

# NERC

NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

# NERC 2014 Annual Report

February 2015

**RELIABILITY | ACCOUNTABILITY**



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## Letter from the President and Chief Executive Officer

As we enter 2015, NERC continues to prioritize efforts on issues that pose the greatest risk to the reliability of the North American bulk power system. This strategic transformation provides a framework based on partnerships, knowledge and skills of industry and information sharing.

NERC continues to mature as the electric reliability organization—improving the standards and compliance processes, enhancing the collection of cyber and physical threat information and continuing to deliver independent assessments on issues that have the potential to impact grid reliability.

Key projects like the Reliability Assurance Initiative and the CIP Version 5 Transition Program enhance the effectiveness of the ERO by providing a risk-based approach to compliance monitoring and enforcement and improving industry’s understanding of the technical security requirements of new standards, respectively. Both programs allow the ERO and registered entities to focus appropriate time and effort on issues that pose a higher risk to reliability.

Several key standards were developed in 2014, including the CIP-014-1 – Physical Security and TPL-007-1 – Transmission System Planned Performance for Geomagnetic Disturbance Events. The physical security standard, which was developed and adopted within 90 days, requires the identification of potential threats and vulnerabilities to critical facilities and the development of a physical security plan. The standard is dynamic and adaptable to the constantly changing threat environment, which provides asset owners the flexibility to address a range of physical security concerns in a responsive and cost-effective manner.

NERC also continued work on the two-phase effort to address reliability risks caused by geomagnetic disturbances. The first-stage standard, EOP-010-1 – Geomagnetic Disturbance Operations, requires entities to have geomagnetic disturbance operating procedures and was approved by FERC in June. The proposed second-stage standard, TPL-007-1 – Transmission System Planned Performance for Geomagnetic Disturbance Events, would require entities to assess impacts from a 1-in-100-year benchmark geomagnetic disturbance event and mitigate against identified impacts. It was approved by NERC’s Board of Trustees in November and filed with FERC in January 2015.



Significant reports this year include the *Potential Reliability Impacts of the EPA's Proposed Clean Power Plan* and the *Five-Year ERO Performance Assessment*. The Clean Power Plan preliminary review examines the potential reliability aspects that could result from the plan's anticipated implementation. This important independent assessment sets the stage for future reliability analyses and evaluations by stakeholders. The *Five-Year Assessment* offers a look at the accomplishments and growth of the ERO over the past five years, while also providing opportunities for improvement going forward.

Based on the ERO's event analysis data, event severity dropped in 2014, which shows continued improvement in bulk power system reliability. While much has been accomplished this past year, we still have work to do. The partnerships and collaboration of 2014 have elevated our efforts and allowed us to be successful in assuring the reliability of the North American bulk power system. The accomplishments in the following report are evidence of the dedication and skill of those who work every day to keep the lights on.

A handwritten signature in black ink, reading "Gerry Cauley". The signature is fluid and cursive, with the first name "Gerry" being more prominent than the last name "Cauley".

*Gerry Cauley*

Gerry W. Cauley  
President and CEO



## NERC Overview

The North American Electric Reliability Corporation's mission as the electric reliability organization is to assure the reliability of the North American bulk power system. This is accomplished through a collaborative network comprised of NERC, the Regional Entities, U.S. and Canadian partnerships and stakeholders. This framework brings together the industry leadership, experience, judgment, skills and technologies necessary to maintain the reliable operation of the grid.

In 2015, the ERO will focus on making improvements in the following five strategic areas: standards; compliance, registration and certification; risks to reliability; coordination; and collaboration. These efforts will build upon the ERO's four pillars for success, which are:

**Reliability** – to address events and identifiable risks, thereby ensuring the reliability of the bulk power system through proper mitigation and remediation.

**Assurance** – to provide assurance to the public, industry and government for the reliable performance of the bulk power system.

**Learning** – to promote learning and continuous improvement of operations and adapt to lessons learned for bulk power system reliability.

**Risk-Based Approach** – to focus attention, resources and actions on issues most important to bulk power system reliability.

The accomplishments highlighted in the following pages of the 2014 Annual Report focus on reliability outcomes. In 2015, the ERO will continue on its path of excellence by evolving and adapting programs and policies to better assure the reliability of the North American bulk power system.

## 2014 Achievements

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### Reliability Assurance Initiative

The Reliability Assurance Initiative (RAI) was a collaborative, multiyear effort among NERC, the Regional Entities and industry to identify and implement changes to enhance the effectiveness of the Compliance Monitoring and Enforcement Program (CMEP). The initiative resulted in the adoption of a risk-based approach to compliance monitoring and enforcement. This approach benefits reliability by focusing resources applied to compliance monitoring and enforcement on risk, thereby allowing the ERO and registered entities to allocate appropriate time and effort on higher-risk compliance issues. This approach does not equate to ignoring lesser-risk compliance issues, which continue to be identified, corrected and tracked.

Further, the approach focuses on how the ERO performs oversight and obtains assurance regarding compliance with NERC Reliability Standards and does not create new or additional requirements (beyond those established in Reliability Standards) for registered entities operating the grid. However, this approach has the benefit of allowing the ERO to leverage certain management practices in use at registered entities to focus its own oversight activities. This ability to leverage management practices also has the effect of disseminating and enhancing such practices throughout industry.

The ERO is prepared to implement the new risk-based compliance and enforcement processes fully by January 2015. By the end of 2015, the ERO expects to measure the success of this initiative in a number of ways, including through measures related to staff competencies, robustness of outreach, program transparency and the sharing of best practices.

### Risk-Based Compliance Monitoring

As part of the transformation to a risk-based CMEP, NERC developed the risk-based compliance oversight framework. This framework consists of processes that involve reviewing system-wide risk elements, an assessment of a registered entity's inherent risk and, on a voluntary basis, an evaluation of a registered entity's internal controls prior to establishing a monitoring plan that is tailored to a particular entity or group of entities.

Historically, the annual ERO CMEP Implementation Plan has specified for the NERC Reliability Standards and requirements to be actively monitored through self-certification or audit by the Regional Entities during the implementation year. For the 2015 ERO CMEP Implementation Plan and beyond, NERC will replace the approach used to develop the CMEP Implementation Plan and the Actively Monitored List. Instead of the one-size-fits-all list of Reliability Standards in the Actively Monitored List, NERC will identify and prioritize continent-wide risks to reliability, known as risk elements, as well as associated Reliability Standards and registration functional categories related to those risks.

The ERO CMEP Implementation Plan provides guidance to Regional Entities in the identification of regional risks and associated Reliability Standards and Requirements for inclusion in their Regional CMEP Implementation

Plans. Regional CMEP Implementation Plans include Region-specific risk areas of focus and additional detail on Regional Entity compliance oversight plans.

