

Agenda

Board of Trustees

November 2, 2016 | 9:00 a.m.-12:00 p.m. Eastern

Ritz-Carlton Buckhead
3434 Peachtree Road
Atlanta, GA 30326

Conference Room: The Ballroom – Lobby Level

Call to Order

NERC Antitrust Compliance Guidelines—Public Announcement

Consent Agenda – Approve

1. **Minutes***
 - a. August 11, 2016 Meeting
2. **Committee Membership and Charter Changes***
 - a. Compliance and Certification Committee Membership
 - b. Planning Committee Membership

Regular Agenda

3. **Remarks and Reports**
 - a. Opening Remarks by Board Chair
 - b. Remarks by Commissioner Colette Honorable, FERC
 - c. Remarks by Liz Dalton, DOE
 - d. Remarks by Murray Doehler, CAMPUT
 - e. President’s Report
4. **Report on Semiannual Meeting of NERC Trustees and Regional Entity Boards – Information**
5. **Standards***
 - a. 2017-2019 Reliability Standards Development Plan – **Approve**
 - b. Florida Reliability Coordinating Council Regional Reliability Standard Development Process Manual Revisions – **Approve**
 - c. Compliance Filing in Response to FERC Directive to Change VRFs of IRO-018-1 and TOP-010-1 to High – **Approve**
 - d. Interpretation of CIP-002-5.1 – **Adopt**
 - e. WECC Interpretation BAL-002-WECC-2a – **Adopt**
 - f. BAL-004-2 – Time Error Correction – **Retire**

6. Other Matters and Reports

- a. 2016 ERO Reliability Risk Priorities: RISC Recommendations* – **Accept**
- b. 2017-2020 ERO Enterprise Strategic Plan and Metrics* – **Approve**
- c. NERC Rules of Procedure Amendment – Consolidated Hearing Process* – **Approve**
- d. E-ISAC Quarterly Update* – **Information**
- e. Update on Mexico – **Information**

7. Committee Reports*

- a. Operating Committee
- b. Planning Committee
- c. Critical Infrastructure Protection Committee
- d. Member Representatives Committee
- e. Personnel Certification Governance Committee
- f. Standards Committee
- g. Reliability Issues Steering Committee
- h. Compliance and Certification Committee
- i. Electricity Subsector Coordinating Council

8. Forum and Group Reports*

- a. North American Energy Standards Board
- b. North American Transmission Forum
- c. North American Generator Forum

9. Board Committee Reports

- a. Corporate Governance and Human Resources
- b. Compliance
- c. Finance and Audit
 - i. Third Quarter 2016 Unaudited Statement of Activities – **Accept**
- d. Enterprise-wide Risk
- e. Standards Oversight and Technology
- f. Nominating Committee

10. Adjournment

*Background materials included.

Antitrust Compliance Guidelines

I. General

It is NERC's policy and practice to obey the antitrust laws and to avoid all conduct that unreasonably restrains competition. This policy requires the avoidance of any conduct that violates, or that might appear to violate, the antitrust laws. Among other things, the antitrust laws forbid any agreement between or among competitors regarding prices, availability of service, product design, terms of sale, division of markets, allocation of customers or any other activity that unreasonably restrains competition.

It is the responsibility of every NERC participant and employee who may in any way affect NERC's compliance with the antitrust laws to carry out this commitment.

Antitrust laws are complex and subject to court interpretation that can vary over time and from one court to another. The purpose of these guidelines is to alert NERC participants and employees to potential antitrust problems and to set forth policies to be followed with respect to activities that may involve antitrust considerations. In some instances, the NERC policy contained in these guidelines is stricter than the applicable antitrust laws. Any NERC participant or employee who is uncertain about the legal ramifications of a particular course of conduct or who has doubts or concerns about whether NERC's antitrust compliance policy is implicated in any situation should consult NERC's General Counsel immediately.

II. Prohibited Activities

Participants in NERC activities (including those of its committees and subgroups) should refrain from the following when acting in their capacity as participants in NERC activities (e.g., at NERC meetings, conference calls and in informal discussions):

- Discussions involving pricing information, especially margin (profit) and internal cost information and participants' expectations as to their future prices or internal costs.
- Discussions of a participant's marketing strategies.
- Discussions regarding how customers and geographical areas are to be divided among competitors.
- Discussions concerning the exclusion of competitors from markets.
- Discussions concerning boycotting or group refusals to deal with competitors, vendors or suppliers.

- Any other matters that do not clearly fall within these guidelines should be reviewed with NERC's General Counsel before being discussed.

III. Activities That Are Permitted

From time to time decisions or actions of NERC (including those of its committees and subgroups) may have a negative impact on particular entities and thus in that sense adversely impact competition. Decisions and actions by NERC (including its committees and subgroups) should only be undertaken for the purpose of promoting and maintaining the reliability and adequacy of the bulk power system. If you do not have a legitimate purpose consistent with this objective for discussing a matter, please refrain from discussing the matter during NERC meetings and in other NERC-related communications.

You should also ensure that NERC procedures, including those set forth in NERC's Certificate of Incorporation, Bylaws, and Rules of Procedure are followed in conducting NERC business.

In addition, all discussions in NERC meetings and other NERC-related communications should be within the scope of the mandate for or assignment to the particular NERC committee or subgroup, as well as within the scope of the published agenda for the meeting.

No decisions should be made nor any actions taken in NERC activities for the purpose of giving an industry participant or group of participants a competitive advantage over other participants. In particular, decisions with respect to setting, revising, or assessing compliance with NERC reliability standards should not be influenced by anti-competitive motivations.

Subject to the foregoing restrictions, participants in NERC activities may discuss:

- Reliability matters relating to the bulk power system, including operation and planning matters such as establishing or revising reliability standards, special operating procedures, operating transfer capabilities, and plans for new facilities.
- Matters relating to the impact of reliability standards for the bulk power system on electricity markets, and the impact of electricity market operations on the reliability of the bulk power system.
- Proposed filings or other communications with state or federal regulatory authorities or other governmental entities.
- Matters relating to the internal governance, management and operation of NERC, such as nominations for vacant committee positions, budgeting and assessments, and employment matters; and procedural matters such as planning and scheduling meetings.

DRAFT Minutes Board of Trustees

August 11, 2016 | 9:00 a.m.–12:00 p.m. Atlantic

Halifax Marriott Harbourfront
1919 Upper Water Street
Halifax, NS B3J 3J5, Canada

Call to Order

Mr. Frederick W. Gorbet, Chair, called to order the duly noticed open meeting of the Board of Trustees (the “Board”) of the North American Electric Reliability Corporation (“NERC” or the “Corporation”) in Halifax, Nova Scotia on August 11, 2016, at 9:00 a.m. Atlantic, and a quorum was declared present. The agenda is attached as **Exhibit A**.

