NERC

NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

2019 Annual Report

February 2020

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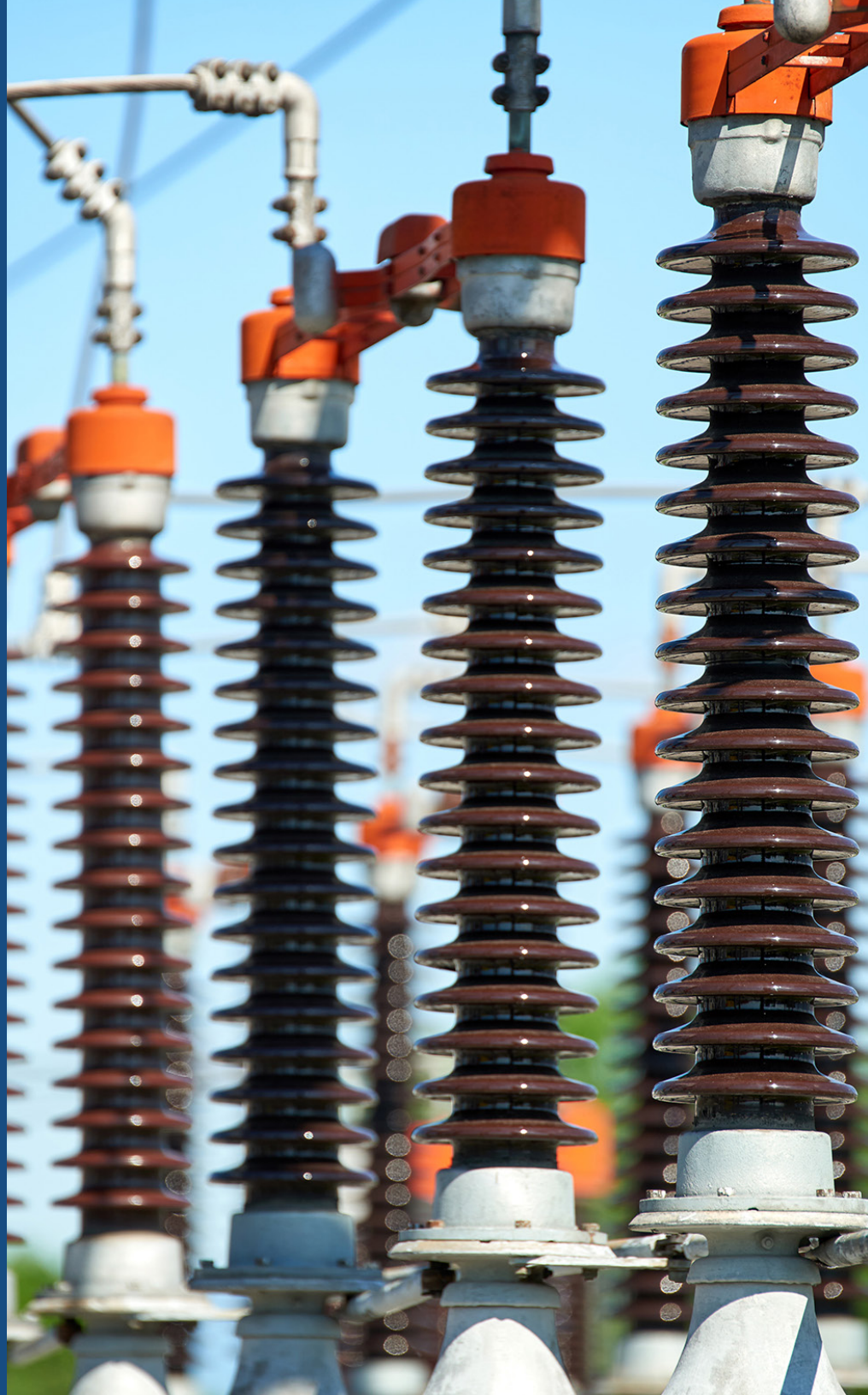


Letter from President and CEO

Jim Robb
President and CEO

With 2019 now in the books, we can look back on it as a true pivot point for the Electric Reliability Organization (ERO) Enterprise. In 2019, NERC and the Regional Entities began a transformation process to unlock the potential and brilliance of the ERO Enterprise model. We committed to each other that we would value our individual roles and respect our independence yet align ourselves toward our common mission of assuring a reliable and secure bulk power system (BPS) across North America. We formed the ERO Enterprise Executive Committee—comprised of NERC's senior leadership team and the CEOs from our six Regional Entities—to symbolize and operationalize that commitment, starting with the development of an updated *ERO Enterprise Long-Term Strategy*, and to invent our future together.

One of the key things we focused on was creating a touchstone to guide our actions—one that reflects our why, how, and what. Our "why" is to assure a highly reliable and secure BPS. Our four major "hows" are deploying and engaging top talent and expertise, innovating our products and services and keeping risk in mind as we evolve our programs, collaborating fulsomely and effectively with industry, and maintaining our independence and objectivity. Our "what" is executing ERO Enterprise programs effectively, efficiently, and collaboratively. Aligning ERO Enterprise leadership and companies with our why, how, and what ensures that we can achieve greater consistency, equity, and impact with all of our program activities.

Our updated strategic plan concentrates on five focus areas, and we are aligning our performance management around them. In the coming months and years, you will see the ERO Enterprise focus on the following:

- Expanding our risk-based focus in our regulatory activities to ensure we are focusing those programs on the real risks to reliability and security
- Ensuring actions are in place to mitigate known risks and better understand emerging risks to reliability and security
- Building a strong security capability for industry centered around the Electricity Information Sharing and Analysis Center (E-ISAC)
- Strengthening our outreach and engagement across the reliability and security ecosystem in North America to ensure our work is relevant and impactful to decisionmakers, whether they be utility planners, control operators, regulators, security professionals, or policymakers
- Pursuing continuous improvement in the effectiveness and efficiency of our activities

In 2019, we took positive steps to build and reinforce the foundation on which these focus areas will be built. For example, in the E-ISAC, we expanded our staff; added critical leadership and technical capabilities to the team; expanded our watch activities to 24/5 with a path to 24/7 in 2020; entered into information sharing agreements with important partners, such as the Natural Gas and Multi-State ISACs; and began piloting a cross-border information sharing arrangement with the Independent Electric System Operator in Ontario, Canada. We are focused now on expanding voluntary information sharing with the E-ISAC and expanding the Cybersecurity Risk Information Sharing Program (CRISP), a premier security program we manage on behalf of the Department of Energy (DOE). I am especially excited to welcome Manny Cancel to NERC as a senior vice president and CEO of the E-ISAC, where he will be leading a refresh of our long-term strategy to ensure the E-ISAC remains an important piece of the sector's security fabric.

We continue to focus on promoting the effectiveness and efficiency of our Reliability Standards to ensure they appropriately address risks to the BPS and, as such, undertook a review of the existing Reliability Standards so that requirements with little or no reliability benefit could be retired or modified for efficiency gain.

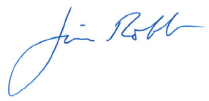
As stakeholders have come to expect, we produced a number of assessments this year that detail emerging risks, including our annual State of Reliability, Long-Term Reliability Assessment and seasonal assessments, a Reliability Issues Steering Committee (RISC) Report, and a joint report by NERC and the Federal Energy Regulatory Commission (FERC) focused on a cold weather event in the South Central United States. Looking forward, we intend to continue making these assessments accessible and impactful while informing key audiences of the evolving risk profile of the industry as it undergoes a rapid transformation in its resource base.

