NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

# FERC Reliability Technical Conference

## Panel I: The Changing ERO Enterprise, Standards, and Reliability

## Remarks of James B. Robb, President and CEO
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## Introduction

It is a pleasure to make my first appearance before the Commission as President and Chief Executive Officer of the North American Electric Reliability Corporation (NERC). The electricity sector has undergone steady evolution over the decades since NERC was founded 50 years ago. We are now in the midst of a historic period that is unprecedented for both the pace and magnitude of change. This evolution is driven by numerous factors which include economics, new technology, public policy priorities, and customer expectations. On the security front, the landscape grows ever more complex as we confront an expanding array of malicious threats and actors. We remain steadfast in our focus on reliability and security of the Bulk Power System (BPS). Our mission is as vital today as any point in our history. It is a shared North American mission that includes strong commitment from industry, federal and provincial regulators, government stakeholders, and cross-sector partners. Even with current challenges, the state of reliability is strong and getting stronger.

The Commission has crafted a broad agenda that speaks to the change theme. The Commission asks about the reliability dimensions of the changing resource mix. It asks how this evolution can assure a reliable system that includes resilience. Today's conference focuses on the need for strong partnerships and innovation to address evolving cyber security threats. Finally, we are asked to examine how NERC and the Regional Entities (REs), collectively the ERO Enterprise, continuously adapt to these changes while remaining independent, efficient, and effective. In my view, the Commission is focused on the most important questions for reliability and security. I look forward to answering these questions today.

### Priorities for NERC and the ERO Enterprise

Working with our stakeholders, NERC and the ERO Enterprise must continue to assure reliability and security as the industry undergoes rapid transformation. Given the pace, the challenge facing the grid should not be underestimated. Regulators, policymakers, and all stakeholders have a shared interest in ensuring that this evolution takes place in an orderly fashion so reliability will remain a top priority. Change itself does not necessarily equate to risk. Yet to address risk, we must be able to anticipate, understand, and adapt to the changes that are taking place. These are where NERC's top priorities lie.

ERO Enterprise Priorities

The *ERO Enterprise Long-Term Strategy* identifies priorities for NERC and the REs. The most important foundational priorities include **full implementation, and, where possible, extension of the risk-based philosophy** that NERC has established.

To do this, we will focus near term on three major areas:

- ***Completing the Standards Efficiency Review.*** This is an important step to getting the ERO Enterprise focused on the key requirements that drive reliability and security performance. The purpose of the review is to identify potential efficiencies through retirement or modification of particular requirements that do not impact maintaining an adequate level of reliability for the BPS. It is another example of the Electric Reliability Organization's (ERO's) continuing evolution as a risk-based enterprise. The Standards Efficiency Review teams performed a comprehensive review of the Requirements within the Reliability Standards, excluding the cyber security standards, and drafted recommendations and justifications for potential retirements. To date, this process has identified approximately 20 percent of the existing requirements as potential candidates for retirement. The review teams posted a draft Standard Authorization Request (SAR) and received industry comment. The teams are reviewing the comments to see whether the draft SAR requires modification. The teams will then submit the draft SAR to the Standards Committee to initiate the standards revision process. The primary benefit to reliability derived from this effort is to eliminate requirements that divert industry resources to administrative tasks, enabling them to concentrate on tasks that directly affect the reliability of the BPS.
- ***Ensuring consistent implementation of compliance across the Regional Entities.*** Work is underway to invest in a uniform work and data management tool for the Compliance Monitoring and Enforcement Program (CMEP) process. This will go a long way in supporting reliability excellence and driving consistency in the CMEP processes across the Regions.
- ***Maintaining rigor at all times.*** As we find ways to improve our focus on key risks and reduce administrative burdens on our entities, we won't lose sight of the importance of continued diligence. As the truism goes, industry is reliable and secure until the moment it isn't. Success in our world is the absence of an event and, of course, this is very hard to measure.