Present at the meeting were:

Board Members:

Frederick W. Gorbet, Chair
Paul F. Barber
Janice B. Case
Gerald W. Cauley, President and Chief Executive Officer
Robert G. Clarke
Kenneth W. DeFontes, Jr.
David Goulding
George Hawkins
Kenneth G. Peterson
Jan Schori
Roy Thilly

NERC Staff

Charles A. Berardesco, Senior Vice President, General Counsel, and Corporate Secretary
Tina Buzzard, Associate Director
Stan Hoptroff, Vice President and Chief Technology Officer
Scott Jones, Vice President of Finance and Treasurer
Mark G. Lauby, Senior Vice President and Chief Reliability Officer
Ken McIntyre, Vice President of Standards and Compliance
Sonia Mendonça, Vice President of Enforcement and Deputy General Counsel
Timothy E. Roxey, Vice President and Chief E-ISAC Operations Officer
Marcus H. Sachs, Senior Vice President and Chief Security Officer
Janet Sena, Senior Vice President, Director of Policy and External Affairs
Michael Walker, Senior Vice President and Chief Financial and Administrative Officer

NERC Antitrust Compliance Guidelines

Mr. Berardesco noted the public nature of the meeting and directed the participants' attention to the NERC Antitrust Compliance Guidelines, which had been included with the advance meeting materials.

Welcoming Remarks/Executive Session

Mr. Gorbet welcomed attendees to the meeting. He expressed his appreciation to the various Canadian provincial and federal regulators who were in attendance, including Chairman Peter Gurnham, Roberta Clarke, and Kulvinder Dhillon of the Nova Scotia Utility and Review Board; Chairman Ray Gorman and François Beaulieu of the New Brunswick Energy and Utilities Board; Christine Long of the Ontario Energy Board; and Alison Scott from the National Energy Board of Canada. He welcomed Chairman Norman Bay and Michael Bardee, Director of the Office of Electric Reliability, of the Federal Energy Regulatory Commission, noting Mr. Bardee's regular attendance and thanking him for his presentation at the prior day's MRC meeting. Mr. Gorbet also expressed his appreciation to Patricia Hoffman of the Department of Energy, Murray Doehler of CAMPUT, Sergio Marchi of the Canadian Electricity Association, and Bob Hanf of Emera for their attendance at the meeting.

Consent Agenda

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

Minutes

The draft minutes for the May 5 and May 13, 2016 meetings were approved as presented to the Board at this meeting.

Committee Membership Appointments and Charter Revisions

Compliance and Certification Committee Membership

RESOLVED, that the Board hereby approves the appointment of the following individuals as members of the Compliance and Certification Committee, each for a term of three years:

- Sheree Kernizan of Georgia Public Service Commission, representing U.S. State
- Ashley Stringer of Oklahoma Municipal Power Authority, representing Transmission Dependent Utility

Planning Committee Membership and Charter

RESOLVED, that the Board hereby approves the appointment of the following individuals to the Planning Committee ("PC"), each for a term of two years:

- Gary Brownfield of Ameren, representing the Investor-Owned Utility sector
- Arthur Iler of American Municipal Power, Inc., representing the State/Municipal Utility sector

- Russ Schussler of Georgia Transmission Corporation, representing the Cooperative Utility sector
- Stéphane Talbot of Hydro-Québec TransEnergie, representing the Federal or Provincial Utility/Federal Power Marketing Administration sector
- Wayne Guttormson of SaskPower, representing the Federal or Provincial Utility/Federal Power Marketing Administration sector
- Bryan Zavesky of Missouri River Energy Services, representing the Transmission Dependent Utility sector
- Michael Goggin of American Wind Energy Association, representing the Merchant Electricity Generator sector
- Mark Sims of PJM Interconnections, LLC, representing the ISO/RTO sector
- Cezar Panait of Minnesota Public Utilities Commission, representing the State Government sector

FURTHER RESOLVED, that the Board hereby approves the appointment of the following individual to the PC for a one year term:

- Christine F. Ericson of Illinois Commerce Commission, representing the State Government sector

FURTHER RESOLVED, that the Board hereby approves the revised PC Charter, substantially in the form presented to the Board at this meeting, to replace the PC charter approved by the Board on November 7, 2013.

Operating Committee Membership

RESOLVED, that the Board hereby approves the appointment of the following individuals to the Operating Committee (“OC”), each for a term ending in September 2017:

- Stephane Desbiens of Hydro-Québec TransEnergie, representing the Federal or Provincial Utility/Federal Power Marketing Administration sector
- Kevin Conway of Intellibind Technologies, representing the Large End-use Electricity Customer sector

FURTHER RESOLVED, that the Board hereby approves the appointment of the following individuals to the OC, each for a term ending in September 2018: |

- Doug Hils of Duke Energy, representing the Investor-owned Utility sector
- Sidney Jackson of Rochester Public Utilities (Minnesota), representing the State/Municipal Utility sector

- Michelle Rheault of Manitoba Hydro, representing the Federal or Provincial Utility/Federal Power Marketing Administration sector
- Mark Ennis of Alabama Municipal Electric Authority, representing the Transmission Dependent Utility sector
- Allen Schriver of NextEra Energy – Florida Power and Light, representing the Merchant Electricity Generator sector
- Connie Davis of DPU – Cleveland Public Power, representing the Small End-use Electricity Customer sector
- Peter Brandien of ISO New England, representing the Independent System Operator/Regional Transmission Organization sector
- Leonard Kula of Independent Electricity System Operator (Ontario), representing the Independent System Operator/Regional Transmission Organization sector
- William Chambliss of Virginia State Corporation Commission, representing the State Government sector

Personnel Certification Governance Committee Membership

RESOLVED, that the Board hereby approves the appointments of the following individuals to the Personnel Certification Governance Committee to complete the terms of two retiring committee members, each for a term to expire on December 31, 2016:

- Margaret Adams of Southwest Power Pool, completing term of John Kerr of Southwest Power Pool.
- Cory Danson of Western Area Power Administration, completing term of William Ellard of Sacramento Municipal Utility District.

Regular Agenda

Remarks by Board Chair

Mr. Gorbet reported that before the open meeting, as is its custom, the Board met in closed session with NERC management, and subsequently in executive session without NERC management, to review NERC management activities. He also noted the appointment of Mr. Hawkins to the National Infrastructure Advisory Committee. Mr. Gorbet referenced the discussions during the prior day's meeting, noting the value of the policy input before the meetings, and that he supported the proposal to distribute the request for policy input earlier in the quarterly meeting cycle.