In 2020, we bid farewell to Board trustees Dave Goulding (who retired effective January 1, 2020), Fred Gorbet, and Janice Case—all long-term trustees who have played significant roles in guiding and shaping this institution. Their contributions will definitely be missed.

I urge you to read through our *2019 Annual Report* to get a more thorough overview of the work done by the ERO Enterprise and throughout industry to assure the reliability and security of the grid. We feel very good about what we collectively achieved in 2019, but we know there is a lot more to accomplish with your help.

Assuring a highly reliable and secure grid is NERC's continuous mission. Electricity is essential to the quality of our 21st century lifestyle and is delivered by a complex fabric of industry participants, government partners, and nongovernmental organizations. My objective is to ensure that the ERO Enterprise plays its part in strengthening that fabric for the benefit of all North Americans. As the reliability and security ecosystem continues to change, we are committed to achieving our vision of a highly reliable and secure North American BPS in 2020 and beyond.

Best,

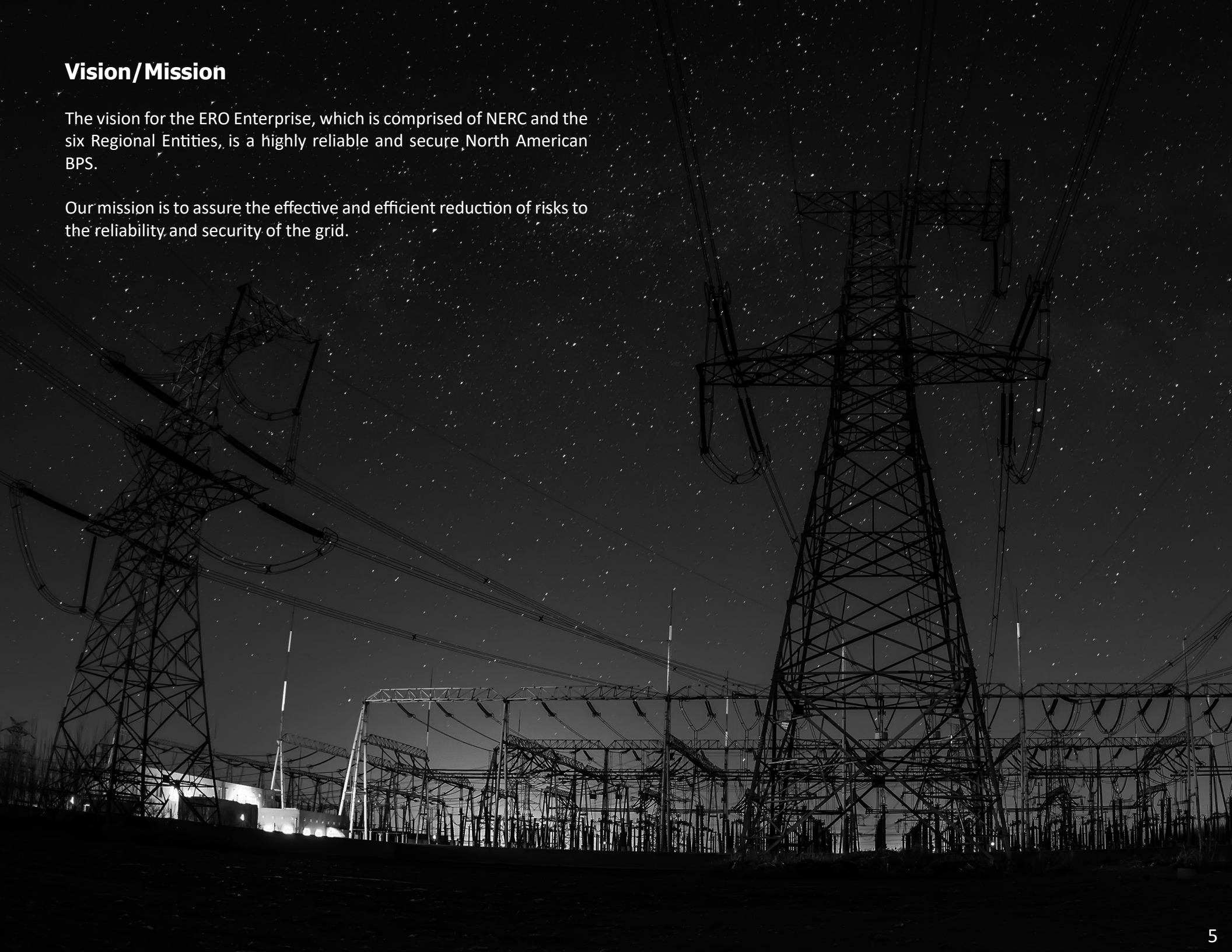


Jim Robb

Vision/Mission

The vision for the ERO Enterprise, which is comprised of NERC and the six Regional Entities, is a highly reliable and secure North American BPS.

Our mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.



ERO Enterprise Transformation

Nearly 400 million North American citizens depend on electricity in their daily lives. Working with users, owners, and operators of BPS assets; government partners; and other stakeholders and industry participants; the ERO Enterprise pursues its mission of assuring the effective and efficient reduction of risks to the reliability and security of the BPS.

This has been a pivotal year for the ERO Enterprise. The ERO Enterprise now encompasses six regional organizations of similar size and complexity. NERC provides industry-wide perspective and oversight, and the Regional Entities have unique features and activities that serve the needs of their regional constituents while ensuring that industry follows NERC Reliability Standards. And while NERC and the Regional Entities play different roles in delivering ERO Enterprise programs, these roles are equally important and complementary, allowing the ERO Enterprise to work as one synchronous machine—effectively, efficiently, and collaboratively.

NERC and the Regional Entities are committed to the following:

- Working together as one team and honoring each of their roles
- Actively supporting ERO Enterprise activities while eliminating unnecessary duplication of work
- Collaborating in developing clear and consistent guidance across the ERO Enterprise
- Sharing information, knowledge, and resources across the ERO Enterprise
- Developing and sharing harmonized messages across ERO Enterprise communications
- Supporting innovation, initiatives, and the sharing of best practices across the ERO Enterprise

As the reliability and security ecosystem continues to change, the ERO Enterprise is explicitly committed to its collective success in achieving its vision of a highly reliable and secure North American BPS.