As we work to build these capabilities, we will focus considerable time and attention to **how the ERO Enterprise works**. As noted, development of an ERO Enterprise strategy, a collective effort by NERC and the Regions, is a prime example of the ERO model working as an effective organization. Coming together to develop a common vision, a common mission and goals, is representative of how well the model is working and how it has evolved.

As a former CEO of a Region, I can attest to the fact that NERC and the Regions are working more closely together as a team than ever before. The ERO Enterprise is undergoing some significant and positive changes that position us well for a new level of alignment and performance. This year, we moved from eight to seven Regions recognizing key roles and priorities for SPP RE, MRO and SERC. The successful integration of Registered Entities from the former SPP RE into MRO and SERC has been consummated effectively. We thank FERC for your support of these efforts. Additionally, we look forward to the transitioning of the executive leadership in several Regions that will provide the ERO Enterprise with a fresh look at processes and procedures aimed at creating a more effective and efficient Enterprise across North America.

Over the years, we reduced the amount of time to develop standards and with FERC's help through our compliance initiatives, we are focused on the greatest risks to reliability. The new CMEP IT tool will further this collective approach, providing efficiencies to our system. Even products like Situation Awareness for FERC, NERC, and the REs (SAFNR) – which we are seeking funding in our 2019 budget to increase its use – provide a common language for situational awareness of the grid among FERC, NERC and the REs. In focusing on how the ERO Enterprise works, there are four major needs:

- ***Balancing independence with partnership.*** The power of the ERO Enterprise lies in its independence and ability to call "balls and strikes" as it sees them. At the same time, we are extraordinarily dependent on the expertise of our stakeholders and benefit greatly from their engagement. Managing our independence and our partnerships are critical to our ongoing credibility as the ERO and one that can't be compromised.
- ***Maintaining ideological independence.*** As we look to understand the reliability benefits of alternative fuel types, the need for preserving essential reliability services, and the opportunities to integrate new technologies into the grid, the ERO Enterprise will maintain our focus on technical evaluation to guide industry and policymakers, remaining fuel and technology neutral.
- ***Improving relationships across the industry ecosystem.*** The ERO Enterprise does not have its hands on any controls. We achieve impact through influence informed by sound technical analysis. To do that, we strive to competently execute and clearly communicate our work to those who can take action on issues we identify, including industry, the Commission, and other stakeholders.
- ***Improving alignment and effectiveness of the delegated operating model.*** The structure of the ERO Enterprise is designed to address the differing regional reliability risks facing a complex, interconnected North American industry. In doing so, and as provided by the Federal Power Act, it also results in a complex governance model. I plan to work closely with the Regional Executives to ensure quality and alignment in practices and equity of outcomes while sustaining regional responsiveness.

Risk Area Priorities

Over the last few years, NERC and the REs worked with the NERC Board of Trustees to develop the *ERO Enterprise Long-Term Strategy*. That work is sound and provides good strategic guidance for several years into the future and NERC's 2019 budget request provides support for these initiatives. This strategy identifies four major risk areas:

- ***Cyber and physical security.*** There are four planks to a solid security strategy that will continue to evolve to meet the ever-changing threats:
  - *Evolving CIP standards.* We will continue reviewing CIP standards to ensure they are setting a sound foundation for a secure Bulk Electric System. The NERC Reliability Standards are key foundational aspects of our work in the security realm.
  - *E-ISAC information sharing and analysis*. At a high level, we constantly work to improve information sharing and inbound data acquisition through expansion of programs like the Cybersecurity Risk Information Sharing Program (CRISP), voluntary information sharing from

industry, and information flows with critical agencies such as the Department of Homeland Security, FBI, the Department of Energy, and, as appropriate, Canadian cybersecurity agencies, etc. We will engage in effective outbound sharing of actionable and timely insights to industry, which is a key challenge. The Critical Broadcast Program is a new communication platform, and we have made further improvements to the E-ISAC portal. These capabilities will continue to be improved to meet our members' needs. With input from the E-ISAC's Members Executive Committee, we have developed a long-term strategic plan to continue to enhance E-ISAC capabilities in response to member needs, including hiring of additional personnel to improve our analytical and watch capabilities. Industry stakeholders and government partners have been very supportive and we greatly appreciate their dedication and support.