Remarks by Chairman Norman Bay, Federal Energy Regulatory Commission

Chairman Bay congratulated NERC on its 10th anniversary as the ERO, noting that while there was no guarantee that the approach set out in Section 215 when it was adopted would work, it had, and that in his view, the state of grid reliability is better now than it would have been without the efforts of the ERO

Enterprise. He expressed his appreciation to NERC, the Regional Entities, the registered entities, and stakeholders, and he noted the collaboration between all parties, including FERC. Chairman Bay expressed thanks for the work related to the Aliso Canyon gas leak, and noted the assessment on gas and on single points of disruption. He expressed his appreciation for the quick response on the supply chain standards directive, and noted that he hoped FERC would soon act on the proposed GMD standard.

Remarks by Patricia Hoffman, Department of Energy

Ms. Hoffman emphasized the important work being undertaken by NERC, particularly the value of its independent analyses at a time of industry transition. She referenced the Proposed Joint U.S.-Canadian Electric Grid Strategy, expressing her hope that the strategy will be completed by the end of the year. Ms. Hoffman referenced the DOE's work on spare transformers and the quadrennial energy review, and noted strong support of the E-ISAC for information sharing. She emphasized the need for enhanced sharing of information across the industry. Ms. Hoffman recognized the support from industry of the work of the E-ISAC, and concluded by congratulating the ERO Enterprise for being forward-leaning, noting that the themes throughout the week's meetings have been very timely.

Remarks by Murray Doehler, CAMPUT

Mr. Doehler noted the substantial Nova Scotia presence at the meeting, and provided background on Halifax and its history. He referenced the meeting between the NERC Board and Canadian regulators and its overall effectiveness. Mr. Doehler emphasized the importance of metrics on measuring effectiveness, including both operations as well as the effect of reliability standards. He complimented the greater alignment of strategic planning and budget development.

Remarks by Sergio Marchi, Canadian Electricity Association

Mr. Marchi referenced the recent meetings of U.S., Canadian, and Mexican leaders, and noted the importance of Canada's move to clean energy production, including the net exports to the U.S. of clean energy that could be used for compliance with the Clean Power Plan. The biggest challenge remains the construction of adequate transmission capacity. Mr. Marchi stated that as the transmissions systems further integrate, NERC will play a critical role in assuring reliability of the inter-connected grid, and that CEA remains a supporter of the ERO model. He referenced the efforts to integrate Mexico into the ERO model and urged continued progress and consultation with Canadian parties as governance documents are addressed. Mr. Marchi noted the need to further enhance the alignment of the strategic plan and budget development, and the importance of expense management.

Remarks by Bob Hanf, Executive Vice President, Emera

Mr. Hanf noted the recent Emera acquisition of TECO and the growth of Nova Scotia Power. He expressed high regard for NERC's efforts, stating that it is vital to the integrity of the grid. He provided background on Nova Scotia Power and the transition to renewable energy. Mr. Hanf highlighted the importance of reliability as the industry undergoes its transition, and the importance of the interconnections between Canada and the U.S. and NERC's increasing role in this context.

President's Report

Mr. Cauley expressed his appreciation to Chairman Bay for his comments on NERC and its historical context, noting various upcoming anniversaries. He referenced NERC's risk informed reliability approach, stating that NERC is at a stable point on reliability standards and has implemented a risk informed compliance monitoring and enforcement approach, while at the same time streamlining processes and procedures. Commenting on the overall questions of cost of reliability standards, Mr. Cauley referenced the principles set forth in the Adequate Level of Reliability, and that even as NERC evaluates both traditional and evolving risks, these principles are still relevant. He noted that even for risks that are seen as "high impact, low frequency", where NERC works with policy makers to consider the costs of addressing the risks, the discussion should still be based on the principles of what constitutes an Adequate Level of Reliability.

Mr. Cauley referenced NERC's ongoing work to better integrate Mexico into the ERO model, referencing this was part of the original vision for the ERO. He referenced the work of the ERO Management Group, and invited Mr. Lane Lanford, as chair of the Regional Entity Management Group, to report on the work of the Regional Entity executives with NERC management and noted that future reports would be included as part of the President's Report. Mr. Lanford reported that the ERO Enterprise executives will be meeting to focus on the strategic plan. On ERO Enterprise technology tools, he stated that the ERO Enterprise is focused on developing tools that work across the Enterprise, which could be the single biggest efficiency gain for the overall ERO Enterprise.

Report on Canadian Regulators Meeting

Mr. Gorbet summarized the Board's meeting with Canadian regulators, noting that it had been a major objective for him to improve NERC's relationships with Canadian regulators. He reviewed the evolution of the annual meetings with Canadian regulators, which are focused on information and education.

Report on Board Strategic Planning Session

Mr. Gorbet summarized the Board's closed strategic planning session that had occurred earlier in the week, noting that the Board had modified its cycle for the annual closed strategic session to better align with the development of the ERO Enterprise strategic plan. While the Board made no decisions during the session, it did express its support for the overall direction of the strategic plan, including the draft Enterprise metrics. He noted that the Board did support the development of additional metrics that would evaluate NERC operations, while also noting that the Board uses a number of different metrics and approaches to determine compensation. With respect to the E-ISAC, Mr. Gorbet requested that management work with the ESCC and MEC to develop a five-year strategic plan that would allow the Board to consider the overall implications of the development of the E-ISAC.

In reviewing other aspects of the Board's strategic session, Mr. Gorbet noted that the Board considered (i) the implications of industry change, including the use of distributed generation, (ii) NERC's role in educating policy makers and the public on reliability issues, and (iii) the role of the technical committees and their workloads. He also reported that the Board is very supportive of NERC's outreach to Mexico.

Standards

Mr. McIntyre presented on the following Reliability Standards projects and other matters. After discussion, and upon motions duly made and seconded, the Board approved the following resolutions:

Reliability Standard PER-006-1– Project 2007-06.2 Phase 2 of System Protection Coordination

RESOLVED, that the Board hereby adopts proposed Reliability Standards PER-006-1, substantially in the form presented to the Board at this meeting.

FURTHER RESOLVED, that the Board hereby approves the associated implementation plan, substantially in the form presented to the Board at this meeting.

FURTHER RESOLVED, that the Board hereby approves the Violation Risk Factors and Violation Severity Levels for the proposed Reliability Standard, substantially in the form presented to the Board at this meeting.

