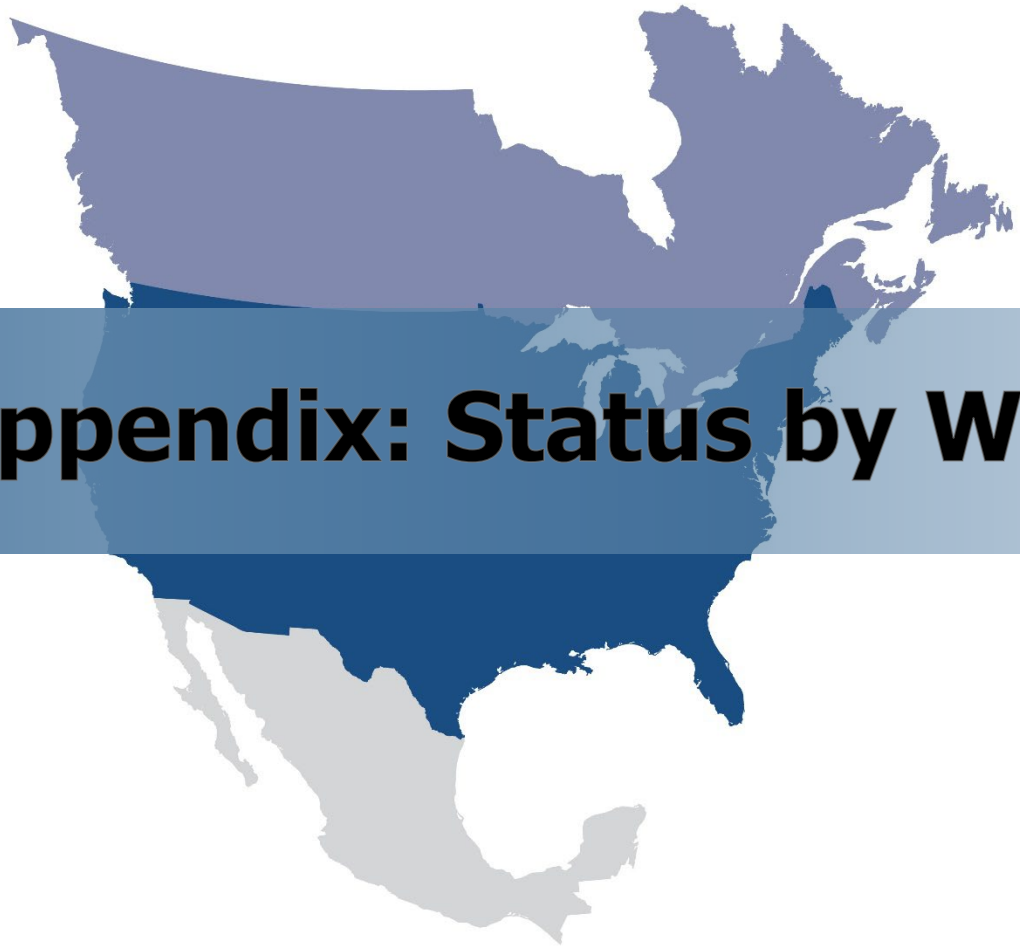
- Implemented governance, risk management, and compliance (GRC) solution and in use by Internal Audit team

➢ Enhanced state outreach and engagement

- Rolled out *Summer Reliability Assessment* and *State of Reliability* to state and provincial regulators in coordination with Regional Entities, with specific recommendations for actions to promote reliability
- Actively engaging with NARUC and CAMPUT

➢ Adaptable, sustainable technology and workforce planning

- Conducted stakeholder survey Atlanta office
- Maintaining <10% regrettable turnover
- Deployed cloud-based email, mobile device management, and IT service management system
- Updating SharePoint Extranet environment



Appendix: Status by WPP

Status by WPP

Reliability Assessments

Reliability assessments incorporate consistent and documented methods to identify and evaluate extreme condition scenarios and energy availability

Perform a special assessment of the potential impacts on the adequacy and operating reliability of the BPS from new and evolving electricity market practices and state authority resource adequacy assurance/availability mechanisms

Conduct extensive outreach to raise awareness and prompt action to assure reliability for the 2023 summer and 2022/2023 winter seasons

Status by WPP

Reliability Standards

Board endorses or adopts:

2023 enhancements to Reliability Standards identified by Cold Weather Inquiry

Energy Reliability Assessment Task Force (ERATF) Energy Assessment Reliability Standards in operations planning timeframe