  - *Member engagement and communication of best practices.* We do this through our NERC Reliability Standards outreach to identify barriers to effective compliance performance and through the E-ISAC engagement team and major events such as GridSecCon, and the recently launched industry augmentation program. We are in an advantaged position with the visibility into threats and entity performance. We will continue to find ways to leverage these capabilities to the benefit of industry.

  - *Participate in and conduct drills.* NERC's GridEx drill is one of the most impressive events I have observed in my career and I can see the value in drilling these capabilities in the quality and clarity of the tabletop exercises. This program will continue to be a key service and we will look for ways to make the scenarios more valuable to industry and our government partners.

- ***Integration of inverter-based technologies.*** NERC has worked with the Western Electricity Coordinating Council (WECC), California entities and supply chain participants to understand and resolve issues related to broad-scale deployment of inverter-based generation resources. This has resulted in two Level 2 alerts, a Reliability Guideline that is currently posted for comment, and the potential for the development of new standards as requested by the California ISO. Broad-scale deployment of inverters will be one of the key dynamics in the changing resource mix in the coming years and the West is providing an opportunity to understand and address the reliability issues associated with integrating more solar PV and batteries into the grid.

- ***Evolution of the Western Reliability Coordinator function.*** The transition from a single Reliability Coordinator (RC) to multiple RCs in the Western Interconnection (WI) presents significant reliability challenges if not managed carefully. NERC and WECC have focused considerable attention to this transition and are working to ensure that the issues are properly managed in the unique context of the WI. The transition from one to multiple RCs in the West introduces additional complexity for coordination and information sharing. To address this challenge, NERC and WECC have been working closely with the potential RCs, including holding monthly meetings with the parties. We are also examining the capabilities, tools and processes of PEAK, the current RC for the West, to evaluate how best to support an orderly transition so reliability is maintained and continues to improve.

- ***The pace of change in the resource mix.*** It is clear that the resource mix will change dramatically over the next five-to-15 years with significant reductions in traditional solid fuel generation and expansion of variable energy resources, deployment of batteries, and an increased reliance on

natural gas. The fuel mix will become increasingly dependent on current and longer-term weather conditions, and the planning model will evolve from the traditional baseload, mid-merit, and peaking array to one that is much more probabilistic in nature. As we move through this transition, NERC will have an increasingly important role in assessing the reliability and security impacts. It is important we keep our eyes 10 years down the road as many of these changes will have infrastructure demands that will take at least that long to develop and deploy.