FURTHER RESOLVED, that the Board hereby approves the proposed retirement of Reliability Standard PRC-001-1.1 (iii), as presented to the Board at this meeting.

FURTHER RESOLVED, that NERC management is hereby authorized to make the appropriate filings with ERO governmental authorities and take such further actions and make such further filings as are necessary and appropriate to effectuate the intent of the foregoing resolutions.

Reliability Standard COM-001-3 – Project 2015-07 Internal Communications Capabilities

RESOLVED, that the Board hereby adopts proposed Reliability Standard COM-001-3, substantially in the form presented to the Board at this meeting.

FURTHER RESOLVED, that the Board hereby approves the associated implementation plan, substantially in the form presented to the Board at this meeting.

FURTHER RESOLVED, that the Board hereby approves the Violation Risk Factors and Violation Severity Levels for the proposed Reliability Standard, substantially in the form presented to the Board at this meeting.

FURTHER RESOLVED, that the Board hereby approves the proposed retirement of Reliability Standard COM-001-2.1, as presented to the Board at this meeting.

FURTHER RESOLVED, that NERC management is hereby authorized to make the appropriate filings with ERO governmental authorities and take such further actions and make such further filings as are necessary and appropriate to effectuate the intent of the foregoing resolutions.

Other Matters and Reports

2017 Business Plan and Budget, Regional Entity and WIRAB 2017 Business Plans and Budgets

Ms. Schori thanked all participants for their contributions to the business plans and budgets, and especially thanked Mr. Walker and Mr. Jones. She noted the enhanced alignment of the budget and strategic plan, and the continued work to further enhance that alignment. Ms. Schori referenced the enhanced funding for the E-ISAC portal and the support of the MEC. She also noted the use of the Assessment Stabilization Reserves to better align the change in budgets and assessments. Ms. Schori reported that the full ERO Enterprise Business Plan and Budgets were presented at the Finance and Audit Committee the prior day, and that the Committee had unanimously recommended Board approval. Upon motion duly made and seconded, the following resolutions were approved:

RESOLVED, that the Board hereby approves the following, substantially in the form presented to the Board at this meeting:

- i. The Proposed 2017 NERC Business Plan and Budget, including the additions to, and use of, the Assessment Stabilization Reserve;
- ii. The proposed 2017 Business Plans and Budgets of the eight Regional Entities and the Western Interconnection Regional Advisory Board; and
- iii. The proposed 2017 assessments to recover the costs of the approved 2017 budgets, subject to adjustments to reflect final Net Energy for Load numbers, together with such other adjustments as may be necessary.

FURTHER RESOLVED, that NERC management is hereby authorized to make the appropriate filings with ERO governmental authorities and take such further actions and make such further filings as are necessary and appropriate to effectuate the intent of the foregoing resolutions.

NERC Rules of Procedure Amendments

Mr. Berardesco summarized the proposed revisions to the NERC Rules of Procedure at Appendices 2, 5A, and 5B to incorporate “Frequency Response Sharing Group” and “Regulation Reserve Sharing Group” consistent with those terms as defined in the Glossary of Terms Used in NERC Reliability Standards, as set forth in the advance agenda materials. He recommended the proposed revisions for approval. Upon motion duly made and seconded, the Board approved the following resolutions:

RESOLVED, that the Board hereby approves the proposed amendments to Appendices 2, 5A, and 5B to the NERC Rules of Procedure, as presented to the Board at this meeting.

FURTHER RESOLVED, that NERC management is hereby authorized to make the appropriate filings with ERO governmental authorities and take such further actions and make such further filings as are necessary and appropriate to effectuate the intent of the foregoing resolutions.

Western Electricity Coordinating Council Bylaws

Mr. Berardesco summarized the proposed amendments to the Western Electricity Coordinating Council (“WECC”) Bylaws, referencing the advance agenda materials. He stated that NERC staff reviewed the proposed revisions to the Bylaws to ensure that they met the criteria set forth in the Regional Delegation Agreement between NERC and WECC and any other applicable regulations, and found no discrepancies, and recommended the proposed revisions for approval. Upon motion duly made and seconded, the Board approved the following resolution:

RESOLVED, that the Board hereby approves the amended and restated Western Electricity Coordinating Council Bylaws, as presented to the Board at this meeting, as presented to the Board at this meeting.

FURTHER RESOLVED, that NERC management is hereby authorized to make the appropriate filings with ERO governmental authorities and take such further actions and make such further filings as are necessary and appropriate to effectuate the intent of the foregoing resolution.

Memorandum of Understanding between the New Brunswick Energy and Utilities Board, the North American Electric Reliability Corporation and the Northeast Power Coordinating Council, Inc.

Mr. Berardesco presented the proposed Memorandum of Understanding between the New Brunswick Energy and Utilities Board, the North American Electric Reliability Corporation, and the Northeast Power Coordinating Council, Inc., referencing the materials included in the advance agenda package. He reviewed the key principles NERC uses to evaluating its agreements across North America, including the importance of NERC’s access to information. Messrs. Cauley and Thilly both remarked on the importance of information sharing throughout the ERO Enterprise, and that the proposed Memorandum of Understanding was an example of enhancing such information sharing. Upon motion duly made and seconded, the Board approved the following resolutions:

RESOLVED, that the Board hereby approves the Memorandum of Understanding between the New Brunswick Energy and Utilities Board, the North American Electric Reliability Corporation, and the Northeast Power Coordinating Council, Inc., on substantially the terms and conditions presented to the Board at this meeting, together with such changes as are approved by NERC’s Chief Executive Officer.

FURTHER RESOLVED, that each of the Chief Executive Officer, General Counsel, and Chief Financial and Administrative Officer, are hereby authorized to execute and deliver, on behalf of NERC, the Memorandum of Understanding.

At this point in the meeting, Mr. Gorbet announced that the agenda would be modified to receive stakeholder Committee reports first, due to certain travel conflicts.

Committee Reports

Representatives of the Standing Committees provided reports to the Board highlighting items from their written reports, which had been included with the advance meeting materials.

Operating Committee

Jim Case, Committee Chair, highlighted key accomplishments set forth in the written report, and expressed his appreciation for the work of Larry Kezele upon his retirement.

Planning Committee

David Weaver, Committee Chair, summarized the Committee's current and upcoming activities, including work to improve the approval process of review of assessments. He also thanked the Board for approving the Committee's charter.

Critical Infrastructure Protection Committee

Marc Child, Committee Chair, summarized and highlighted portions of the written report, including work on emerging technologies and lessons learned from GridEx III. He stated that for the next year, the Committee intends to focus on security metrics, supporting the strategic plan and efforts, including work on E-ISAC and compliance, and to work on the FERC supply chain directive.