The risk-based compliance monitoring framework involves further tailoring through the Inherent Risk Assessment, which is a review of potential risks posed by an individual registered entity to the reliability of the bulk power system. The Inherent Risk Assessment considers ERO and Regional Entity risk elements as well as other factors such as assets, systems, geography, interconnectivity, prior compliance history and the overall unique entity composition specific to each registered entity. The Inherent Risk Assessment identifies entity-specific risks, areas of focus and associated Reliability Standards that should be considered for compliance monitoring.

The Internal Control Evaluation is a voluntary process that can be used to refine the focus on entity-specific risks and associated Reliability Standards identified through the Inherent Risk Assessment. The Internal Control Evaluation identifies and considers internal controls to help determine the appropriate compliance monitoring need to obtain a reasonable assurance of compliance with Reliability Standards. After conducting an Inherent Risk Assessment and Internal Control Evaluation, if applicable, Regional Entities will ultimately determine the appropriate CMEP tools (i.e., off-site or on-site audit, self-certification or spot check) needed to tailor a more individualized, risk-based compliance oversight plan for registered entities based on risks to reliability.



### **Risk-Based Enforcement**

The risk-based enforcement approach developed under RAI allows the ERO to focus on higher risks to the reliability of the bulk power system, provide clear signals to registered entities about identified areas of concern and risk prioritization and maintain the ERO's existing visibility into potential noncompliance issues regardless of the level of risk they posed. This approach also encourages the self-identification of noncompliance and enhancement of internal controls by registered entities.

In the first half of 2014, the ERO addressed concerns regarding the timeliness of minimal risk issue resolution and communication. As of January 1, 2014, all Regional Entities have implemented a triage process to assess noncompliance. To improve the quality of submitted information and facilitate a prompt evaluation of noncompliance, NERC and Regional Entity staff prepared self-report and mitigation plan user guides for registered entities.

Throughout 2014, the ERO continued the implementation of two key risk-based enforcement programs that will allow both the Regional Entities and registered entities to focus their efforts on issues that pose a greater risk to reliability. Beginning in November 2013, the

ERO implemented a program to expand enforcement discretion by identifying minimal-risk noncompliances that would be recorded and mitigated without triggering an enforcement action. Noncompliance that is not pursued through an enforcement action by the ERO is referred to as a “compliance exception.”

Beginning in October 2013, a small number of registered entities with demonstrated effective management practices have been permitted to self-log minimal-risk issues that would otherwise be individually self-reported. To date, the ERO has identified several benefits of self-logging, including increased visibility into potential noncompliance, increased efficiency and reduced administrative burdens associated with individual self-reports. Since May 2014, the number of entities participating in this voluntary self-logging program has gradually expanded to allow the ERO to further evaluate the benefits and to adjust related processes.

### **Coordinated Oversight for Multi-Regional Registered Entities**

Also in 2014, the ERO developed a program for Coordinated Oversight of Multi-Regional Registered Entities (MRREs). An MRRE is a registered entity that has a single NERC Compliance Registry number in more than one Region or affiliated registered entities in multiple Regional Entities with multiple NCR numbers. Coordinated Oversight is intended to streamline risk assessment, compliance monitoring and enforcement and event analysis activities for the MRRE. Further, Coordinated Oversight may result in reduced administrative burdens for the MRRE and improved consistency. Initial implementation of this program will begin in January 2015.

### **Communication and Outreach**

NERC intensified its outreach efforts to ensure that the objectives and design of the risk-based CMEP are clear to all interested parties. NERC is conducting training and outreach directed at ERO staff to ensure successful and consistent implementation. NERC also provided a series of training opportunities for industry, including an “RAI 101” webinar, which attracted more than 700 participants. In addition, NERC conducted two industry outreach workshops, one on each coast, focusing on stakeholder understanding. Participants in these workshops had the opportunity to hear scenarios and examples from both NERC and Regional Entity staff, as well as learn from other stakeholders who have already experienced implementation of certain aspects of the risk-based CMEP. Participants were also able to engage in open dialogue with ERO staff and industry presenters and to ask questions on RAI-related activities and the potential impact on stakeholders for the 2015 implementation year and beyond. NERC plans to continue adding such opportunities into 2015.

To serve as a ready reference for stakeholders, NERC has enhanced its RAI web page and added new content. NERC’s RAI web page now includes an overview of the ERO’s risk-based CMEP, detailed descriptions of all new and expanded risk-based compliance monitoring and enforcement processes, key development and implementation milestones, workshop and webinar information, a news archive and more.

In addition, NERC formed an RAI advisory group composed of industry and trade association leaders, Regional Entity executives, and representatives from FERC. This advisory group met in September and October and will continue to meet regularly to provide input and guidance and to serve as a conduit to further expand outreach, communications and transparency efforts.

## Transition to Critical Infrastructure Protection Version 5

In 2013, FERC approved Version 5 of the Critical Infrastructure Protection Reliability Standards (CIP Version 5). The CIP Version 5 standards represent a significant improvement—and change—over the currently effective CIP Version 3 standards as they include new cybersecurity controls and extend the scope of the systems that the CIP Reliability Standards protect.

NERC initiated the CIP Version 5 Transition Program in an effort to collaborate with Regional Entities and responsible entities to understand how to implement the CIP Version 5 standards in a manner that is timely, effective and efficient. The goals of the program are to improve industry’s understanding of the technical security requirements for CIP Version 5 and to clarify the expectations for compliance and enforcement.

In 2014, NERC concluded a nine-month CIP Version 5 implementation study. During the study, a representative sample of six responsible entities focused on the technical solutions and processes needed to implement the CIP Version 5 standards. In so doing, they developed a deeper understanding of compliance and enforcement matters applicable to CIP Version 5.

As anticipated, NERC, the Regional Entities and the implementation study participants identified a number of issues during the study that called for additional guidance and clarity. To further ensure registered entity confidence in the transition to CIP V5, NERC continued working with the Regional Entities and implementation study participants to develop lessons learned and FAQ documents on specific issues. As documents are finalized, they will be shared with industry.

Working in collaboration with the Regional Entities, implementation study participants and other stakeholders, NERC also developed a transition guidance document and compatibility tables that compare requirements in CIP Version 5 with requirements in CIP Version 3. In addition, NERC addressed stakeholder concern with a document that clarifies how the risk-based compliance monitoring and enforcement processes developed under RAI will apply to CIP Version 5.

To continue assisting industry with the transition to CIP Version 5, the CIP Version 5 Transition Program will remain in place until April 1, 2017, when the final CIP Version 5 requirement becomes enforceable. More information about the CIP Version 5 Transition Program, including links to each of the documents, is available on the CIP V5 Transition page.