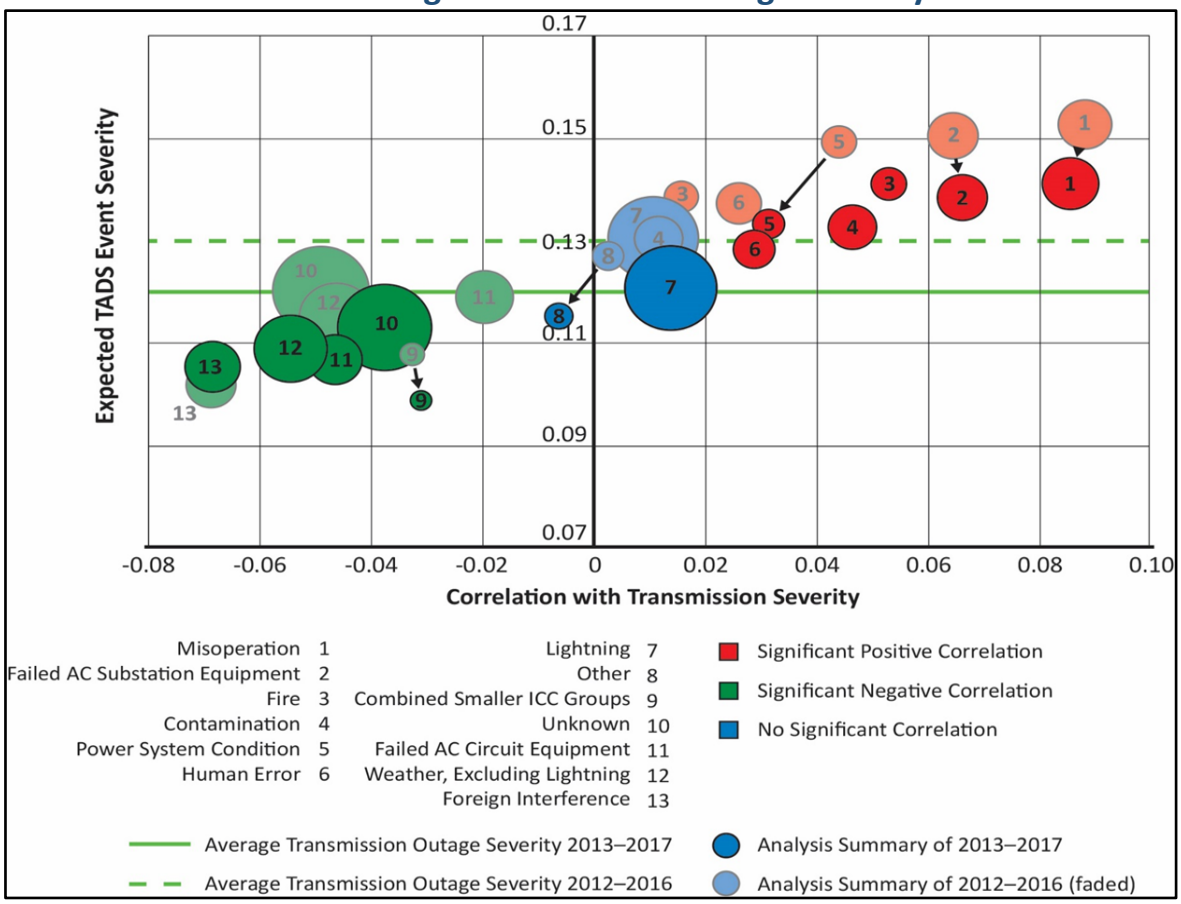
## State of Reliability 2018

*State of Reliability 2018* is NERC's independent assessment developed by its Performance Analysis staff with support from the Performance Analysis Subcommittee (PAS). *The State of Reliability 2018* focuses on BPS performance during 2017 as measured by a predetermined set of reliability metrics. Based on the metrics, the BPS provided an adequate level of reliability during 2017. The only metric indicating cause for concern is Metric M-1: Planning Reserve Margin, which is actually a forward-looking indicator previously reported in NERC's *2018 Summer Reliability Assessment*. In addition to identifying reliability risks, NERC highlights significant work by industry to improve reliability.

*State of Reliability* allows the ERO Enterprise to take a long, multi-year view of the grid's performance, benchmarking certain characteristics, especially by interconnection in the case of frequency response. We now have a large enough data base of performance to "strip out" the noise in the data. By applying statistical rigor, we can determine if significant improvement is being made in performance across the industry, or from a regional view. Further, the large North American datasets have revealed "faint signals" of occurrences that could become bigger events that pose additional risk to reliability. This multi-year view provides insights into first- and second-order effects of actions and changes across the grid. These analytical efforts using the data FERC has authorized us to collect are showing real insights into performance and feedback on reliability improvement efforts NERC and the Regions have placed on things like misoperations rates.

The chart immediately below analyzes information from the Transmission Availability Data System (TADS), providing insight into key factors affecting BPS reliability. It plots the cause of transmission outages, their frequency, and correlation with transmission severity. Take for example relay misoperations, represented by the red circles on the far right with the number "1" inside. Misoperations have the highest correlation or are the biggest predictor of event severity when analyzing transmission outage severity by cause. The dim red circle with the arrow pointing down and the smaller bright red circle underneath it illustrate that the frequency of misoperations is declining and that outages that do occur are becoming less severe. Looking at each of the 13 causes combined, the green horizontal lines show that events are happening less frequently and with less severity, demonstrating continuing improvement overall.