ERO Enterprise Executive Committee meeting in Washington, D.C. (March)

2020 ERO Enterprise Executive Committee

Jason Blake
President and CEO
SERC

Manny Cancel
Senior VP and CEO
E-ISAC

Melanie Frye
President and CEO
WECC

Tim Gallagher
President and CEO
RF

Lane Lanford
President and CEO
Texas RE

Mark Lauby
Senior VP and Chief Engineer
NERC

Sonia Mendonca
Senior VP, General Counsel, and Corporate Secretary
NERC

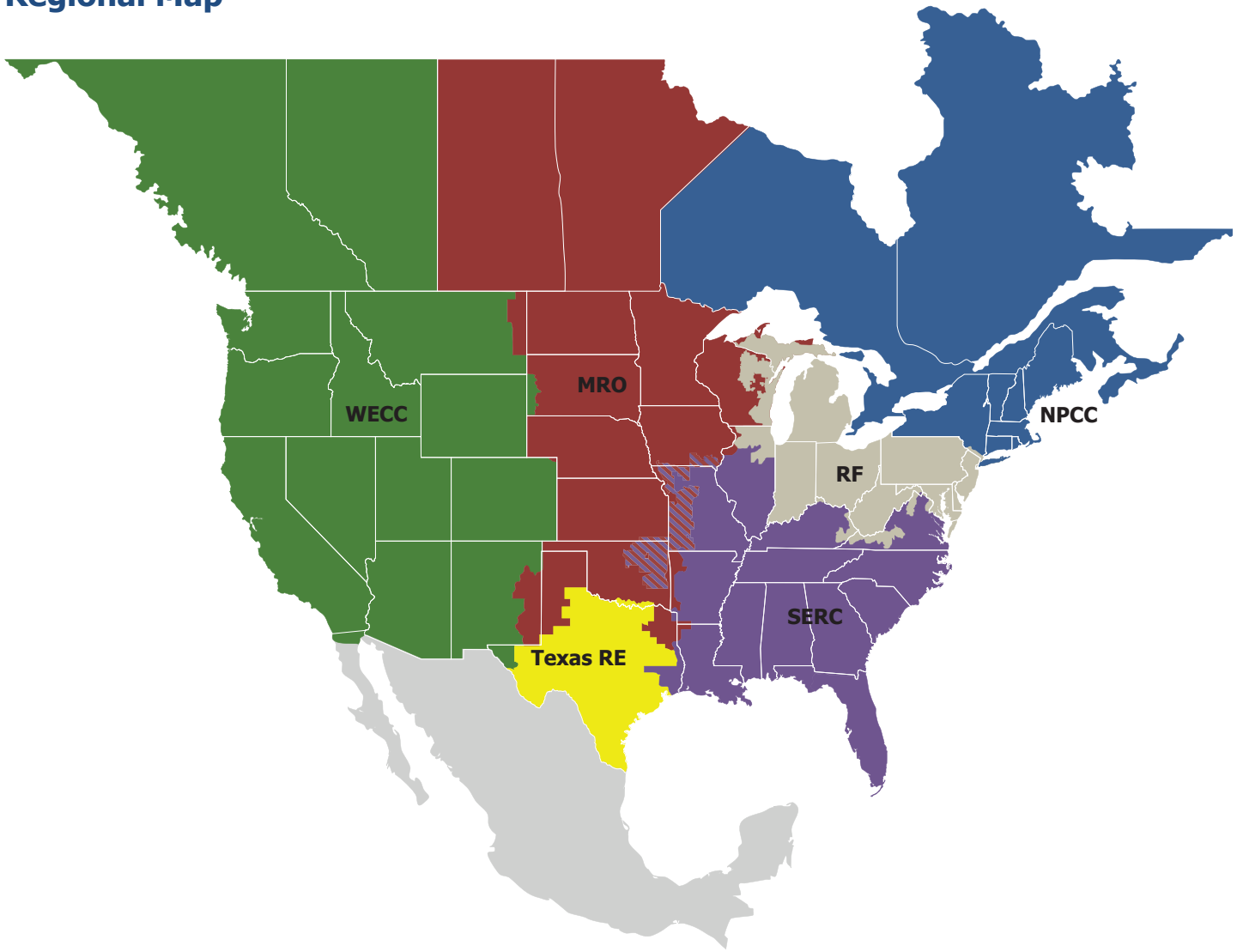
Sara Patrick
President and CEO
MRO

Jim Robb
President and CEO
NERC

Ed Schwerdt
President and CEO
NPCC

Janet Sena
Senior VP and Director of Policy and External Affairs
NERC

Regional Map



Midwest Reliability Organization (MRO)

Northeast Power Coordinating Council (NPCC)

ReliabilityFirst (RF)

SERC Reliability Corporation (SERC)

Texas Reliability Entity (Texas RE)

WECC

Achieving and Maintaining Risk-Based Operations

The ERO Enterprise assures North American BPS reliability primarily through the identification, prioritization, and effective and efficient mitigation of risks. By maintaining a risk-based focus in its operations, the ERO Enterprise is able to apply resources to the most significant reliability risks and better respond to emerging risks.

Supply Chain Standards

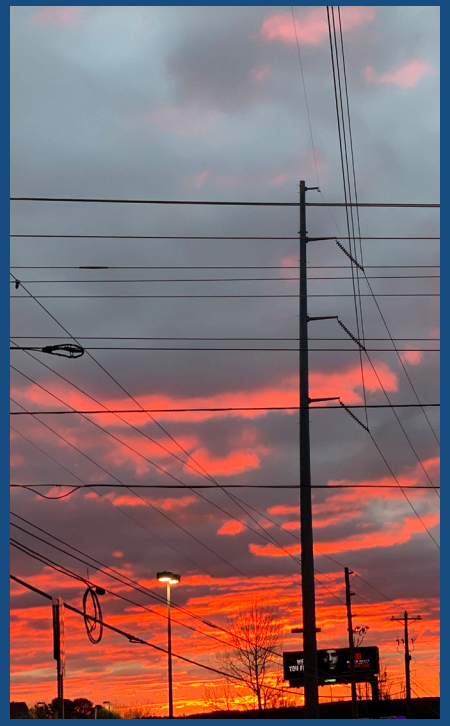
The supply chains for information and communications technology as well as industrial control systems may provide various opportunities for compromise, thereby presenting risks to Bulk Electric System (BES) security. The Supply Chain Standards—CIP-013-1, CIP-010-3, CIP-005-6—require responsible entities that possess medium- and high-impact BES cyber systems to develop processes to ensure that supply chain risks are being managed through the procurement process. Consistent with the risk-based framework of the NERC CIP Reliability Standards, the Supply Chain Standards are applicable to the highest risk systems with the greatest impact to the grid.

In May, the NERC Board of Trustees (Board) accepted NERC's *Cyber Security Supply Chain Risks report*, which provided an analysis of best practices and standards in other industries to mitigate supply chain risks, documented the results of the evaluation of supply chain risks associated with certain categories of assets not currently subject to the Supply Chain Standards, and recommended actions to address those risks. The report concluded that the Supply Chain Standards should be modified to include electronic and physical access controls for medium- and high-impact BES cyber systems.

NERC staff also worked with the Critical Infrastructure Protection Committee (CIPC) Supply Chain Working Group to develop a data request to determine if low-impact BES cyber systems with inbound or outbound electronic access should be included. They also considered the number and nature of these systems, the benefits of including them in the standards, and the associated costs of extending CIP-013 to cover them. NERC published a summary assessment of the data request results and is working with stakeholders to review the recommendations and determine follow-up actions in order to continue to protect the grid from supply chain risks.

