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# FERC Reliability Technical Conference -- Panel I

## State of Reliability and Emerging Issues

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Chairman Wellinghoff, Commissioners, Staff, and fellow panelists. My name is Tom Burgess and I am the Vice President and Director, Reliability Assessment and Performance Analysis (RAPA) at the North American Electric Reliability Corporation (NERC). The RAPA organization and associated stakeholders serve to provide a solid technical foundation for understanding reliability and performance across North America. Those insights provide a unique perspective that shapes insights, guidance and directional efforts to ensure and enhance the reliable operation of the bulk power system. The independent integrity of the assessments and performance analyses are core strengths, clearly benefiting from wide industry engagement about reliability. Support, unique expertise and engagement from industry are essential ingredients that support the overall mission.

First of all, I would like to highlight the State of Reliability Report, one of our premier efforts to describe insights about the reliability performance, review some recent results and identify some emerging trends and risks. The State of Reliability Report represents an integrated perspective for understanding the current and projected reliability performance, and it sets the stage for accountability of the many entities within the bulk power system in North America. NERC provides an independent, core center of technically excellent resources that assess, measure and investigate reliability risks, trends and projected performance. The over-arching objective is to provide insights and guidance that enable industry and regulatory decision-makers to understand and support efforts to anticipate reliability risks and take corresponding measured steps that address those risks.

A comprehensive understanding of the complexity of the changing bulk power system is a key to developing effective approaches for achieving reliability. Developing the solid technical foundation and maintaining the insights and interdependencies are essential in a rapidly changing environment. RAPA works to develop that technical framework for understanding reliability risks facing the industry and uses those insights to provide guidance that enhances reliability. RAPA does this through its own engineering and analytic efforts, as well as through marshaling stakeholder resources with subject matter expertise, providing confidence to stakeholders of the essential underpinnings of reliability conditions and emerging risks reflected within assessments and performance analysis reports. These serve to drive NERC's overall activities focused on managing the most important reliability risks.

## Overview of the State Of Reliability

The main goal of the State of Reliability Report is to serve as the premier depiction of the current and projected condition of bulk system reliability. The report describes the status of reliability, analytically assessing the conditions and performance of the system. The effort is based on analysis of data gathered in extensive databases, developed metrics and benchmarking, coupled with event analyses results, and insights gained from assessments of emerging reliability issues. In this way, a solid technical basis supports an integrated view of reliability, measures of reliability performance and indicators of the effectiveness of initiatives designed to ensure reliability. The analysis is extensive and uses sophisticated statistical and root-cause methods to assure confidence, while ensuring that guidance and actions align with the risk and potential. Further, a series of carefully formulated metrics and benchmarks, developed in concert with stakeholders, enable review of reliability performance over a sustained period pointing to trends that may warrant action. This analysis is an effective approach used across many other industries to consistently marry the insights of data gathered with actual event performance. In other words, we must assess the current and projected state of reliability so that guidance and insights can be identified that serve to avoid system risks, and thereby enhance and ensure reliability.

## Risk-Informed Reliability Performance Approach

The central elements are based on independent analysis of data, events and assessment trends to reveal potential risk clusters, for example data/metrics trends or assessment indicators. These are then integrated to validate and confirm the indications, reflect the extent of the potential risk and impacts and enable the scaling, or grading of actions, guidance, and other direction designed to lessen or prevent the risk from occurring. With prioritized risks and potential impacts, then grading or scaling the range of potential actions can be prioritized accordingly. The next major step will link measurements of the results of risk-graded actions, to observe an improvement trend for a particular risk control project with associated measures validated through an analytic framework. This approach connects the dots across wide area bulk system performance, recognizing regional aspects and leading to a composite view in which no single parameter or metric defines the many aspects that impact reliability performance.

This approach can be used in two further aspects -- one is providing a technical basis to align compliance focus for those areas with the greatest reliability performance impact. The second is providing insights about better aligning standards with reliability risks. As you can see, an integrated view of the reliability risk is being woven into the overall ERO approach across major areas of operation.

## 2013 State of Reliability Report

NERC has published the State of Reliability Report since 2012 as part of its mission to promote reliability excellence and serve as a leading reliability resource. The report informs industry and policy makers on trends, challenges and recommendations for ensuring reliability. The report provides an integrated view of historic performance, and it identifies risk patterns based on hard data and statistical analysis.

This year's report reflects continuing steady overall reliability performance, with some positive indicators of improving trends. The key findings include:

- Bulk power system reliability remains adequate.
  The number of bulk power system transmission-related outages since 2008 resulting in loss of firm load decreased from an average of nine per year to two in 2012.
- Risks from standards violations are decreasing.
  Of the more than 5,000 violations filed through December 2012, only two percent involved serious reliability impact, while nearly 85 percent had minimal impact to reliability, and 13 percent had moderate impact. Key compliance metrics of violations assessed with serious impact are trending lower – 10 in 2012 down from 39 in 2008.
- Transmission availability performance is high.
  Transmission availability between 2008 and 2012 remains steadily high. Availability of AC circuits exceeds 97 percent and of transformers is above 96 percent [2010 – 2012].
- Frequency response is steady.
  The expected frequency response is stable and for each interconnection remains higher than the recommended obligation.