## Continued Decline in Average Transmission Outage Severity




Analysis of the 2017 events and data drive six key findings:

<u>BPS Showed Improved Resilience during the NERC Category 5 Events</u>

Hurricanes Harvey and Irma inflicted massive disruptions on the electric power systems in Texas and Florida. The extent of impacts met the criteria as Category 5 events under NERC's event classification system.[1] Recovery demonstrated the benefits of amphibious vehicles and unmanned aerial vehicles in Texas. In Florida, restoration time was significantly shortened due to hardening investments since 2005.

<u>Inverter Disconnects during Transmission Disturbances Present an Emerging Risk</u>

In 2016 and 2017, NERC observed inverter-based resources tripping off-line or entering momentary cessation during transmission disturbances. NERC developed a second Level 2 alert (industry recommendation) in May 2018 to further analyze inverter information and evaluate the extent of conditions associated with emerging issues. NERC has also published a reliability guideline regarding inverter-based resources and is working with vendors to track and trend occurrences.

[1] A NERC Category 5 event is one that results in unintended loss of load of 10,000 MW or more and/or unintended loss of generation of 10,000 MW or more.

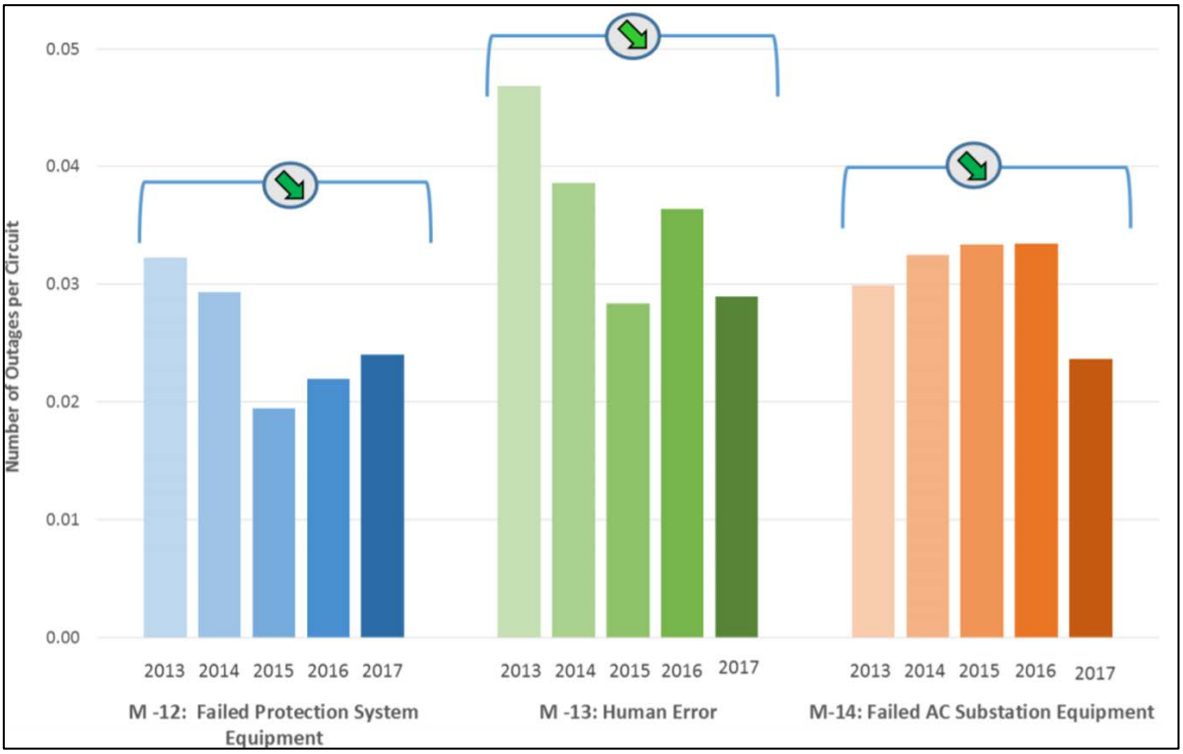
No Loss-Of-Load Due to Cyber or Physical Security Events despite Continually Evolving Threats

While there were no NERC-reportable cyber security incidents during 2017 and therefore none that caused a loss of load, this does not necessarily suggest that the risk of a cyber security incident is low, as the number of cyber security vulnerabilities are increasing.