## Critical Infrastructure Protection Standards Version 5 Revisions

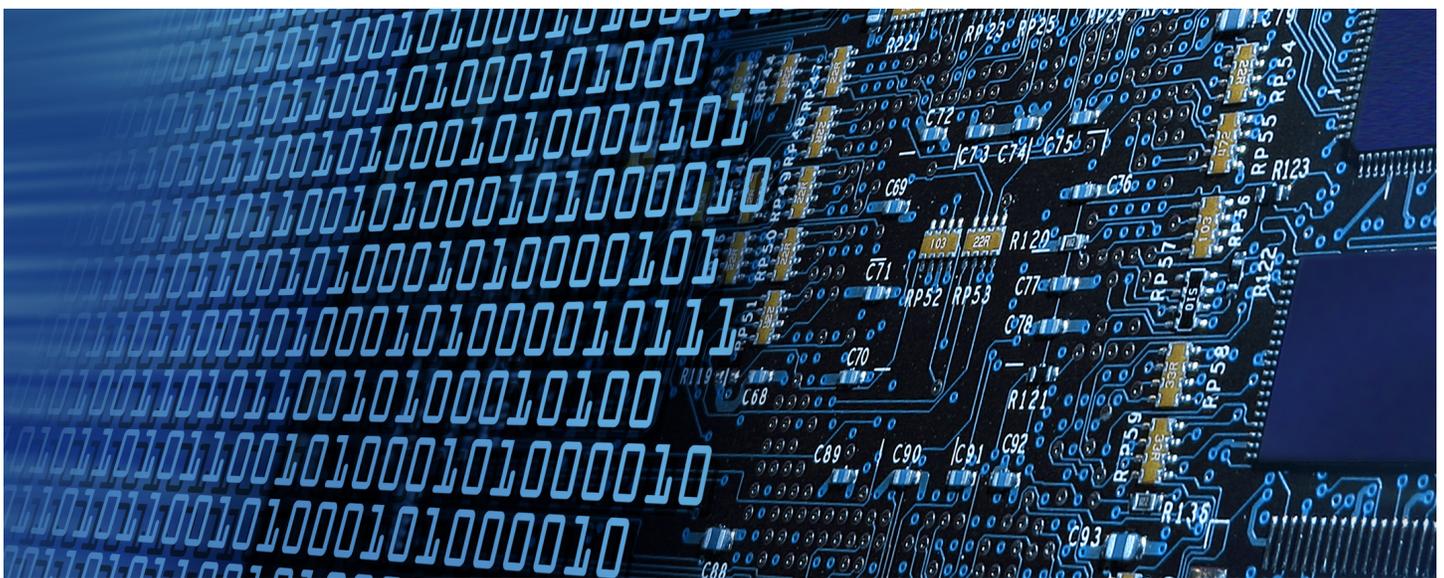
In its 2013 order approving CIP Version 5, FERC directed NERC to make certain modifications to the standards:

- Modify or remove the “identify, assess, and correct” language in 17 CIP Version 5 requirements;
- Develop modifications to the CIP standards to address security controls for low-impact assets;
- Develop requirements that protect transient electronic devices; and
- Create a definition of “communication networks” and develop new or modified standards that address the protection of communication networks.

FERC directed NERC to submit new or modified standards relating to the “identify, assess, and correct” language and communication networks by February 3, 2015. FERC did not place any time frame for NERC to respond to the low-impact and transient electronic devices directives.

Early in 2014, NERC formed Project 2014-02 Critical Infrastructure Protection Standards Version 5 Revisions to address these FERC directives. The Project 2014-02 standard drafting team focused its revisions specifically on the FERC directives and collaborated with the CIP Version 5 Transition Program to ensure that transition program activities were aligned with the drafting team’s efforts. As part of this coordination, members of the drafting team participated in meetings with implementation study participants, regional representatives, and NERC staff and will continue to do so as the revised standards go into effect.

In November 2014, the NERC Board of Trustees adopted proposed revisions to the CIP Version 5 standards to remove the “identify, assess, and correct” language and address the communication networks directive. In January 2015, the revisions to address the low impact and transient device directives received the requisite industry approval and will be presented for Board adoption at the February 2015 meeting. Provided that the Board of Trustees adopts these revisions, the proposed standards addressing each of the four directives will be filed with FERC for approval in February 2015.



## **Risk-Based Registration Initiative**

NERC's Risk-Based Registration initiative seeks to ensure that the right entities are subject to the right set of applicable NERC Reliability Standards using a consistent approach to risk assessment and registration across the ERO. In 2014, NERC established the Risk-Based Registration Advisory Group (RBRAG) and the RBRAG technical task force to provide input and advice on the design framework and implementation plan.

The framework includes: refined thresholds based on sound technical analysis, risk considerations and support; reduced NERC Reliability Standard applicability based on sound technical analysis, risk considerations and support; and clearly defined terms, criteria and procedures that are risk-based and ensure the reliability of the bulk power system as outlined in the new BES definition. The proposed enhancements reduce unnecessary burdens while preserving bulk power system reliability and avoid causing or exacerbating instability, uncontrolled separation or cascading failures.

Key achievements in 2014 include:

- Filing with FERC the amendments to the Rules of Procedure that implement Risk-Based Registration.
- Clarifying key registry criteria terms.
- Centralizing the review process regarding issues in the application of the registry criteria (e.g., determining when to register entities that don't meet the criteria or when not to register entities that do).
- Removing from the NERC Compliance Registry three functional registration categories, including purchasing-selling entity, interchange authority and load-serving entity functions.
- Refining the thresholds for one other functional category, distribution provider.
- Synchronizing the thresholds and criteria to the new Bulk Electric System definition for the transmission owners/transmission operators and generator owners/generator operators.
- Developing a NERC Reliability Standard applicability sub-list for distribution providers that own, control or operate underfrequency load shedding equipment and do not meet other distribution provider registry criteria.

In addition, registered entities will be permitted to make a one-time attestation of "not applicable" to a given NERC Reliability Standard requirement with respect to self-certifications and other compliance monitoring activities. NERC and the Regional Entities will also implement an ERO registration form that includes common data elements for registered entity registration.

The ERO will continue training and communication on Risk-Based Registration through workshops, webinars and published documents, and will work with industry to implement key activities scheduled for Phase II in 2015. These include evaluation of opportunities for sub-set lists for low-risk transmission owners/transmission operators and generator owners/generator operators.