In addition, the report describes the Adequate Level of Reliability (ALR) indicators we have used since 2008, including the severity risk index (SRI)[1] and 18 ALR metrics. These results are provided on the NERC public website, and in composite provide a portrait of the performance of aspects of reliability. Studying these results can be useful in identifying areas for further study, and potential actions to address.

The 2013 report advanced the reliability risk-issue identification methods in a consistent and predictable manner. These involve sophisticated data analyses and a broader range of factors potentially affecting reliability, and thereby provide a sound, technical base for effective prioritized steps based on risk significance. For example, the report draws attention to two risk issues that contribute to disturbance events and automatic transmission outage severity: protection system misoperations and AC substation equipment failures.

Relay misoperations have been a continuing trend of reliability performance resulting in transmission outages that are more severe than otherwise, considering the initiating causes. Measured steps to address the key aspects of these misoperations, should enable over time to recognize a measureable improvement in the relay performance. Since October 2010, NERC started gathering information to identify and prioritize the key issues. Root cause analysis led to a Protection System Misoperation Task

[1] SRI is a "stress" index, measuring risk impact of transmission loss, generation loss, and load loss events.

Force[2] (PSMTF) report completed in April 2013. Approximately 65 percent of misoperations are caused by:

- Incorrect settings/logic/design errors
- Relay failures/malfunctions
- Communication failures

A targeted actionable approach to reduce future misoperations was assembled to address this risk, including distributing Lessons Learned, Industry Webinar, training modules for each primary cause, providing focused assistance to the entities that need guidance the most, sharing industry examples of excellence, adding on-going performance measures (ALR4-1) – Misoperation Rate,[3] and implementing a number of Standards Projects surrounding protection system coordination, maintenance, and verification.

The second finding identified AC Substation Equipment Failures as a significant contributor to disturbance events and automatic transmission outage severity. In particular, substation circuit breaker failures were the prominent category of equipment resulting in transmission outage severity, which has been validated by event analysis reviews. In this case, the AC Substation Equipment Task Force was formed at the June, 2013 Planning Committee meeting to: 1) conduct a root cause investigation of substation equipment failures, 2) propose risk control solutions to improve performance, and 3) deliver a final report by June 2014. In tandem, NERC developed an ALR metric to measure on-going performance changes in Failed AC Substation Equipment.[4]

So, in summary, this report has directly pointed to trends in reliability performance, identified key areas for attention coupled with measured approaches and metrics to monitor ongoing effectiveness of these measures.

## Emerging risks trends

The final aspect I would like to review includes Reliability Assessments that provide a technical platform for important policy discussions on projected and emerging risks facing the bulk power system. Each year, NERC is responsible for independently assessing and reporting on the overall reliability, adequacy and associated risks that could impact the long-term, ten-year period. As emerging risks and potential impacts to reliability are identified, special assessments are conducted that provide technical insights about the range and specific challenges.

[2] Protection System Misoperations Task Force (PSMTF), http://www.nerc.com/comm/PC/Pages/Protection-System-Misoperations-Task-Force-(PSMTF)-2013.aspx

[3] ALR4-1 http://www.nerc.com/pa/RAPA/ri/Pages/ProtectionSystemMisoperations.aspx

[4] ALR6-13 http://www.nerc.com/pa/RAPA/ri/Pages/Automatic-OutagesInitiatedbyFailedACSubstationACCirc.aspx

Over the next 10 years, the electric industry will face a number of significant emerging reliability issues, which could result from a transformational change within the industry. As examples, these potentially result from a dramatically different resource mix with reliance on natural gas-fired and renewable generation, a need for enhanced modeling, a new risk and probabilistic framework built to address reliability challenges, and growing critical infrastructure and protection concerns—both physical and cyber. Substantial modifications to the bulk power system require a great deal of time to ultimately construct, while retirements and new generation types contribute to the resource shift. In tandem, the transmission system will be challenged to develop a resilient grid supporting these resource shifts.

The long-term challenges affecting the bulk power system are cross-cutting—the interdependencies present unique challenges. The confluence of these risks is critically important to strategically manage, monitor and mitigate them to preserve reliability. Numerous activities currently ongoing exemplify the industry's commitment to address future reliability.

Thus a key element of developing risk-informed recommendations is through evaluating emerging reliability issues so that industry has time to address improved reliability performance. The following key issues and risks—identified in NERC's Long-Term Reliability Assessments[5]—continue to prompt significant technical research and recommendations that enhancement overall reliability:

- Changing Resource Mix
- Environmental Regulation
- Enhance Modeling Requirements and Simulations
- High-Impact, Low-Frequency Events
- Uncertainties in Long-Term Load Forecasts
- Aging Infrastructure

**Wrap-up/Vision Restatement**

In conclusion, the solid analytic foundation demonstrated in these efforts is continuing to deepen the insights and guidance that enables sound actions within industry and among policy makers. These approaches are continuing to mature, and though there is still work to be done, an established solid foundation is in place to identify and develop effective measures commensurate with the risk. This framework for independent risk-informed decisions ensures progress and measures continued reliability success. I wish to thank the Commission for their invitation and attention. I look forward to our discussions on NERC's standard development vision, approach and goals.

[5] 2012 Long-Term Reliability Assessment: http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/2012_LTRA_FINAL.pdf