Supply Chain Standards		
CIP-005-6	CIP-010-3	CIP-013-1

Hydro-Quebec transmission tower (June)



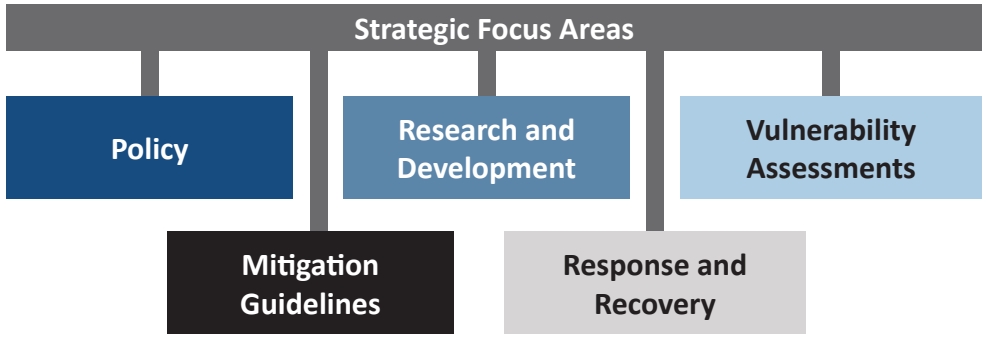
High voltage lines in Duluth, Georgia (December)

Media roundtable with Jim Robb (June)

Electromagnetic Pulse Task Force

Protecting the BPS and assuring the effective reduction of risks to reliability are integral pieces of the ERO Enterprise's mission; this is why NERC launched efforts to identify reliability concerns associated with electromagnetic pulses (EMPs) and potential methods for promoting resilience by creating a task force to identify key issues and areas of improvement. The EMP Task Force, formed in March, collaborates with governmental authorities and applicable industry members to provide front-end, high-level leadership; recommendations; and guidance to the Board on next steps based on current research.

Following numerous meetings and a July technical workshop, the EMP Task Force identified five focus areas and offered recommendations or suggested next steps for each in their *EMP Task Force: Strategic Recommendations report*. The research is ongoing, and the task force will be expanded and continue to provide guidance for further work, particularly projects undertaken through the NERC technical committees to develop vulnerability assessments, mitigation guidelines, and enhanced response and recovery plans. Given the complex nature of addressing the risks associated with an EMP event, many of the recommendations are interrelated, making the timing and sequencing of the recommendations and policy matters in the report crucial. The Board accepted the report in November and is seeking policy input on the recommendations and priorities going forward. The ERO Enterprise is dedicated to ensuring a highly organized and coordinated effort is launched to support EMP resilience.



Holly Hawkins (SERC), Mark Lauby, and Jim Robb at a NERC committee meeting (February) Courtesy of RTO Insider

State of Reliability

NERC issues an annual, independent assessment of BPS performance during the previous year that informs regulators, policymakers, and industry leaders of reliability and performance trends, needed actions to address known and emerging risks, and whether mitigations have led to positive improvements on the system.

As indicated by nearly every measure used to evaluate reliability, North America's BPS remains highly reliable even as the electricity sector undergoes significant and rapid change, presenting new challenges.

Ongoing performance measures show positive trends in generation, transmission, and protection and control performance; however, NERC's *2019 State of Reliability* encouraged continued vigilance as the evolving resource mix and cyber and physical security threats continue to present critical challenges.

This year's assessment identified seven key findings with extreme weather events being identified as the leading contributors to transmission, generation, and load loss. While year-over-year performance of the BPS shows positive trends, a strong reliability posture is needed to manage the emerging challenges as a result of the changing resource mix. With appropriate insight, careful planning, and continued support, the electricity sector will continue to navigate the associated challenges in a manner that maintains reliability.

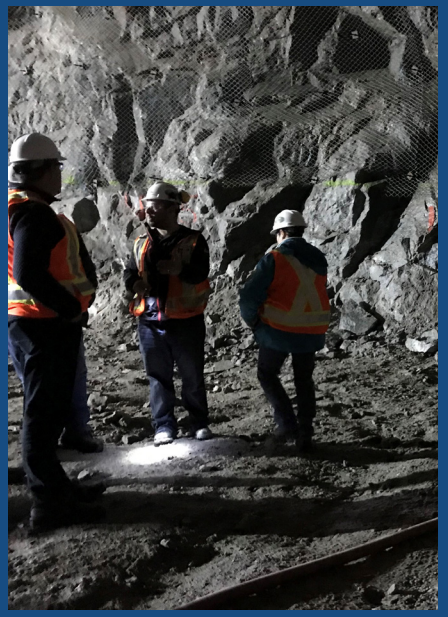
State of Reliability Key Findings

- Extreme weather events continue to be leading contributors to load loss.
- There were no nonweather Category 3, 4, or 5 events in 2018.
- Misoperations continue to decline.
- Frequency response continues to improve in all Interconnections.
- In Texas, there is still reliability risk in 2019 due to the projected capacity deficit, but better-than-expected performance from the generation fleet helped meet 2018 summer peak demand.
- Despite continually evolving threats, no cyber or physical security incidents led to unauthorized operational control actions or a loss of load.
- As more inverter-based generation is added, solutions to emerging reliability challenges are being identified.

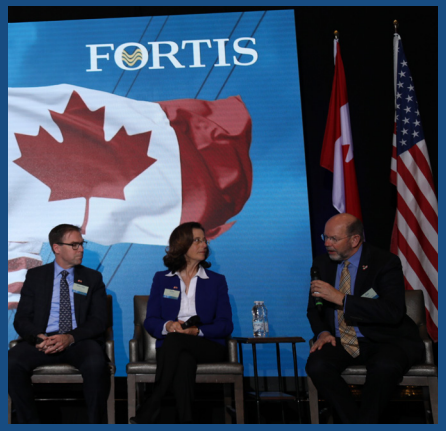
Being More Effective and Efficient

Industry and consumers are facing economic pressures while the ERO Enterprise faces increased resource demands, reinforcing the criticality of identifying and implementing mechanisms to achieve greater Enterprise-wide effectiveness, efficiency, and cost savings. The ERO Enterprise is dedicated to making these improvements while engaging with industry leadership to ensure the productive, efficient, and effective engagement of industry technical expertise that is essential to the success of the ERO Enterprise's mission.

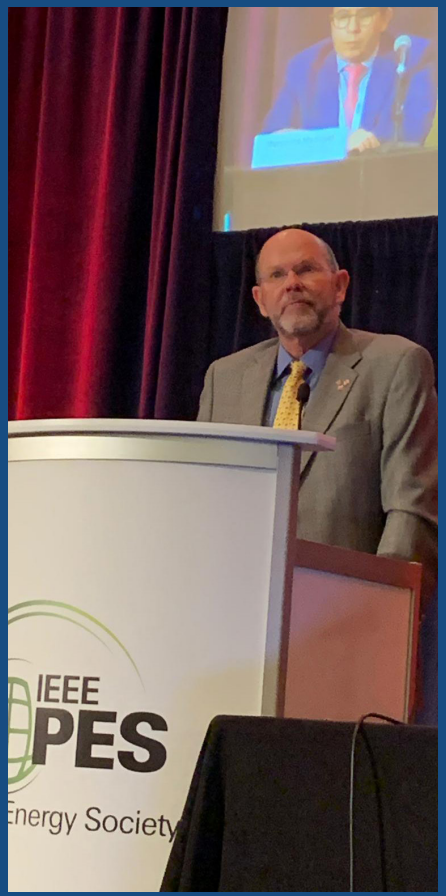
In support of this goal, NERC and the Regional Entities identified current and ongoing efforts with the objective of enhancing the efficiency of ERO Enterprise operations and improving the effectiveness in executing its statutory functions. In 2019, the ERO Enterprise focused on three main areas: stakeholder engagement realignment, Standards Efficiency Review, and Align (formerly called the Compliance Monitoring and Enforcement Program (CMEP) tool). While a number of activities are part of day-to-day operations and budget processes that continually improve operational effectiveness and efficiency, the ERO Enterprise must continue to review major processes and use technology to improve efficiency, reduce costs, and ensure organizational efficiencies.