Inverter-based resource Reliability Standards (performance, modeling, studies, validation)

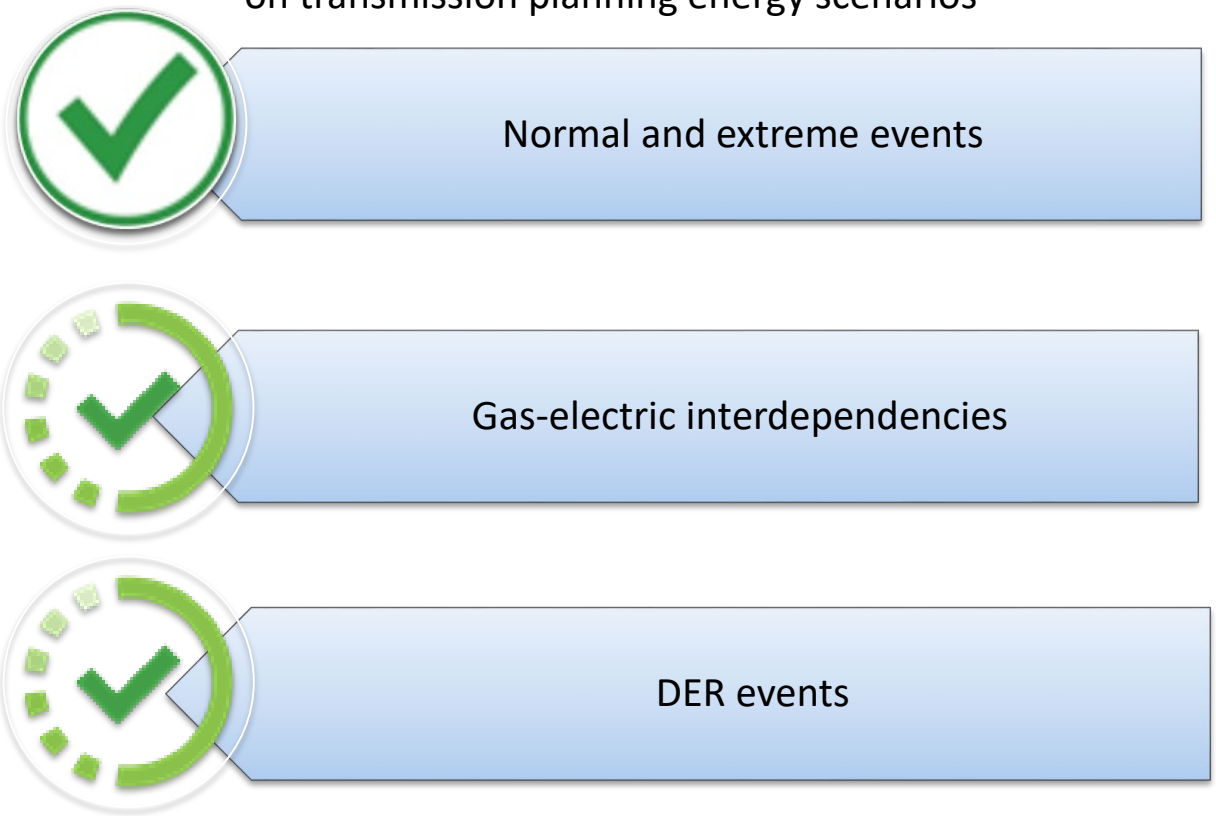
CIP Reliability Standard modifications to accommodate virtualization

Changes needed based on evaluation of the CIP bright-line risk criteria

Status by WPP

Reliability Standards

Standards Committee accepts SARs focused on transmission planning energy scenarios*



*Includes extreme events creating common conditions that impact the energy resilience of the BPS, such as extreme long-term, widespread cold and hot temperatures, widespread droughts conditions, solar, wind, and fires

Status by WPP

Registration

Review and update, if needed, registration criteria for generation to include BES-connected variable energy resources (VERs) and DERs

Event Analysis and Situation Awareness

Include loss of significant amounts of energy-constrained resources and energy deficiencies

BPS awareness daily reports to include new system conditions and expand depth and breadth

Engineering

Develop cyber-informed planning approaches documented in technical reports or other guidance material to study, identify, and reduce the number of critical facilities and attack exposure/impact