Transmission Outages Caused by Failed Protection System Equipment, AC Substation Equipment, or Human Error All Show a Decreasing Trend for the Last Five Years

Transmission outage rates are trending lower while the overall correlation with outage severity has remained similar to past years. Transmission line sustained outages caused by Failed AC Circuit Equipment and Failed AC Substation Equipment (e.g., breakers, transformers) have remained top contributors to BPS transmission outage severity.

## 200 kv+ Outages by Cause Code




Frequency Response Performance Trends, while Remaining Acceptable, Are Showing Varied Results by Interconnection

Frequency response arrests and stabilizes frequency during system disturbances. NERC closely monitors the M-4 Interconnection frequency response metric (IFRO in the stabilizing period) as the rapidly changing resource mix must continue to provide sufficient amounts of frequency response. Individual Interconnection performance is separated into performance during the arresting period and during the stabilizing period.

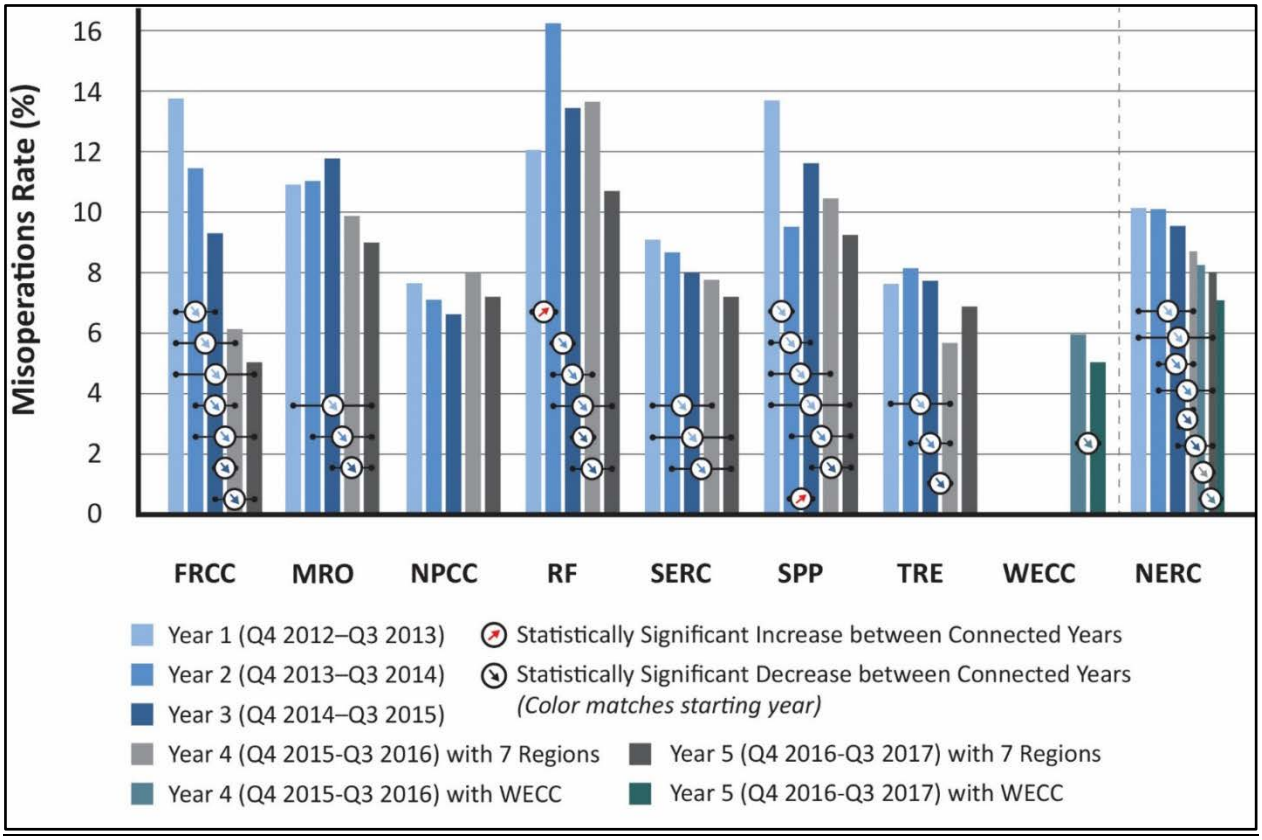
Arresting Period: Over the 2013–2017 operating years, the Eastern Interconnection (EI), the Texas Interconnection (TI), and the Québec Interconnection (QI) each had a statistically significant and improving frequency response trend during the arresting period. The WI trend was neither statistically improving nor declining.