Hydro-Quebec tour (June)



Jim Robb at Fortis Energy Exchange in Toronto (March)



Jim Robb at IEEE PES meeting in Atlanta (August)

Stakeholder Engagement Realignment

Given the nature of the ERO Enterprise model and criticality of industry expertise to ERO Enterprise success, enhancing the effectiveness of stakeholder participation in the face of our rapidly changing industry while always keeping an eye on the need to be as efficient as reasonably possible given all of the other demands on participants and staff is a primary objective. Therefore, a stakeholder engagement team (SET) was formed to review the existing NERC technical committee structure and develop recommendations for improving its effectiveness and efficiency.

The SET recommended creation of the Reliability and Security Technical Committee (RSTC), which the Board approved in November. The RSTC is a new formal oversight committee that combines the experience of the technical committees (i.e., Operating, Planning, and Critical Infrastructure Protection Committees). The newly created RSTC reports to the Board and manages the work of the various subcommittees, working groups, and task forces organized to address specific risks to reliability and security. The RSTC will also oversee the implementation of those tactical prioritizations identified by the RISC through work plans as well as advise on the reliability and security of the BPS to address any unexpected new and emerging risks.

Standards Efficiency Review

The Standards Efficiency Review process allows NERC to review the existing body of Reliability Standards and determine whether there are requirements with little or no reliability benefit that can be retired or modified to better address risk. Following Phase 1 of the review, NERC staff submitted two petitions for the approval of Reliability Standards requirement retirements in the Interchange Scheduling and Coordination, Facilities Design, Connections, and Maintenance, Protection and Control, and Modeling, Data and Analysis, Interconnection Reliability Operations and Coordination, Transmission Operations, and Voltage and Reactive Reliability Standards families. In Phase 2, the working team finalized a list of four prioritized efficiency concepts and identified two remaining concepts that will be handled by another group.

In June, the SER Advisory Group endorsed the scope of the Critical Infrastructure Protection (CIP) SER project, which uses a risk-based approach to evaluate NERC CIP Reliability Standards in order to identify potential efficiencies through retirement or modification of Reliability Standard requirements. The CIP SER scope and approach will be very similar to SER Phase 1 for operations and planning requirements.

SER Phase 2 Concepts

- Evidence Retention Overhaul
- Consolidate Information/Data Exchange Requirements
- Move Requirements to Guidance
- Prototype Standard

Centennial Park lights in Atlanta (December)

Rich Bauer, Jim Robb, and Mark Lauby at Schweitzer Engineering Laboratories (September)

Stan Hoptroff and ConEd employee in New York (September)

Align Tool

The Align tool will enhance the ERO Enterprise's ability to share and analyze data that is crucial to the security and reliability of the grid. It will also eliminate the varying processes and systems that lead to inconsistency issues for monitoring compliance across the ERO Enterprise. The Align project team is dedicated to ensuring data security, refining and harmonizing compliance audit and investigation business processes across the Regional Entities, and addressing stakeholder concerns regarding evidence collection. The project team continues with its scheduled activities with the goal of launching Release 1 in 2020. A single platform to capture and share crucial CMEP data will better align the business processes of the ERO Enterprise; improve documentation, sharing, and analysis of compliance work activities; and make CMEP activities more efficient and effective across the ERO Enterprise.

Identifying and Assessing Emerging Risks

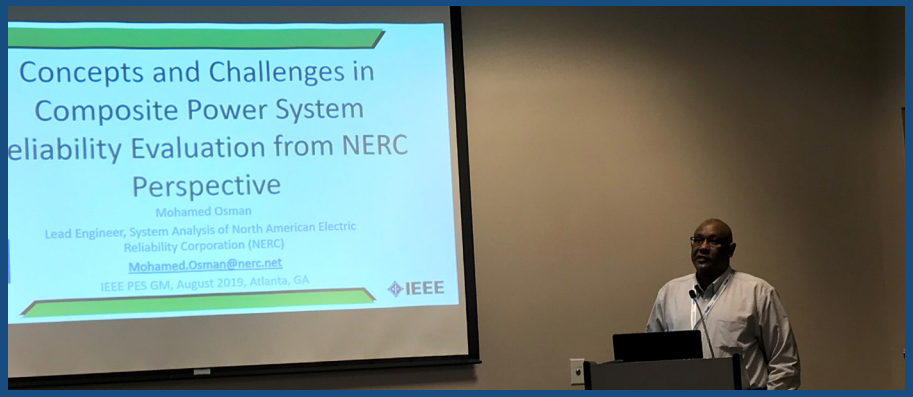
In addition to preparing and publishing traditional reliability assessments, the ERO Enterprise also produces detailed assessments of emerging risks. The evaluation of early indicators of risk supported by data and analysis drive actions across industry that support BPS reliability.

Summer Reliability Assessment and Winter Reliability Assessment

NERC projected adequate resources and planning reserve margins to meet anticipated summer peak demand in most areas of North America. NERC identified specific reliability risks in the *2019 Summer Reliability Assessment*, including resource adequacy challenges in Texas, natural gas supply constraints in Southern California, and the potential for wildfire hazard conditions to impact the operation of the BPS in California. In NERC's *2019–2020 Winter Reliability Assessment*, anticipated resources were projected to meet or exceed recommended margin levels for all assessment areas. Winter fuel assurance concerns continue in parts of North America, including the Northeast and Midwest, where demand for natural gas to serve both heating and electric generation can stress natural gas delivery infrastructure.

In both the summer and winter reliability assessments, NERC noted that extreme weather conditions could result in higher-than-expected generation or transmission outages and higher-than-expected electricity demand, potentially causing grid operators to employ emergency procedures to maintain reliable operations in some areas. NERC's seasonal assessments include operational risk scenarios for all areas to help identify and assess low-likelihood seasonal risks to the BPS.

As part of its ongoing effort to inform system planning, operations, performance, and oversight, NERC sharpened its focus in 2019 on the complex, technical challenges facing BPS planners and operators. Key risks identified in seasonal reliability outlooks related to factors associated with fuel delivery and severe weather.



Mohammed Osman, RASA, at IEEE PES meeting in Atlanta (August)

Long-Term Reliability Assessment

Continuing NERC's long-standing and evolving viewpoints on the BPS transformation, the *2019 Long-Term Reliability Assessment* found that North America has sufficient generation capacity to meet increasing demand over the next decade. A growing amount of utility-scale renewable generation, distributed generation, and energy storage technology can be both a detriment and a benefit for the reliability and resilience of the BPS going forward.