Status by WPP

BPS Risk Mitigation

Implement a revised and more agile Reliability Standards development process

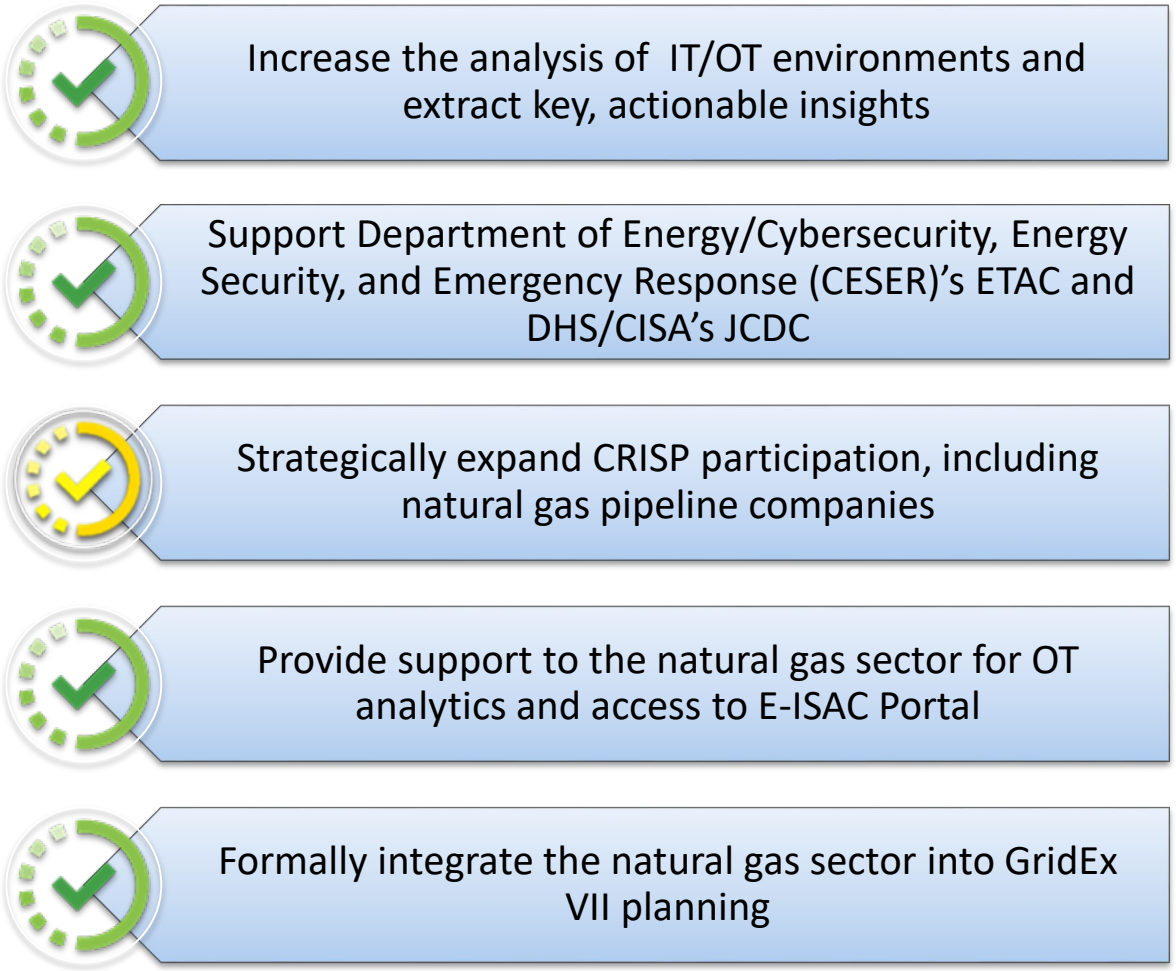
Establish Level 3 alert process

Strengthen reliability guidelines (essential actions, measures of effectiveness)

Leverage CMEP tools for early visibility of BPS risk

Status by WPP

E-ISAC



Status by WPP

Corporate Risk Reduction

Provide additional data management, classification, and protection tools and processes

Implement audit management software solution to automate Internal Audit processes

Talent Management

Successfully onboard 14 new employees

Maintain regrettable turnover at <10% and sustain employee engagement score

Status by WPP

State/Provincial Outreach

- Expand outreach to national associations, including NARUC and CAMPUT, to further educate state and provincial regulators and policymakers on NERC assessments
- Build bench strength in NERC's External Affairs team with a focus on state outreach and stakeholder engagement

Process Improvement & Efficiency

- Decide on future direction of Finance and Accounting/HR systems and begin execution
- Complete Atlanta facility workplace assessment, survey market conditions, and conduct site tours of alternate options