Member Representatives Committee

Nabil Hitti, MRC Chair, summarized the issues that had been discussed at the MRC meeting on the previous day, and discussed assessments and the importance of MRC policy input including the timing of policy input.

Personnel Certification Governance Committee

Brett Hallborg, Committee Chair, summarized the written report, noting the Committee's charter and manual approval at this meeting and pass rates. In reference to system operator credential renewals, he requested the input of operators in developing additional questions for the Committee's test bank.

Standards Committee

Michelle D'Antuono, reporting on behalf of the Committee chair, referenced the written report and presentations at the Board committee and MRC meetings, and noted the Committee's focus on the FERC supply chain directive.

Reliability Issues Steering Committee

Peter Brandien, Committee Chair, thanked the Board for allowing the use of policy input in the Committee's work. He stated that the Committee will use feedback received to make modifications to the risk profiles. Mr. Brandien noted that the Committee is preparing a report for the November meeting, and that the comments in the policy input will lead the Committee to clarify its recommendation. He reported that the Leadership Summit will occur next year in March in order to allow ample time for coordination.

Compliance and Certification Committee

Patti Metro, Committee Chair, referenced the written report, noting her report at the MRC meeting, and the Committee's work on reporting tools.

Electricity Subsector Coordinating Council

Mr. Cauley reported on the ESCC's recent meeting, noting that only the electric sector has the level of CEO and Canadian engagement. He summarized key strategic initiatives including information sharing, cross-sector coordination, cyber mutual assistance, operating under degraded conditions, EMPs, and GridEx lessons learned. Mr. Cauley stated that the ESCC is also focused on the upcoming government transitions as a result of the general election.

E-ISAC Quarterly Update

Mr. Sachs provided the quarterly update, referencing the presentation included in the advance agenda materials, including updates on member engagement, portal activity, NERC advisories, work with the MEC to outreach to members and potential members, staffing and technology updates, and the progress against the 2016 work plan. He noted that all major power systems are participating in the E-ISAC, and that NERC is evaluating the development of a more streamlined CRISP program.

Forum and Group Reports

North American Energy Standards Board

Michael Desselle, NAESB Chair, referenced the written report, including continued work to develop standards in response to the elimination of LSEs from the NERC registry.

North American Transmission Forum

Nelson Peeler, reporting on behalf of the CEO, referenced the Forum's written report, including the growth in the member assistance program.

North American Generator Forum

Josh Sandler, Forum Vice Chair, referenced the written report, noting work on frequency response and an upcoming workshop with NERC.

Board Committee Reports

Corporate Governance and Human Resources Committee

Mr. Clarke, Committee Chair, summarized the Committee's open and closed meetings that occurred prior to this meeting, including reviewing the status of performance metrics, draft assessments, ERO Effectiveness Survey results and action plans. He noted that the human resource and staffing update indicated that there has been a reduction in attrition. Mr. Clarke referenced the policy input on the 2017 metrics and will be working on them through the end of the year in developing compensation metrics.

Compliance Committee

Ms. Case, Committee Chair, summarized the recent sessions of the Committee. She noted a presentation on the consolidated hearing process, the handling of CIP information, and the quarterly CMEP report.

Finance and Audit Committee

Ms. Schori, Committee Chair, reported on the Committee's recent meetings. On behalf of the Committee, she requested approval of the extension of the capital financing program. Upon motions duly made and seconded, the following resolutions were approved:

RESOLVED, that the Board hereby approves NERC entering into a capital financing credit transaction with PNC Bank (the "Bank"), on substantially the same terms and conditions as presented to the Board at this meeting, subject to the approval of NERC's Chief Financial Officer and General Counsel as to the final documentation thereof (the "Credit Documents"), and that such Credit Documents may be executed on behalf of NERC by any of the Chief Executive Officer, Chief Financial Officer, or General Counsel, and each such officer of NERC is hereby authorized to take any other action requested, required or deemed advisable by the Bank in order to effectuate this resolution, all such other actions being hereby approved, ratified and confirmed.

FURTHER RESOLVED, that in connection with any extension of credit referenced or authorized by the Credit Documents, which permit NERC to effect multiple advances or draws thereunder, either of NERC's Chief Executive Officer or Chief Financial Officer (or any other person designated in writing by any of such officers) shall be authorized to request such advances or draws.

FURTHER RESOLVED, that all past acts of officers of NERC in borrowing or obtaining credit from the Bank and in executing documents or otherwise entering into agreements and giving security on behalf of NERC are hereby ratified and confirmed.

FURTHER RESOLVED, that the Bank is authorized to take any action authorized hereunder based upon: (i) the telephonic or electronic request (including e-mail request) of any person purporting to be a person authorized to act hereunder, (ii) the signature of any person authorized to act hereunder that is delivered to the Bank personally or by facsimile transmission, or (iii) the telex originated by any of such persons, tested in accordance with such testing procedures as may be established between NERC and the Bank from time to time.

FURTHER RESOLVED, that a certified copy of these resolutions be delivered to the Bank and that they and the authority vested in the persons specified herein will remain in full force and effect until a certified copy of a resolution of NERC revoking or modifying these resolutions and such authority has been delivered to the Bank, and the Bank has had a reasonable time to act thereon.

Ms. Schori then requested on behalf of the Committee acceptance of the second quarter financial statements. Upon motion duly made and seconded, the following resolution was approved:

RESOLVED, that the Board, upon recommendation of the Finance and Audit Committee, hereby accepts the NERC Second Quarter 2016 Unaudited Statement of Activities, as presented to the Board at this meeting.

Enterprise-wide Risk Committee

Mr. Goulding, Committee Chair, summarized the work of the Committee, including the audit report status and heat map development.

Standards Oversight and Technology Committee

Mr. Peterson, Committee Chair, reported on the Committee's open meeting, noting that the Committee received the IT report and the standards report, and referencing the work of the IT subgroup. On standards, the report indicated that all most all FERC directives and recommendations from Paragraph 81 and the Independent Experts Panel had been addressed, and that the focus going forward should shift from looking retrospectively to looking forward on the enhancement of existing standards and development of required new standards. In commenting on the ERO Effectiveness Survey results, Mr. Peterson noted the lower scores for key items on standards, which to him appears to mean that that the term "steady state" as it relates reliability standards is more about the development process and pace and less about the about the standards themselves. He queried if there is an opportunity to shift the overall focus to a smaller core group of standards that are actually enforced. Mr. Cauley responded by noting that the Effectiveness Survey was undertaken during implementation of CIP v5, which likely affected the results, but that NERC staff would work with the Standards Committee on the feedback.