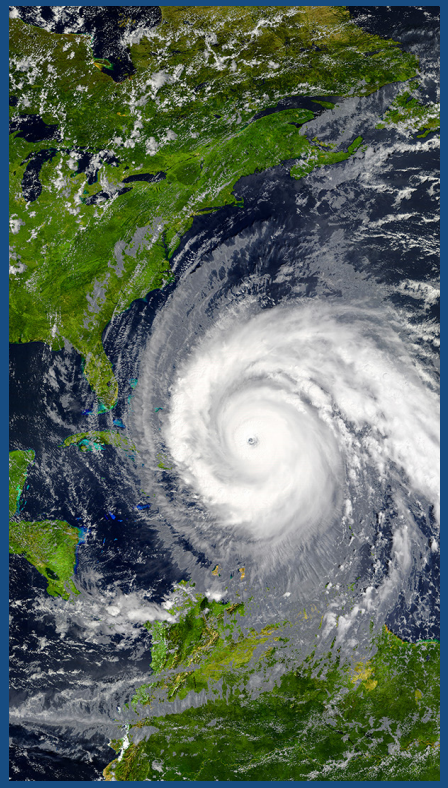
The report noted the continuing trend of tighter reserve margins with increased variability and uncertainty of resources could potentially result in increased reliability risks in certain regions of North America. To address this potential risk, the report recommended that the ERO Enterprise and industry should take steps to ensure reliability of the BPS by developing accurate BPS models, monitoring and assessing the impacts of electric storage and distributed generation, developing and enhancing reliability and resilience metrics, and increasing coordination with electric and gas industry participants and pertinent policymakers.

Resource Mix Trends through 2029:

- More than 330 GW of solar and wind
- Approximately 8 GW of utility-scale electricity storage
- Declining transmission infrastructure development

Joint Report on January 2018 Extreme Cold Weather Event

Collaboration with FERC and other policymakers on using lessons learned to ensure the future reliability of the BPS continues to be a priority for NERC. In July, NERC and FERC released their joint report on the January 2018 extreme cold weather event that affected the South Central United States. The joint report found that, despite prior guidance from FERC and NERC, cold weather events continue to result in unplanned outages that impair system reliability. Among other recommendations and consistent with those of the latest Long-Term Reliability Assessment, the report calls for one or more Reliability Standards that require generators to improve cold weather preparations. The standards should also inform NERC-certified Reliability Coordinators and Balancing Authorities about any limitations on the operation of their units to improve operations due to extreme weather (cold, high winds, heavy cloud cover, etc.). To help industry navigate the rapid changes affecting the generation and transmission landscape going forward, NERC is calibrating its lessons learned, training, guidance, and Reliability Standards for the continued reliability and resilience of the North American BPS.



RISC Report

The primary objective of the 2019 RISC Report was to highlight risks and recommend actions that align with those risks. This report differs from other ERO reports in that it is a forward-looking view of the BPS that documents the results of the committee's continued work to identify key risks to the reliable operation of the BPS and provides recommendations to mitigate those risks. For the 2019 report, the RISC significantly reduced the number of recommendations by consolidating overlapping recommendations and removing recommendations that reflect activities that, while important, are already well underway and monitored as part of NERC's *Long-Term Strategic Plan* and applicable NERC committee plans. The *2019 ERO Reliability Risk Priorities Report* identified more than a dozen risk factors and grouped them into four high-level risks: Grid Transformation, Extreme Natural Events, Security Risks, and Critical Infrastructure Interdependencies.

High-Level Risks

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

Extreme Natural 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

Promoting Leading Security Practices, Information Sharing and Analysis, and Resilience

The protection and resiliency of facilities and systems critical to maintaining BPS reliability are crucial objectives for the ERO Enterprise. Over the past several years, NERC's E-ISAC has focused on strengthening its technical and analytical resources and capabilities. The E-ISAC is focused on completing its transformation to an indispensable source of classified and unclassified cyber and physical security threat intelligence that is actionable for industry. Continued collaboration with industry members and government partners to attain that collective goal is essential for the future security of the BPS across North America.

E-ISAC Long-Term Strategic Plan

This year represented a key milestone in the implementation of the *E-ISAC Long-Term Strategic Plan*, which focused the E-ISAC on becoming the credible source for actionable, big picture information through multi-level engagement with members and partners to mitigate cyber and physical risks to the BPS. The year's advances prompted the E-ISAC to embark on the next evolution of the strategic plan with a focus on refining goals for enriched data collection and targeted analysis in order to reach the next level of transformation.

Key to the success of the E-ISAC in 2019 was the increased capability of its Watch Operations and the expansion of its Industry Engagement Program (IEP). In November, Watch Operations moved to around-the-clock monitoring Monday through Friday to ensure the E-ISAC's capabilities are always available to industry regardless of the time of day. In 2020, the E-ISAC plans to launch 24-hour, 7-days-a-week threat monitoring. The E-ISAC launched the IEP to raise awareness of the E-ISAC's cyber and physical security analysis processes and data protections and emphasize its separation from NERC's compliance functions. The IEP increased opportunities for the E-ISAC to receive feedback from industry on tools and communications protocols and strengthen utility security programs through exchange of best practices and lessons learned.

With the E-ISAC focused on increasing its value to members, a member relations management system was procured to conduct engagement in a more systematic manner to better understand member needs and to target important member communications. Additionally, the system will enable the E-ISAC to deliver products and services to the analyst, executive, and partner levels in support of the shared mission of BPS security and reliability.

Media tour of the E-ISAC (June)

GridSecCon

More than 600 cyber and physical security experts from across North America attended NERC's ninth annual Grid Security Conference in October, which was co-hosted by NERC and the SERC Reliability Corporation in Atlanta. The conference focused on the critical importance of training, sharing lessons learned, and strong partnerships to outpace cyber and physical adversaries and to mitigate their threats.

In addition to offering the full day of industry cyber and physical security training that takes place at each GridSecCon, the E-ISAC took key steps to enhance the member experience at the 2019 conference. New GridSecCon elements included an E-ISAC women's networking breakfast and a more streamlined registration process,as well as more targeted panel discussions on interdependencies like natural gas and supply chain and threat intelligence best practices.

GridEx

NERC and the E-ISAC had record levels of participation in the fifth exercise in the GridEx series in November. More than 7,000 security professionals from nearly 530 industry and government organizations participated in GridEx V, which included an increase of more than 50 community-owned utilities and electric cooperatives. Participating organizations also included 29 FBI field offices and 26 state governments. There was increased participation in electricity's interdependent sectors including natural gas, electrical equipment manufacturing, telecommunications, and finance. Industry and government emergency response planning increasingly takes into account the interdependence of critical infrastructures. This growth in participation underscores the industry's commitment to improving its security response and recovery capabilities and the overall security of the grid.

For the first time, the executive tabletop went beyond high-level policy issues and considered the extraordinary operational measures needed to respond to coordinated physical and cyber attacks in a specific region of the country. This cross-border and operational perspective focused the discussions beyond generalities and helped assess which policy decisions would be effective or would create unintended consequences. This included greater natural gas coordination; coordination with telecommunications regarding prioritization; coordination with the DOE on the design, issuance, and liability protections for Grid Security Emergency orders; strengthening preparedness against supply chain attacks on critical grid components; and increasing United States and Canada cross-border coordination. These outcomes will drive electricity industry security collaboration in the coming years as the industry seeks to enhance the resilience of the BPS.

Jim Robb keynote at GridSecCon 2019

Transferring Knowledge and Communicating Effectively

The security and reliability of the BPS in North America are as intertwined as the grid is interconnected across boundaries, making information sharing and knowledge transfer crucial priorities for the ERO Enterprise.