## Five-Year ERO Performance Assessment

NERC's second performance assessment report was accepted by the Federal Energy Regulatory Commission in November. The Five-Year ERO Performance Assessment highlighted various achievements of the ERO during the five-year assessment period, as well as ongoing efforts to continue enhancing the reliability and security of the bulk power system. In its order approving the five-year assessment, FERC said that NERC and the Regional Entities continue to satisfy statutory and regulatory criteria for certification as the ERO. FERC also acknowledged NERC's numerous efforts and initiatives to improve the performance of and mitigate risks to the bulk power system. These initiatives include streamlining the standards development process and establishing a mature compliance monitoring and enforcement program that focuses on the greatest threats to grid reliability.

While recognizing the tremendous progress to date, FERC also identified several opportunities for improvement that build upon NERC's plans and initiatives for improving coordinated operations across the ERO. Specifically, FERC issued two directives related to tracking reliability standard projects and improving consistency and coordination across the ERO that must be outlined in a November 20, 2015, informational filing.

FERC also recommended that the ERO make improvements related to violation processing, data sharing, development of performance metrics, processing and development of reliability standards and continuing transparency in enforcement. FERC issued several directives and recommendations to enhance future five-year ERO performance assessments.

In the past five years, the ERO has accomplished much toward ensuring the reliable planning and operation of the North American bulk power system; however, opportunities remain for continued enhancement and improvement. NERC has always made reliability a priority and this commitment will continue into the future.

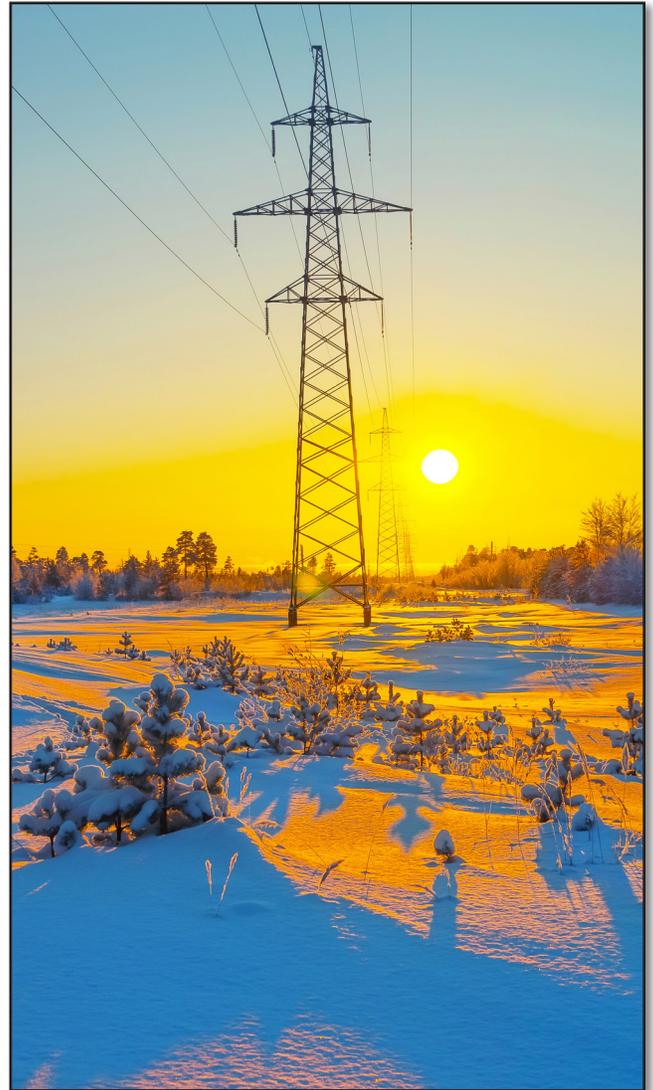
## Polar Vortex Review

As part of NERC's ongoing efforts to identify risks to bulk power system reliability and to inform stakeholders, NERC reviewed the extreme weather event that occurred January 6–8. The *Polar Vortex Review* details how the bulk power system showed its resiliency during the polar vortex. The report showed that bulk power system reliability was maintained despite sustained record-low temperatures occurring over a large geographic area in North America. Many areas experienced daytime high and overnight-low temperatures that were between 20 and 30 degrees below normal, with 49 cities setting new record lows.

Generation and transmission operators in North America responded well to prevent major impacts to the bulk power system. NERC examines these types of events to ensure lessons learned and information sharing occurs to prevent reoccurrences where possible and, most importantly, sustain successful operation and maintenance practices. As expected, key factors during the event included fuel deliverability issues, natural gas pipeline outages, gas service interruptions, frozen electricity and gas equipment and other extreme cold weather operating challenges.

During the event, grid operators employed techniques such as voltage reduction and demand-side management to ensure that bulk electric system reliability was maintained. The fact that only one balancing authority shed firm load during the polar vortex event is an indication of a strong overall performance by industry under extremely challenging circumstances. Industry owners and operators used all the resources at their disposal to keep the grid reliable during these extreme conditions.

NERC offered industry a winter weather preparation webinar in October that provided reports and training material in preparation for the upcoming winter weather forecasts and entity cold weather preparedness. The webinar encouraged generator owners and operators to focus on areas that were observed in past events, such as inspecting and maintaining heat trace equipment and thermal insulation, erecting adequate wind breaks and enclosures, and taking measures to protect instrument lines and equipment prior to the onset of winter weather. NERC also highlighted the Reliability Guideline Generating Unit Winter Weather Readiness – Current Industry Practices, which was developed by the Operating Committee. These guidelines provide a general framework for developing an effective winter weather readiness program for generating units throughout North America. A Cold Weather Event Training Package was also developed to assist nontraditional cold weather registered entities properly prepare for cold weather events.



Operators and other Regional Coordinator area entities demonstrated the value of regular training and annual drills by effectively and successfully implementing emergency procedures. Proactive communication and coordination between the Regional Coordinators and within the Regional Coordinator areas themselves helped ensure appropriate situational awareness was maintained and facilitated rapid response as needed.

Industry continues to work with gas suppliers, markets and regulators to quickly identify issues with natural gas supply and transportation. Power plant weatherization programs are being reviewed and updated as a result of lessons learned from this event. Industry continues to work to identify and protect against outages that occurred within the cold weather design basis of the plant. Additionally, entities continue to review the winter cold weather temperature design basis for their generating units to determine if improvements are needed while ensuring that the generating unit's ability to withstand higher temperatures in the summer is not compromised.

## Assessments and Reports

As part of its ERO mission to identify risks to reliability, NERC develops assessments annually to inform industry and policy makers on trends and challenges regarding the North American bulk power system. These assessments provide the analysis required for stakeholders to ensure the system maintains reliability.