Stabilizing Period: Frequency response over the 2013–2017 operating years indicated that the WI and TI trends experienced statistically significant improvement during the stabilizing period. The EI and QI trends neither statistically improved nor declined. Interconnection performance differences impact decisions on resource characteristics vital to maintain the BPS reliability.

Protection Systems Misoperations Rates, while Remaining High Priority, Have Declined for the Fifth Consecutive Year

Protection system misoperations exacerbate the impact of transmission outages, thereby increasing their severity. While the misoperation rate for some REs increased in 2017, the overall NERC 2017 misoperation rate is lower than 2016. For the second year, the WECC Region's operation count was collected, enabling the WECC misoperation rate to be developed in 2017 (calculated to be 4.6 percent for 2017). Inclusion of the WECC rate lowers the 2017 NERC rate to 7.1 percent.

## Misoperation Rates Continue to Decline



### North American ERO Partnership with Mexico

As noted, given the interconnected grid in North America, NERC is a unique international institution with a focus on reliability and security in the United States, Canada and Mexico. Relationships between the ERO and non-U.S. jurisdictions have matured and we have entered into new Memoranda of Understanding with several Canadian provinces as well as Mexico. Under the March 2017 Memorandum of Understanding with Mexico, NERC has been working with the Comisión Reguladora de Energía (CRE) and the Centro Nacional de Control de Energía (CENACE) on several areas of mutual interest, including prioritization of reliability standards for adoption into Mexico's regulatory instruments; cyber security; reliability assessment; and best practices for operational reliability. WECC has been a key partner in these efforts. Over the past year, representatives from CRE and CENACE have participated in NERC operating and planning committee meetings, and our reliability and security workshops as well as GridEx. CRE also completed its first state of reliability report for the Mexican electricity system, which was a tangible product of our collaboration. These efforts are important to ensure a common understanding of what is required on both sides to support a reliable and secure interconnected system. I am very pleased at the strong relationships we have built and at the substantive technical conversations that have been taking place.

Federal Power Act Sec. 215 and FERC regulations recognize this value, directing the ERO to seek recognition in Canada and Mexico. We appreciate the support of industry stakeholders, FERC, DOE, and regulators in Canada in helping us demonstrate and communicate the value of the ERO to our colleagues in Mexico. I think it is fair to say that NERC, WECC, CRE and CENACE have each benefitted from this partnership. Full Mexican participation in the ERO remains our long-term objective, but we are mindful that this partnership involves many complexities and will take time to develop. We remain in close communication with CRE and CENACE, and look forward to conversations on the future nature of our relationship once the new administration takes office.

## Conclusion

As the ERO Enterprise, our priorities remain keenly focused on anticipating, understanding, and adapting to change. Now entering our second decade as the ERO and NERC's second half century as an organization, our work is guided by a continuing focus on risk. Such focus informs our reliability assessments and the development and enforcement of standards. This focus has honed our metrics and understanding so we can achieve greater fidelity in measuring reliability and identifying new trends. A risk-based approach shapes our partnerships that are so critical to security. Even given the pace and magnitude of change, the data shows significant improvements to reliability. Most trend lines show that the future is moving in the right direction. We will continue this progress and focus needed resources on new and emerging risks.