Nominating Committee

Mr. Peterson, Committee Chair, referenced his report at the MRC meeting. He noted that the interview team will include Mr. Thilly as incoming Board Chair.

Closing Remarks

In his closing remarks, Mr. Gorbet expressed his appreciation to this meeting's speakers for their attendance, and stated that he believed this had been an excellent set of meetings. He expressed his thanks to the NERC and regional entity staff for their hard work at these meetings.

Adjournment

There being no further business, and upon motion duly made and seconded, the meeting was adjourned.

Submitted by,



Charles A. Berardesco
Corporate Secretary

Compliance and Certification Committee Membership

Action

Approve

Background

The Compliance and Certification Committee (CCC) is recommending that the Board of Trustees (Board) approve the appointments of three new CCC representatives. All appointments are for a three-year term effective upon the date of Board approval.

The CCC respectfully requests the Board approve the following new membership appointments:

- John D. Rhea of Oklahoma Gas & Electric Company, representing Investor-Owned Utility
- Daniela Cismaru of Alberta Electric System Operator, representing Canada Provincial (non-voting)

Planning Committee Membership

Action

Approve

Background

The Planning Committee is recommending that the Board of Trustees (Board) approve Bob Ramaekers (Tenaska) to represent the Electricity Marketer sector on the committee (currently vacant), term ending June of 2018.

2017-2019 Reliability Standards Development Plan

Action

Approve

Background

The draft 2017-2019 Reliability Standards Development Plan (RSDP), developed by NERC staff in conjunction with members of the Standards Committee (SC), focuses on conducting Enhanced Periodic Reviews (EPRs), targeting emerging risks, addressing FERC directives, responding to Standard Authorization Requests, and the standards grading initiative. NERC and the SC will continue to work with NERC committees and task forces to address any potential reliability risks. As an evolution to previous RSDPs, which emphasized the methods and progress for NERC Reliability Standards to become “steady state”¹, the 2017-2019 RSDP emphasizes NERC’s approach to prioritizing activities related to EPRs, new FERC directives, and emerging risks.

The 2017-2019 RSDP was posted for a 30-day public comment period from June 20, 2016 until July 19, 2016. Modifications were made to the RSDP based on SC member and industry comments. The SC endorsed the RSDP in its September 14, 2016 meeting.

Additional Information

A link to the 2017-2019 RSDP is included for reference: [2017-2019 RSDP](#)

¹ For the purposes of that plan, “steady state” meant a stable set of clear, concise, high-quality, and technically sound Reliability Standards that are results based, including the retirement of requirements that do little to promote reliability.

Florida Reliability Coordinating Council Regional Reliability Standard Development Process Manual Revisions

Actions

Approve the following standard documents and authorize staff to file with applicable regulatory authorities:

- **FRCC Regional Reliability Standard Development Process Manual**
[\[FRCC Regional Reliability Standard Development Process Manual - Clean\]](#)

[\[FRCC Regional Reliability Standard Development Process Manual - Redline\]](#)

Background

Florida Reliability Coordinating Council (FRCC) has revised its Regional Reliability Standard Development Process Manual (SDPM). The purpose of these revisions is to improve and clarify the FRCC standard development process and establish consistency in standards development with NERC and other Regional Entities. The current version of the FRCC SDPM was approved in 2007. The proposed changes are intended to align the FRCC SDPM with the improvements that have been made in the intervening years to the NERC Standard Processes Manual and other Regional Entity standard development processes.

Summary

A summary of the changes to the FRCC SDPM is provided below:

- Incorporation of the results-based standards principles and NERC standard template.
- Inclusion of concurrent posting periods to significantly reduce the length of time required for standards development.
- Addition of clarifying details surrounding the development and approval of Violation Severity Levels (VSLs) and Violation Risk Factors (VRFs) and the responsibilities and roles of participants in the FRCC process.
- Addition of a new FRCC Regional Reliability Standard development process flowchart.
- Updates to the Standard Authorization Request document to incorporate functional entity changes and addition of clarifying language.
- Updates to the format of the document.

In addition, FRCC has revised the FRCC SDPM to reflect that the FRCC Regional Entity Committee and Compliance Forum now exercises oversight authority over the FRCC standard development process, in accordance with certain FRCC Bylaws revisions that were approved by the NERC Board of Trustees in 2014.

Additional details regarding the revisions are provided in the [FRCC Process Revisions Summary Document](#).

As required by the Section 311 of the NERC Rules of Procedure, NERC staff reviewed FRCC's SDPM and concluded the document met all of the evaluation criteria. The FRCC SDPM unanimously passed its final ballot on April 23, 2016 and was subsequently approved by the FRCC Board of Directors on June 30, 2016. The FRCC SDPM was posted on the NERC website for industry stakeholder comment from July 1 to August 15, 2016 and no adverse comments were received.

Additional Information

A link to the project history and files is included here for reference:

[FRCC Regional Reliability Standard Development Process Manual Project](#)

Compliance Filing in Response to FERC Directive to Change VRFs of IRO-018-1 and TOP-010-1 to High

Action

Approve changes to the Violation Risk Factors (VRFs) for Reliability Standard IRO-018-1 Requirement R1 and Reliability Standard TOP-010-1 Requirements R1 and R2 from “medium” to “high,” and authorize NERC staff to file with the applicable regulatory authorities:

- IRO-018-1(i) [[redline showing revised VRF for Requirement R1](#)]
- TOP-010-1(i) [[redline showing revised VRF for Requirements R1 and R2](#)]

Background

On September 22, 2016, the Federal Energy Regulatory Commission (FERC) issued an order approving Reliability Standard IRO-018-1 (Reliability Coordinator Real-time Reliability Monitoring and Analysis Capabilities) and Reliability Standard TOP-010-1 (Real-time Reliability Monitoring and Analysis Capabilities) and requiring a compliance filing to address VRF designations. In that order, FERC concluded that the “medium” VRFs assigned to Requirement R1 of Reliability Standard IRO-018-1 and Requirements R1 and R2 of Reliability Standard TOP-010-1 are not: (i) consistent with FERC’s guidelines; or (ii) in alignment with NERC’s definitions of high, medium, and low VRF levels. FERC directed NERC to revise the VRF designations for these three Reliability Standard Requirements from “medium” to “high” and to submit a compliance filing within 60 days (*i.e.*, by November 21, 2016).