Partnerships

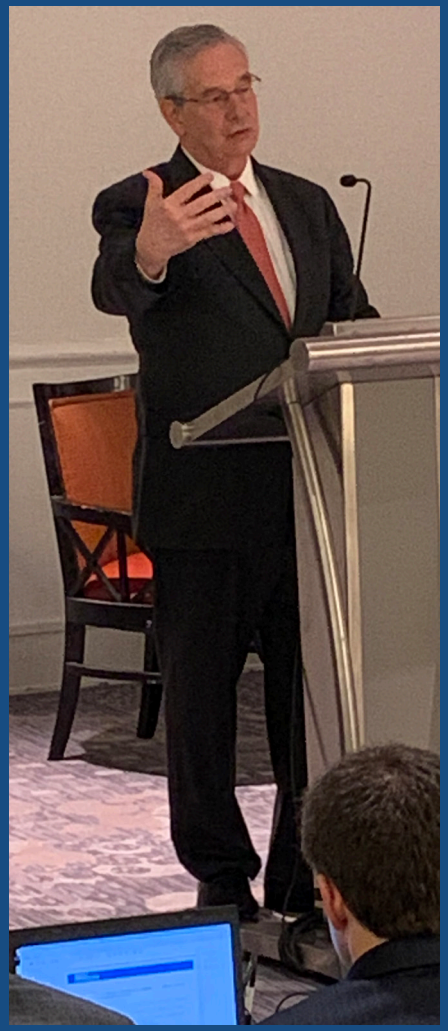
NERC and the E-ISAC reached a new level of partnership with industry and government in 2019, a recognition that the security and reliability of the BPS in North America depends on effective information sharing and knowledge transfer among stakeholders who are increasingly focused on critical infrastructure interdependencies. The E-ISAC's partnership growth included new agreements with industry and government ISACs; the maturation of CRISP; greater partnership with Canadian members, Ontario's Independent Electric System Operator, Canadian government officials; and key contributions to NERC's Reliability Leadership Summit.

In 2019, the E-ISAC signed new information sharing agreements with ISACs representing sectors focused on natural gas, oil, water, and state and local governments, among others. As cross-sector information sharing advances, the E-ISAC is focused on facilitating effective cyber and physical security threat communication with other ISACs to improve the collective security of interdependent infrastructures.

Industry members of the E-ISAC and CRISP benefited significantly in 2019 from the data collection and analysis program in partnership with DOE's national laboratories. Findings in the analysis of classified and unclassified threat information are shared with CRISP participants within a day, and any actionable indicators of compromise are anonymized and shared through the E-ISAC Portal with all asset owners and operators. DOE and the Department of Homeland Security also used the E-ISAC Portal to post critical bulletins derived from sensitive information in an unclassified manner for the electricity industry, providing additional value to members. Of vital interest to asset owners and operators in 2019 and beyond are descriptions of the tactics, techniques, and procedures used to identify a threat and the methods to prevent or mitigate it.

The E-ISAC also strengthened its partnerships with IESO and the Canadian Centre for Cybersecurity. The centre hosts monthly conference calls that bring together Canadian electricity industry members of the E-ISAC with Canadian and United States government partners.

NERC staff at IEEE Student Fair (August)



Mark Lauby at Reliability Leadership Summit in Washington, D.C. (March)

Reliability Leadership Summit

In March, NERC and the RISC hosted a Reliability Leadership Summit with leaders of the reliability community, including top industry executives, state and federal regulators, and NERC and Regional Entity senior leadership. The summit focused on three specific areas: regulatory and policymaking during unprecedented change, identifying and mitigating significant existing and emerging landscape of risks to reliability, and providing assurance for the availability of adequate fuel delivery to satisfy energy needs.

Panel discussions underscored the importance of conducting cross-sector coordination as well as the potential impact on reliability from the accelerating proliferation of distributed energy resources and potential NERC efforts to assess their effects on the reliable operation of the BPS. Recognizing that the performance of renewable energy resources is affected by weather, the discussions reiterated the importance of improving weather forecasting to mitigate risks associated with its uncertainty. With large increases in renewable resources and natural-gas-fired units, continued retirements of coal and nuclear units is expected. All resources must be integrated into the BPS while ensuring sufficient levels of essential reliability services are maintained.

Additionally, the need for higher levels of cyber security awareness will continue to create additional intricacies for BPS reliability. Cyber vulnerabilities rank among the BPS risks with the highest likelihood and impact. Therefore, it is important to understand which organizations are accountable for cyber security and long-term security plans. Information technology and operational technology convergences should be recognized and adequate levels of cyber security should be planned for prospectively. For effective implementation of existing and future cyber security standards developed for each of the critical infrastructure sectors, harmonization may be required. Summit participants discussed the need for industry and government to strengthen collaboration with the E-ISAC, which is focused on providing actionable threat intelligence to asset owners across North America. The E-ISAC's work with its members and government partners to provide commonly used adversary tactics, techniques, and procedures as well as awareness of campaigns targeted against industry to the asset owners across North America was critical in 2019 and will continue to be so going forward as the threat landscape continues to evolve.

Strengthening Engagement

Maintaining electric reliability and security requires broad engagement among a diverse array of stakeholders. Electric utilities, regulators, and policymakers across industry and in all three North American countries bear the shared responsibility for a reliable and secure electric grid. Fostering and maintaining relationships with each other is therefore vitally important to our industry, and the ERO Enterprise is dedicated to working hand-in-hand in support of its collective mission of reliability, resilience, and security.

North American Engagement

NERC continues to support the North American Transmission Forum (NATF) and the North American Generation Forum in addressing existing and emerging risks to reliability. This includes co-sponsoring a number of workshops and conferences, collaborative work on guidelines and compliance guidance, and technical collaboration on various industry groups. Signifying the desire for a stronger working relationship, NATF and NERC signed an enhanced memorandum of understanding laying the groundwork for deeper, project-based collaboration on risk identification and mitigation.

NERC continues to undertake activities to strengthen Canadian engagement. Increased outreach has fostered stronger relationships and greater information exchange. NERC has also worked to bolster Canadian representation on the E-ISAC's Member Executive Committee and the Member Representatives Committee. The 2019 annual meeting between the NERC Board and Canadian regulators provided an opportunity to build relationships and share information to further the shared goal of a resilient North American BPS. NERC also works with the Federal-Provincial-Territorial Electricity Working Group in Canada in support of the ERO mission.

E-ISAC staff at Alaska Power meeting in Juneau, Alaska (August)

Regulators from five provinces attended the annual meeting between the Board and Canadian regulators.

The E-ISAC's engagement with the National Governors Association prior to GridEx resulted in an increase in state participation, with 26 states participating, up from 20 in 2017.