### Potential Reliability Impacts of the EPA’s Proposed Clean Power Plan Preliminary Report

A preliminary reliability review of the assumptions and potential reliability impacts of the Environmental Protection Agency’s proposed Clean Power Plan under Section 111(d) of the Clean Air Act was completed in November. This assessment, *Potential Reliability Impacts of EPA’s Proposed Clean Power Plan*, examined the potential reliability concerns that could result from the plan’s implementation. In order to continue operating the bulk power system safely and reliably, more detailed and thorough analysis was deemed necessary to determine whether the assumptions are feasible and consistent with the requirements of bulk power system reliability.

This assessment provides a foundation for future reliability analyses and evaluations required by the ERO, stakeholders and federal and state policy makers to create a framework with realistic timelines that accommodate the expected infrastructure deployments needed to support bulk power system reliability while achieving the environmental objectives of the proposed rule.

As noted in the *2014 Long-Term Reliability Assessment*, the bulk power system is undergoing a fundamental transformation toward increasing dependency on natural gas, wind and solar resources. The Clean Power Plan substantially accelerates that shift and proposes a very different mix of power resources. NERC’s role is to identify emerging reliability issues that must be adequately addressed to ensure future reliability of the electricity supply.

The Clean Power Plan, which seeks to reduce carbon dioxide emission from power plants to 30 percent below 2005 levels by 2030, calls for states to begin submitting implementation plans as early as June 30, 2016, and regional implementation plans by June 30, 2018.

Based on projections in NERC’s 2014 LTRA, power plant retirements and limited capacity additions are contributing to diminishing reserve margins in New York, the Midwest and Texas. Since 2011, more than 30 GW of conventional fossil-fueled generation has been retired, primarily due to existing environmental policies and low natural gas prices. Industry projections indicate an additional 44.2 GW will be retired across the NERC footprint. By 2020, the EPA assumes that impacts of existing environmental regulations, combined with the proposed Clean Power Plan, will reduce coal-fired generation by up to 69.8 GW beyond NERC’s 2014 LTRA reference case projections.



NERC plans to conduct three additional assessments as the rule is finalized and implemented, including an analysis that provides a more detailed examination of generation and transmission adequacy and reliability impacts in 2015; a comprehensive assessment of the final rule prior to the state implementation plan deadline; and an assessment that examines the final state implementation plans in 2016.



### **2014 Long-Term Assessment**

The *2014 Long-Term Reliability Assessment* provided a forward-looking, independent North American perspective of the resource adequacy needed to maintain reliability during the next 10 years. NERC examined key indicators including load forecasts, expected resources and transmission additions. The assessment identified three key reliability findings facing industry in the coming years: downward trends in reserve margins, uncertain impacts of environmental rules and an ongoing resource mix transformation.

In several assessment areas, reserve margins trended downward because of ongoing generation retirements, despite low load growth. Uncertainty remains for a large amount of existing conventional generation that may be vulnerable to retirement resulting from pending regulations, particularly the EPA’s proposed Clean Power Plan.

Other areas of ongoing reliability work include the changing resource mix, variable energy resources and essential reliability services.

### **Evolving Resource Mix**

As part of NERC’s efforts to continually assess all facets of potential impacts to reliability, the LTRA identified a number of significant emerging reliability issues that could prove challenging in the next decade. These challenges stem from a changing resource mix comprised of significant increases in variable energy resources to meet renewable portfolio standards, increased reliance on natural-gas-fired generation and demand-side management primarily driven by economics and the retirement of nearly 10 percent of North America’s generation capacity. The changing resource mix has the potential to alter the operational characteristics of the grid, so industry must pay more attention to the effects this will have on essential reliability services.

### **Variable Energy Resources**

Reliably integrating high levels of variable energy resources into the North American bulk power system requires significant changes to the traditional methods used for system planning and operation. The amount of variable renewable generation is expected to grow considerably as policy and regulations on greenhouse gas emissions are developed and implemented by federal authorities and individual states and provinces. Operators require new tools and practices, including potential enhancements to NERC Reliability Standards or guidelines to maintain bulk power system reliability. The NERC Integration of Variable Generation Task Force (IVGTF) developed a number of recommendations over the past years that spurred significant action across the industry,

including the identification of potential gaps and enhancements to NERC Reliability Standards and guidance on developing new operating procedures and planning considerations, including specifics on unique regional challenges, differing market structures and regulatory policies.

### **Essential Reliability Services**

The NERC Planning and Operating Committees jointly created the Essential Reliability Services Task Force (ERSTF) in 2014 to consider the issues that may result from the changing generation resource mix. The group released an ERSTF concept paper in October. The concept paper identifies the key characteristics of a reliable grid in two main categories: voltage support and frequency support. In the coming year, the task force will be analyzing the impact of retirements, replacement resources and resource capability.

### **State of Reliability**

NERC published the *State of Reliability 2014* report in May. This report represents NERC's independent view of ongoing bulk power system trends to provide an integrated view of reliability performance. The report is important for industry because key findings and recommendations serve as technical input to NERC's risk assessment, standards project prioritization, compliance process improvement, event analysis, reliability assessment and critical infrastructure protection.

The 2014 SOR identified five key findings:

- **Sustained high performance for bulk power system reliability:** The daily severity risk index (SRI), which measures risk impact or stress from events resulting in the loss of transmission, generation and load, has been stable to improving from 2008 to 2013. On average, the SRI was approximately as good as the best year on record.
- **Stable frequency response in North America:** Protection system misoperations continue to cause transmission events. On average, transmission system events with protection system misoperations were more impactful than other transmission events. Misoperations were also, in aggregate, a significant contributor to transmission outage severity, indicating that a reduction in protection system misoperations would lead to an improvement in system reliability.
- **Impact of substation equipment failures on transmission event severity:** The AC Substation Equipment Task Force (ACSETF) was created to address high-priority reliability issues related to ac substation equipment. A separate ACSETF report provided many recommendations to improve performance.
- **Declining use of Energy Emergency Alert Level 3 (EEA 3):** Only one of the seven EEA 3 events in 2013 required firm load to be shed to preserve reliability of the bulk power system. This further demonstrates the ability of the grid to perform well under stressed conditions.

The annual *State of Reliability* report provides a reference of historical reliability, offers analytical insights regarding industry action, and enables the identification and prioritization of specific steps that can be taken to manage identified risks to reliability.

## Transformation to Steady-State Standards

In 2014, NERC continued to transition its body of standards to steady state by addressing FERC directives and requirements that were recommended for retirement, and by applying quality and content criteria to standards under development. The ERO undertook 30 projects during 2014, whereas the 2015–2017 Reliability Standards Development Plan reflects only four new projects.