Additional Information

A link to the FERC order is included here for reference:

[Order Approving Reliability Standards IRO-018-1 and TOP-010-1](#)

Project 2015-INT-01 Interpretation of CIP-002-5.1 for Energy Sector Security Consortium (EnergySec)

Action

Adopt the following Interpretation and authorize NERC staff to file with applicable regulatory authorities:

- **Interpretation of CIP-002-5.1 – Cyber Security — BES Cyber System Categorization**
[\[Interpretation\]](#)

Background

EnergySec submitted a Request for Interpretation (RFI) seeking clarity regarding CIP-002-5.1, Requirement 1, Attachment 1, Part 2.1. The RFI asks whether the language “shared BES Cyber Systems” refers to discrete BES Cyber Systems that are shared by multiple units, or whether it refers to groups of BES Cyber Systems that, collectively, could impact multiple units. Essentially, the RFI seeks clarity regarding whether the evaluation required under Requirement R1 should be performed individually for each discrete BES Cyber System at a single plant location, or instead, applied collectively for groups of BES Cyber Systems.

The Standards Committee (SC) accepted the RFI at the September 23, 2015 meeting. However, on December 9, 2015, the SC endorsed deferring consideration of the RFI until the standard drafting team for Project 2016-02 Modifications to CIP Standards was formed and could also serve as the Interpretation Drafting Team (IDT) for the RFI.

In reviewing the RFI, the IDT identified three distinct questions within the request and developed this interpretation pursuant to the NERC Guidelines for Interpretation Drafting Teams.

The three questions were:

1. Whether the phrase “shared BES Cyber Systems” means that the evaluation for Criterion 2.1 shall be performed individually for each discrete BES Cyber System at a single plant location, or collectively for groups of BES Cyber Systems?
2. Whether the phrase “shared BES Cyber Systems” refers to discrete BES Cyber Systems that are shared by multiple units, or groups of BES Cyber Systems that could collectively impact multiple units?
3. If the phrase applies collectively to groups of BES Cyber Systems, what criteria should be used to determine which BES Cyber Systems should be grouped for collective evaluation?

Standard Development Process

The IDT developed a response that addressed each of the above questions. In response to the first question, the evaluation of a shared BES Cyber System should be performed individually for each discrete BES Cyber System. In response to the second question, the phrase “shared BES Cyber Systems” refers to discrete BES Cyber Systems that are shared by multiple generation units. In response to the third question, the phrase applies to each discrete BES Cyber System.

The Interpretation was posted for a 45-day formal comment period with an associated initial ballot. The initial ballot ended on September 12, 2016 with an approval rating of 91.68 percent. The results from the final ballot will be presented at the November Board meeting.

Minority Issues

There are no unresolved minority issues.

Additional Information

A link to the project history and files is included here for reference:

- **Project 2015-INT-01 Interpretation of CIP-002-5.1 for Energy Sector Security Consortium (EnergySec)**

[\[Project Page\]](#)

WECC Interpretation BAL-002-WECC-2a

Action

Adopt the Regional Reliability Standard Interpretation BAL-002-WECC-2a (Interpretation) for Arizona Public Service Company (APS) and authorize NERC staff to file with applicable regulatory authorities.

- [[Interpretation of BAL-002-WECC-2a](#)]

Background

On March 5, 2015, WECC filed a Standard Authorization Request for Interpretation on behalf of APS requesting clarification on Requirement R2 of BAL-002-WECC-2 – Contingency Reserve.

Summary

BAL-002-WECC-2 Requirement R2 states:

R2. Each Balancing Authority and each Reserve Sharing Group shall maintain at least half of its minimum amount of Contingency Reserve identified in Requirement R1, as Operating Reserve – Spinning that meets both of the following reserve characteristics. (Emphasis added)

- 2.1 Reserve that is immediately and automatically responsive to frequency deviations through the action of a governor or other control system;
- 2.2 Reserve that is capable of fully responding within ten minutes.

APS sought clarification that, for purposes of BAL-002-WECC-2 Requirement R2, APS and other Balancing Authorities or Reserve Sharing Groups can include “technologies, such as batteries, both contemplated and not yet contemplated...as potential resources [to meet the Operating Reserve – Spinning requirement of BAL-002-WECC-2, Requirement R2] – so long as the...resource can meet the response characteristics described in the standard.”

The Interpretation unanimously passed the WECC final ballot on August 7, 2015 and was subsequently approved by the WECC Board of Directors on October 29, 2015. NERC posted the Interpretation for a 45-day public comment period on August 14, 2015, and no adverse comments or minority opinions were received. NERC staff has reviewed and supports the Regional Reliability Standard Interpretation. On June 16, 2016 the WECC Board of Directors approved sending the Interpretation to NERC for adoption and subsequent filing with applicable regulatory authorities.

Pertinent FERC Order No. 693 directives

None.

Additional Information

A link to the project history and files is included here for reference:

[Interpretation of BAL-002-WECC-2a](#)

Project 2010-14.2.2 Phase 2 of Balancing Authority Reliability-based Controls (BAL-004-0 Retirement)

Action

Adopt the following standard document and authorize staff to file a request for retirement of Reliability Standard BAL-004-0 with applicable regulatory authorities:

- **Implementation Plan for BAL-004-0 Retirement¹**
[BAL-004 Implementation Plan](#)
- **Retirements**
 - BAL-004-0 - Time Error Correction

Background

Project 2010-14.2.2 Phase 2 of Balancing Authority Reliability-based Controls proposes to retire BAL-004-0 as a standard that does not contribute materially to reliability. This proposal is consistent with (i) the Standard Authorization Request (SAR) for the project, (ii) the 2013 Independent Expert Review Report reviewing NERC Reliability Standards, and (iii) recommendations by the Balancing Authority Reliability-based Controls Phase 2 (BARC 2) Periodic Review Team (PRT) examining the standard between 2012-2013. The project was approved by the NERC Standards Committee on March 11, 2015.

Overview of BAL-004-0:

Time Error is created when an Interconnection operates on the aggregate at a frequency different than the intended 60 hertz (Hz) or cycles. The North American Energy Standard Board (NAESB) has developed a business practice standard to correct for Time Error. Interconnection Time Monitors are currently responsible for monitoring Time Error in accordance with NAESB standards and initiating corrective procedures. While Time Error itself is not a reliability issue, execution of manual Time Error Correction (TEC) can affect reliability, resulting in BAL-004-0.