Jim Robb and Tom Fanning (Southern Company) during GridEx V media call (November)

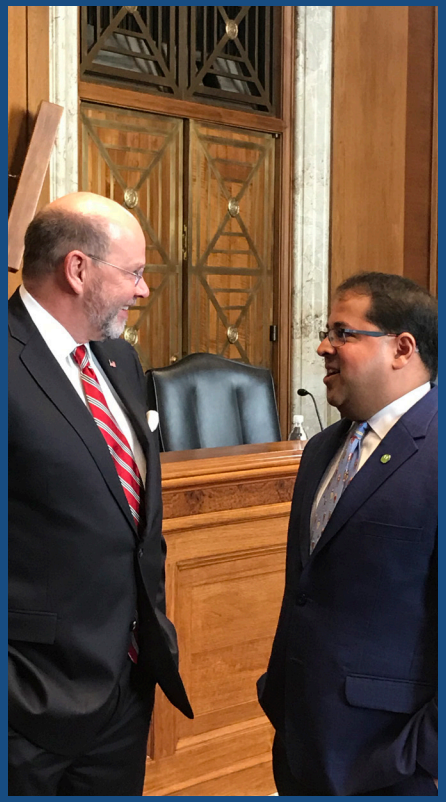
NERC maintains robust communication with the states, including utility commissions, policymakers, and consumer advocates. NERC provides regular presentations of reliability assessment, technical, and cyber security work to the National Association of Regulatory Utility Commissioners. In 2019, targeted engagement also took place with the National Association of State Utility Consumer Advocates, the National Governors Association, and the National Association of State Legislatures. To help support state outreach, NERC works closely with the two state utility commissioners who serve on the Member Representatives Committee. NERC is committed to its long-term partnerships with FERC and the DOE, which continue to be central toward ensuring reliability of the BPS with engagement occurring at all levels. DOE, industry, and NERC have come together in support of CRISP, and DOE's funding for additional membership is a key element in that collaboration. Continuous engagement and collaboration with regulators and policymakers is integral to supporting a reliable and secure grid.

Reliability Coordinator Transition in Western Interconnection

Peak Reliability served as the NERC-certified Reliability Coordinator (RC) for the Western Interconnection (except the Canadian province of Alberta for which the Alberta Electric System Operator provides RC-like services) beginning in January 2014. In 2018, the California Independent System Operator and the Southwest Power Pool (SPP) announced their intentions to perform the RC function and offer RC services to Balancing Authorities and Transmission Operators across the west, and British Columbia Hydro and Power Authority decided to provide RC services for the province of British Columbia. Subsequently, Peak decided to cease operations as the RC, effective at the end of 2019.

NERC and WECC collaborated extensively to ensure readiness before and during this transition. Specifically, work was focused on system operating limit methodology and congestion management, coordinated operations of phase shifting transformers and outage coordination, remedial action scheme coordination, and blackstart restoration. Other RC transition activities included twice-monthly NERC and WECC participation in RC-to-RC coordination meetings; quarterly WECC RC forums; and industry transition coordination groups, which provided stakeholders the opportunity to discuss any RC issues.

The CAISO (doing business as RC West), SPP, and BCH initiated certification activities with WECC and NERC during Q1 and Q2 2019. BCH RC became the RC of record in September. RC West followed a two-step implementation process, beginning in July and expanding to the full area in November. In December, the Western Interconnection reached a major reliability milestone in this transition to multiple RCs as SPP became the final new RC of record and Peak Reliability ceased operations. This transition represents a significant accomplishment for all new RCs, their customers, Peak Reliability, and the grid.



Jim Robb and FERC Chair Neil Chatterjee at Senate Energy and Natural Resources hearing (February)

FRCC Consolidation and Integration with SERC

On July 1, SERC Reliability Corporation (SERC) assumed delegated authority over all of the registered entities in Florida, resulting in the transfer of 35 registered entities to SERC. On the same day, the Florida Reliability Coordinating Council (FRCC) Regional Entity dissolved, and its delegation agreement with NERC terminated. The dissolution of the FRCC RE and expansion of SERC's regional boundaries to include all of Florida was approved by the Board on February 7 and by FERC on April 30.

SERC assembled a project team of SERC and FRCC leaders and subject matter experts to manage the complex transition plan and created a dedicated FRCC Integration web page to communicate how stakeholders would be engaged to learn more about SERC programs, technical committees, and outreach initiatives. The web page provided, and continues to provide, a one-stop shop for all relevant integration information and a window into the project's progress. SERC also collaborated with the Midwest Reliability Organization to leverage the experiences, lessons learned, and feedback garnered from the great work done in 2018 with the integration of entities from the former SPP RE. At the crux of SERC's robust outreach plan was a dedication to working together with the affected registered entities to keep all stakeholders engaged throughout the process, resulting in a stronger, more reliable, and more efficient Region.

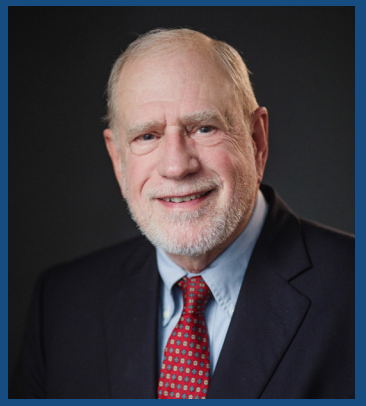
Letter from NERC Board Chair Roy Thilly

NERC's mission to enhance the reliability and resilience of the North American grid requires constant vigilance in the face of dramatic industry change and the emergence of new threats by bad actors. I am pleased to report that NERC, together with industry and the Regions, continues to be successful in meeting this important responsibility.

This was a transformative year for NERC. In his first full year as NERC's CEO, Jim Robb increased outreach and dramatically tightened the collaborative bond between NERC and the Regions. Internally, he forged a new culture of teamwork and collaboration where initiative is rewarded and responsibility shared. Importantly, Jim led the Board, the Regions, and stakeholders in sharpening NERC's long-term strategic focus and developing means to track and measure success.

In 2019, NERC put special emphasis on increasing the effectiveness and efficiency of its work. This effort included the following:

- Reorganizing and streamlining the committee structure through which crucial industry expertise is captured to inform and strengthen all aspects of NERC's work
- Guiding a seamless transition of the Regions from eight to six
- Developing the Align project to create a uniform tool for gathering and managing compliance and enforcement data across the Regions and NERC
- Sharpening NERC's strategic plan to focus the combined efforts of NERC, the Regions, and industry on the most important reliability risks and the steps that must be taken to successfully address those risks
- Establishing a highly collaborative structure for the combined work of NERC and the Regions, transforming what some viewed as a complicated model into a strong and brilliant model for meeting the mission
- Forging a new security information exchange mechanism with Canada, improving relationships with the provinces, and increasing Canadian industry participation in NERC activities
- Overseeing the successful dissolution of Peak RC in the West and the certification of three new RCs to fill the crucial function



Roy Thilly
Board Chair

In 2019, NERC substantially increased its budget for the E-ISAC and hired a number of new expert analysts to implement the E-ISAC five-year strategic plan, the development of which the Member Executive Committee has guided. Our Board is very grateful for the work of this group of industry CEOs, chief information officers, and E-ISAC staff in confronting a constantly changing threat environment.

Finally, in 2019, our Board directed that further in-depth work be done on identifying and implementing ways to confront the many challenges of supply chain equipment and software cyber risk. At the same time, a new EMP Task Force, which reports to the Board, began the complicated task of understanding the risks of an EMP attack on the grid and developing strategies necessary to protect against this risk.

On behalf of the Board of Trustees, I would like to thank NERC's stakeholders, staff, and the Regions for their continued hard work and dedication to our shared mission. I look forward to a rewarding and productive 2020.

Roy Thilly

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