The amount of work accomplished by the ERO in 2014 was possible due to efficiencies incorporated into the standards development process over the last two years that resulted in an approximately 75 percent reduction in the time required to produce a quality standard. The efficiencies were derived from the revised Standard Processes Manual, which became effective on June 26, 2013, and the use of informal development, which focuses on obtaining industry and regulator input early and throughout the standard development process. This transformed the standard drafting teams into teams facilitating solutions using stakeholder and regulator input, leading to an increase in industry approval ratings and fewer directives in final FERC orders.

### Directives Addressed in 2014

NERC made significant progress on FERC obligations in 2014. There were 107 FERC directives remaining at year-end 2013, and FERC issued an additional six in 2014. Of these, 60 have been addressed, leaving 53 remaining at year-end 2014.

### Adoption, Filing and Approval of Key Standards

In 2014, NERC’s Board of Trustees adopted 44 continent-wide standards, three regional standards and one definition, a significant increase from 2013. Among the key standards adopted by the Board and filed with or approved by applicable regulatory authorities are MOD-001-2 – Available Transmission System Capability, COM-002-4 – Operating Personnel Communications Protocols, CIP-014-1 – Physical Security, EOP-010-1 – Geomagnetic Disturbance Operations and TPL-007-1 – Transmission System Planned Performance for Geomagnetic Disturbance Events.

#### Total Number of FERC Directives

|                                   |           |
|-----------------------------------|-----------|
| Remaining at Year-end 2013        | 107       |
| Issued since Year-end 2013        | 6         |
| Addressed in 2014                 | 60        |
| <b>Remaining at Year-end 2014</b> | <b>53</b> |

*Directives are considered “addressed” if standard projects addressing them were filed with FERC or if stakeholders approved the project in a final ballot.*

MOD-001-2 – Available Transmission System Capability was adopted by the Board in February, and FERC issued a Notice of Proposed Rulemaking proposing to approve it in June. The significant changes proposed under this project consolidate six standards and 56 requirements into one standard with six requirements. MOD-001-2 ensures that determinations of available transmission system capability are completed in a manner that supports the reliable operation of the bulk power system and that the methods and data underlying those determinations are disclosed to those registered entities that need such information for reliability purposes. NERC is coordinating with FERC and the North American Energy Standards Board to determine how these retirements affect related North American Energy Standards Board standards.

COM-002-4 – Operating Personnel Communications Protocols was also adopted by the Board in May. The standard satisfies FERC directives from Order 693 and is designed to ensure that reliability-related information is conveyed effectively, accurately, consistently and in a timely manner toward mutual understanding by all key parties when issuing or receiving emergency and non-emergency operating instructions. FERC issued a Notice of Proposed Rulemaking proposing to approve the standard in September.

CIP-014-1 – Physical Security, developed in response to a March 7 FERC order directing the development of a standard that addresses physical security threats and vulnerabilities, was adopted by the Board and filed with FERC in May. FERC approved the standard on November 20. CIP-014-1 is dynamic and adaptable to the constantly changing threat environment, providing flexibility to the asset owners to address a range of physical security concerns in a responsive and cost-effective manner. The standard was developed and filed with FERC within 90 days, as directed by FERC, proving that with Standard Processes Manual-approved deviations from the usual standard development process, the ERO can develop a technically sound standard in an expedited time frame when required.



In 2014, NERC also continued work on the two-phase effort to address reliability risks caused by geomagnetic disturbances in response to a May 2013 FERC order. The first-stage standard, EOP-010-1 – Geomagnetic Disturbance Operations, requires entities to have geomagnetic disturbance operating procedures. FERC approved the standard on June 19. The proposed second-stage standard, TPL-007-1 – Transmission System Planned Performance for Geomagnetic Disturbance Events, would require entities to assess the impacts from a 1-in-100-year benchmark geomagnetic disturbance event and mitigate against identified impacts. It was approved by the Board in November and was filed with FERC in January 2015. The proposed TPL standard and the approved EOP standard address the unique risks posed by a high-impact, low-frequency geomagnetic disturbance event to the reliable operation of the bulk power system.

Collectively, the standards achievements of 2014 demonstrate the ERO's improved efficiency in standards development as well as its ability to respond quickly in response to emerging threats. As NERC further narrows the scope of outstanding standards work that it must address, moving ever closer to a steady state for standards, it is better poised to address future risks in support of reliability.

## Bulk Electric System Definition and Tool

FERC approved the revised definition of BES on March 20, 2014, as outlined in Order Nos. 743, 773 and 773-A. The definition includes bright-line core criteria with various enumerated inclusions and exclusions. The ERO developed enterprise-wide processes to provide a uniform, clear way of determining assets contained within the bulk electric system. As a result of the new definition, all elements and facilities necessary for the reliable operation and planning of the bulk power system will be included as bulk electric system elements. FERC also approved the process for review of elements on a case-by-case basis to allow for exceptions from the definition, where appropriate, as well as a process for entities to self-notify Regions of their determinations of BES elements.

The ERO also developed processes and tools to provide a uniform, clear way of determining asset inclusions, exclusions and self-determinations under the revised BES definition. The tools offer a consistent way to identify assets and manage workflow, which will enhance the reliability of the bulk power system. The ERO enterprise-wide software application, the BES Notification and Exceptions Tool, or BESnet, is used by entities to submit to their respective Regional Entity notifications of changes to BES assets that affect the registered entity's responsibilities for compliance with the Reliability Standards.

## Vegetation Management Progress

Ineffective vegetation management was identified as a major cause of the August 2003 blackout. In response, NERC developed the FAC-003 Reliability Standard, which formalized the transmission vegetation management program and reporting requirements. In efforts to continue enhancing reliability, more research is ongoing in this area.

FERC issued Order No. 777, which called for additional research on vegetation management issues. The FERC directive ordered NERC to conduct testing to develop data on the flashover distances between conductors and vegetation. Since FAC-003-1 became effective in 2007 (it was superseded by FAC-003-3 in July 2014), transmission outages from grow-ins have consistently decreased, with only one grow-in outage in the past four years. Prior to 2010, there were 63 reported grow-in outages.



EPRI conducts flashover tests.

NERC currently is conducting research and testing to statistically validate the gap factor that should be used to calculate minimum vegetation clearance distances (MVCD). Significant industry support for the application of the Gallet Equation, which uses the gap factor to calculate MVCD, was key to achieving approval for this NERC Reliability Standard. This research is historically supported by a statement prepared by the Electric Power Research Institute (EPRI) involving a testing project that will culminate with a final report. The report will be filed with FERC in June 2015.

## Canadian Collaboration

As part of its strategic focus on coordination and collaboration, the ERO made concerted efforts in 2014 to increase interaction with Canadian reliability stakeholders. This was done through onsite visits and meetings with Canadian registered entities and provincial authorities, including regulators. In the past year, NERC participated in the Canadian Association of Members of Public Utility Tribunals (CAMPUT) and other Canadian regulator meetings, as well as trilateral sub-group meetings with NERC, the United States and Canadian governmental authorities. The increased coordination led to the development of a more robust Canadian presence on the NERC website and summaries of provincial reliability frameworks.



In addition, the second agreement between the Régie de l'énergie du Québec (Régie), NERC and NPCC was executed in the third quarter of 2014. This agreement supplements and completes the agreement that was first executed in 2009, setting the stage for several key actions by the Régie, including issuance of the Québec Reliability Standards Compliance Monitoring and Enforcement Program (QCMEP) and the roles and responsibilities of the Régie, NPCC and NERC regarding implementation of the QCMEP.

The QCMEP was issued October 10, 2014, with the implementation date for enforcement of mandatory standards to be set by the Régie. NERC continues to work with the Régie and NPCC toward full implementation of a mandatory reliability framework. In addition, NERC established a full-time Canadian Affairs position in 2014 to work with Canadian reliability stakeholders to support continued implementation of a robust international reliability framework.

## Grid Security Exercise

As part of its ongoing training and education efforts, NERC conducted its second industry-wide grid security exercise, GridEx II, in November 2013. The report, which was released in March 2014, highlights recommendations and lessons learned for industry to use when preparing for and responding to cyber and physical threats, vulnerabilities and incidents. The results are also incorporated into strategic action by NERC's Critical Infrastructure Protection Committee and the Electricity Subsector Coordinating Council.

The exercise, a coordinated cyber and physical attack on the bulk power system, promoted coordination and highlighted urgent issues facing the industry. The simulated cyber attack impacted corporate and control networks, while the concurrent, simulated physical attack degraded reliability and threatened public health and safety. NERC encouraged the more than 230 participating organizations to modify the GridEx II baseline scenario to achieve entity-specific objectives and ensure relevance to local conditions.

Planning for GridEx III, which is scheduled for late 2015, has begun. The scenario will include robust cyber and physical threats to the bulk power system to exercise crisis response and recovery, improve crisis communications, gather lessons learned and engage senior industry and government leaders.

## **Grid Security Conference**

As part of NERC's ongoing efforts to educate and collaborate with industry, NERC hosted the fourth annual grid security conference, GridSecCon 2014. More than 430 industry and government stakeholders attended to discuss prevention of cyber and physical threats and share best practices. More than 40 senior industry and government leaders and subject matter experts discussed strategy, tactics and tools to ensure the reliability and resiliency of the grid. Additionally, almost 250 attendees received credentialed training sessions in cybersecurity and physical security.

The conference seeks to discuss and provide solutions to emerging industrial control system security issues, highlight public-private partnerships and provide Electricity Sector Information and Analysis Center updates.

GridSecCon 2015 is scheduled for October 13–16, 2015, in the ReliabilityFirst Region. Additional details will be posted on NERC's website as they are available.

## **Reliability Issues Steering Committee**

The Reliability Issues Steering Committee was developed in 2012 in response to recommendations by the Standards Input Process Group. The RISC is made up of stakeholder and committee representatives who provide a broad ERO perspective when assessing and prioritizing risks for enhancing the reliability of the North American bulk power system. The RISC presented their ERO Reliability Risk Priorities to the NERC Board of Trustees in November. The report defined and assessed risks to reliability and provided a roadmap to represent the current state of each risk relative to other risks.

Additionally, the RISC and NERC hosted a Reliability Leadership Summit in September to gain insight on current reliability perspectives and gather information about existing and emerging risk trends. More than 100 industry leaders attended the summit, which focused on diverse issues the industry faces, including integration of renewables, potential generation retirements in light of low-cost natural gas and environmental regulations, electric-gas interdependency, and communications during and while recovering from bulk power system emergencies.

Based on these activities, the RISC concluded that NERC should focus its attention on the complex interdependencies between the electric industry and other industries, resiliency, regulatory and structural uncertainty, resource adequacy, resource commitment confidence and visibility, and situational awareness. NERC will use this information for upcoming business planning and budgeting through the development of corporate goals and standing committee work plans.

## NERC Regional Entities

### FRCC

**Florida Reliability Coordinating Council** is a nonprofit corporation whose mission is to promote and assure the reliability of the bulk power system in Peninsular Florida.

*Stacy Dochoda, president and chief executive officer*

### MRO

**Midwest Reliability Organization** covers roughly one million square miles spanning the Canadian provinces of Saskatchewan and Manitoba, the states of Iowa, North Dakota, Minnesota and Nebraska, the majority of the states of South Dakota and Wisconsin and portions of Illinois, Michigan and Montana.

*Daniel Skaar, president and chief executive officer*

### NPCC

**Northeast Power Coordinating Council, Inc.** includes the State of New York and the six New England states, along with the Canadian provinces of Ontario, Québec and the Maritime provinces of New Brunswick and Nova Scotia. Overall, NPCC covers an area of nearly 1.2 million square miles, populated by more than 56 million people.

*Edward Schwerdt, president and chief executive officer*

### RF

**ReliabilityFirst** is a non-profit corporation responsible for ensuring the reliability of the bulk power system in all or portions of the states of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. ReliabilityFirst's footprint includes a large number of metropolitan areas, including Baltimore, Chicago, Cincinnati, Cleveland, Columbus, Detroit, Indianapolis, Milwaukee, Pittsburgh, Philadelphia and Washington, D.C.

*Timothy Gallagher, president and chief executive officer*

### SERC

**The SERC Reliability Corporation** is a nonprofit corporation responsible for promoting and improving the reliability, adequacy and critical infrastructure of the bulk power supply systems in all or portions of 16 central and southeastern states. The SERC Region covers an area of approximately 560,000 square miles, populated by nearly 53 million people.

*Scott Henry, president and chief executive officer*

### SPP Regional Entity

**The Southwest Power Pool Regional Entity (SPP RE)** is an independent and functionally separate division of SPP, Inc. SPP RE promotes and works to improve bulk power system reliability within SPP RE's footprint, an eight-state area that includes all or parts of Arkansas, Kansas, Louisiana, Mississippi, Missouri, New Mexico, Oklahoma and Texas.

*Ron Ciesiel, general manager*

## Texas RE

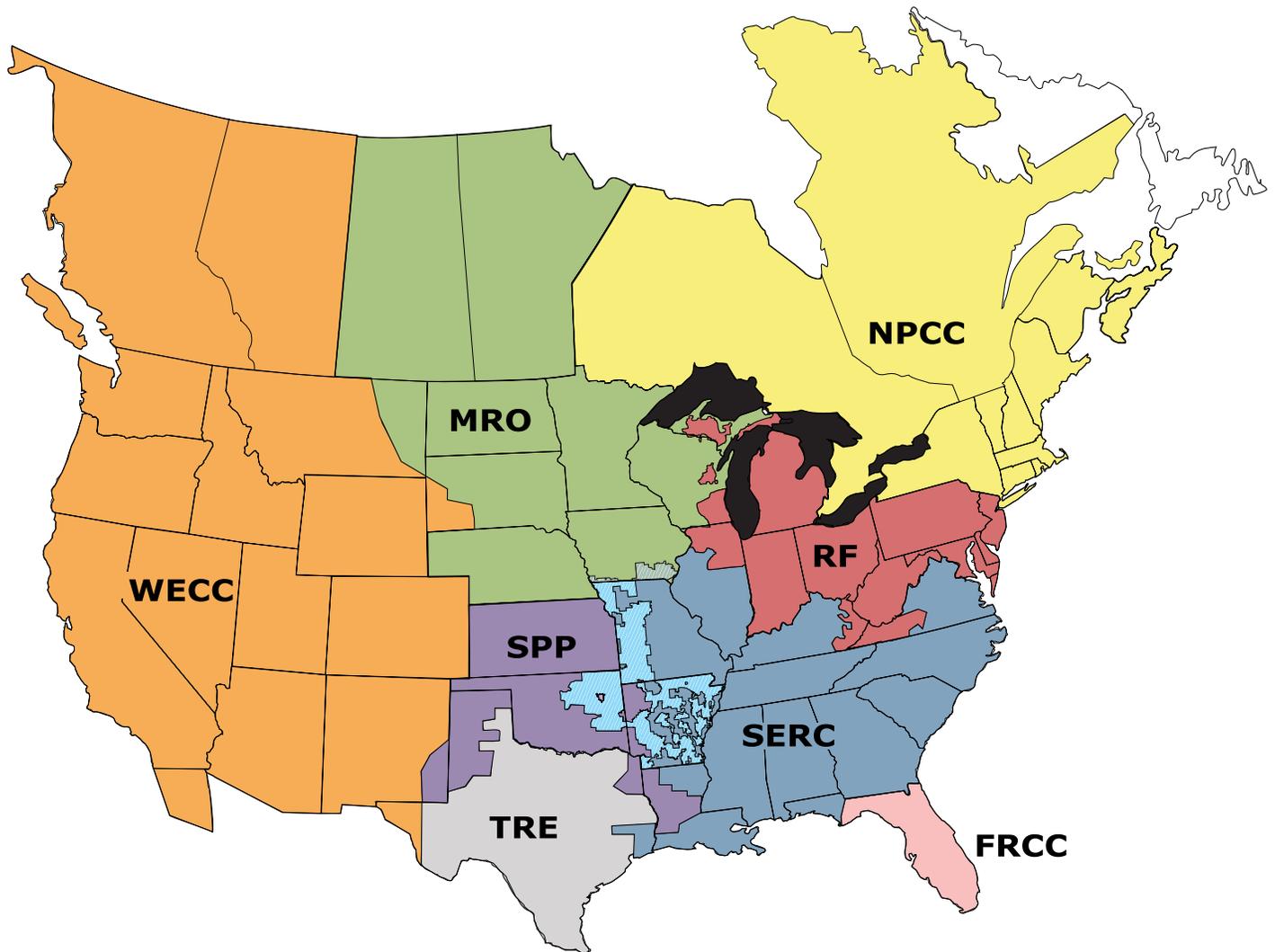
**Texas Reliability Entity, Inc.** is a nonprofit corporation responsible for ensuring reliability of the bulk power system in the Electric Reliability Council of Texas (ERCOT) Region. The ERCOT Region is located exclusively within Texas and represents 85 percent of the state's electricity load and 75 percent of the Texas land area.

*W. Lane Lanford, president and chief executive officer*

## WECC

**Western Electricity Coordinating Council's** territory extends from Canada to Mexico. It includes the provinces of Alberta and British Columbia, the northern portion of Baja California, Mexico, and all or portions of the 14 western states between, which totals approximately 1.8 million square miles.

*James B. Robb, chief executive officer*



## Letter from the Board of Trustees Chair

NERC had an excellent year in 2014, and I am pleased with the progress we made on a number of fronts. We continued to streamline and improve existing standards while successfully addressing new challenges with regard to physical security, geomagnetic disturbances and CIP Version 5. We continued, with support of the Regions, to transition the ERO enterprise to a risk-based operation, making significant strides in introducing rigorous risk-based approaches to compliance, enforcement and registration. We have continued to improve our analytic capacity to inform stakeholders and policy makers about reliability risks through our annual and special assessments.

As an enterprise, we continued to improve our business planning and budgeting process. We have further developed our three-year ERO Strategic Plan, enhancing clarity about expectations and metrics as well as managing the timing so that it fits better with the business planning and budgeting timetable. We also made progress in integrating the work of the Reliability Issues Steering Committee into our strategic plan metrics and business plan. The stakeholder committees that advise the Board are aligning their work with the enterprise strategic plan, and this is proving to be very effective. Our Board continues to meet regularly with the leadership of the regional Boards to foster open communication.

Recognizing the international nature of the ERO, we have strengthened relations with regulators in Canada and with the Canadian Electricity Association, and we have updated agreements with Quebec and New Brunswick. We are also watching the significant changes taking place in Mexico with great interest as it moves toward a new, more open and competitive structure for electricity.

This progress has not come without a lot of hard work by many people. On behalf of the Board, I would like to thank the Members Representative Committee for a year of positive contribution and communication. We have worked together to enhance the discussion and policy input that the Board gets at the quarterly meetings. We underscore the importance of the policy input we receive and will work to make further improvements where we can. I also want to thank NERC management and staff for the professionalism, commitment and passion they bring to the task of serving reliability in North America. We have an excellent management team, and the Board appreciates their leadership. I also want to thank the thousands of industry volunteers



who serve on the technical committees that help support the work of the enterprise.

Finally, I want to acknowledge that this February, Bruce Scherr will be leaving the Board of Trustees after 12 years of continuous service. Bruce has been a great contributor and a wonderful colleague. We will miss him and we thank him very much for his outstanding service to NERC and to reliability.

A handwritten signature in black ink, appearing to read 'Fred Gorbet', is placed above the printed name and title.

Fred Gorbet  
NERC Board Chair

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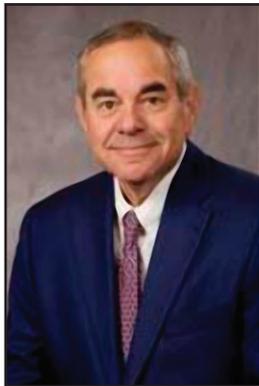
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