BAL-004-0 was approved by the Federal Energy Regulatory Commission (Commission) in Order No. 693 to help ensure coordinated manual TEC and has been implemented since 2007, with one Regional Reliability Standard BAL-004-WECC-1 (not impacted by this project). In 2009, NERC proposed version BAL-004-1, however, this proposal was withdrawn in 2012 after consideration of the Commission's 2010 notice of proposed rulemaking regarding the proposed revisions and after further examination

¹ In addition, for reference, (i) the Periodic Review Team Recommendations supporting the project are available at [Periodic Review Team Recommendations](#); (ii) the White Paper prepared by the Standard Drafting Team for consideration during industry comment and balloting is available at [White Paper](#); and (iii) the Operating Committee approved Time Monitoring Reference Document to help facilitate a smooth transition upon retirement of BAL-004-0 is available at [TEC Reference Document](#).

demonstrated that the proposed revisions were not necessary.² As a result, BAL-004-0 has continued in effect since 2007, subject to continued study.

Findings Resulting in Proposed Retirement of BAL-004-0

The Standard Drafting Team (SDT) determined that manual TEC does not materially support reliability of the bulk power system (BPS) and that manual TEC is inconsistent with NERC Reliability Principle 2 that “frequency and voltage of interconnected bulk power systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.” The SDT’s findings were consistent with the Periodic Review Team Recommendations that manual TEC does not materially support reliability and should be retired. The PRT noted that the Independent Expert Review Report similarly found that the standard does not support reliability, stating, “[t]he PRT agrees with the Independent Experts and many stakeholders that BAL-004-0 should be retired under Paragraph 81 criteria.”³

Further, the SDT found that more recent mandatory Reliability Standards (such as Reliability Standards BAL-003-1.1, BAL-001-2, and the Interconnection Reliability Operations and Coordination Standards) incent continued adherence to frequency approximating 60 Hz over long-term averages, making BAL-004-0 redundant. Therefore, retiring Reliability Standard BAL-004-0 would be “consistent with the Commission’s policy promoting increased efficiencies in Reliability Standards and reducing requirements that are either redundant with other currently-effective requirements or have little reliability benefit.”⁴

Approach to Support a Smooth Transition to Retirement and Avoid Uncoordinated Manual TEC

The proposal to retire BAL-004-0 is conditioned upon retirement of NAESB’s manual TEC standard to avoid uncoordinated manual TEC. In addition, to facilitate a smooth transition upon retirement of BAL-004-0 and NAESB’s manual TEC standard, the SDT worked with the NERC Operating Committee (OC) to develop a Time Monitoring Reference Document. This Reference Document was approved by the OC in September of 2016 and provides guidance to stakeholders on appropriate actions if manual TEC is determined necessary. Together with retirement of BAL-004-0, this approach will help ensure that manual TEC is not performed in a manner that adversely affects reliability.

Pertinent FERC Directives

FERC issued two directives and one determination in Order No. 693 related to BAL-004-0. These concerns would be addressed through NERC’s proposed retirement of the standard.

² See, *Notice of Withdrawal of the North American Electric Reliability Corporation of BAL-004-1 - Time Error Correction*, Docket No. RM09-13-000, at p. 2 (filed Oct. 24, 2012). Non-utility industry stakeholders also expressed confusion regarding the proposed revisions.

³ [Periodic Review Team Recommendations](#), at p. 5; and [Standards Independent Experts Review Project, An Independent Review by Industry Experts](#), at p. 26, Appendix E (“Independent Expert Review Report”) (June 2013).

⁴ *Transmission Operations Reliability Standards and Interconnection Reliability Operations and Coordination Reliability Standards*, Order No. 817, 153 FERC ¶ 61,178, at P 2 (2015). See also, *id.*, at PP 13-14.

Order No. 693, at PP 382-383:

The Commission approves Reliability Standard BAL-004-0 as mandatory and enforceable. In addition, pursuant to section 215(d)(5) of the FPA and § 39.5(f) of our regulations, the Commission directs the ERO to develop a modification to BAL-004-0 through the Reliability Standards development process that includes Levels of Non-Compliance and additional Measures for Requirement R3. Further, based on commenters' concerns that there is no engineering basis for changing the time error correction to the WECC approach or any other approach, when reviewing the Reliability Standard during the ERO's scheduled five-year cycle of review, we direct the ERO to perform research that would provide a technical basis for the present approach or for any alternative approach.

Many commenters aver that the time error correction procedure belongs within the realm of NAESB and is not a reliability issue. The Commission disagrees, as BAL-004-0 is intended to ensure that time error corrections are performed in a manner that does not adversely affect the reliability of the Interconnection. The financial aspects of time error correction such as MISO's concern about the unilateral payback of interchange imbalances remain with NAESB. However, the technical details, including the means to carry out the procedure, are a reliability issue.

Standard Development Process

BAL-004-0 was posted for initial ballot on September 24, 2015 and the ballot period ended on November 12, 2015, with an approval rating of 98.17 percent. The final ballot ended on December 17, 2015, with an approval rating of 98.26 percent.

As noted, throughout development, the SDT worked with NAESB to coordinate proposed retirement of manual TEC standards. Subsequent to balloting, the SDT also worked with the OC to prepare a reference document to help facilitate a smooth transition upon retirement of the standard.

Minority Issues

There were not any significant unresolved minority issues.

Additional Information

A link to the project history and files is included here for reference:

- **Project page**

[Project 2010-14.2.2](#)

ERO Reliability Risk Priorities Report

Action

Accept the report.

Background

In 2016, the ERO Enterprise streamlined its strategic planning process to begin with input from the Reliability Issues Steering Committee's (RISC's) annual ERO Reliability Risk Priorities report. The 2016 report reflects the committees' determination of the most pressing risks to the bulk power system taking into account policy input received in early August. The committee has taken these high-level risks and categorized them into High, Moderate, and Low risk profiles.

High risks require a larger amount of industry attention and resource focus to better understand and address impacts to the system. Moderate risks still represent a large potential impact to the bulk power system but there is consensus that the industry understands the risk and necessary steps to improve reliability. Low risks do not mean that possible reliability impact is small, but rather the profiles are understood with clearly identifiable steps that can be taken to manage risk. Thus, even risks that are well understood and have measures in place for risk mitigation are included as risk profiles because the industry must remain vigilant in addressing these Lower or Moderate risks in order to prevent the profiles from being escalated higher.

Each risk profile includes descriptors of risk and recommendations for mitigation. These recommendations are presented to the NERC Board of Trustees and industry stakeholders as input into the strategic planning documents.

Attachment

ERO Reliability Risk Priorities, RISC Recommendations to the NERC Board of Trustees

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

ERO Reliability Risk Priorities

RISC Recommendations to the NERC Board of
Trustees

November 2016

RELIABILITY | ACCOUNTABILITY



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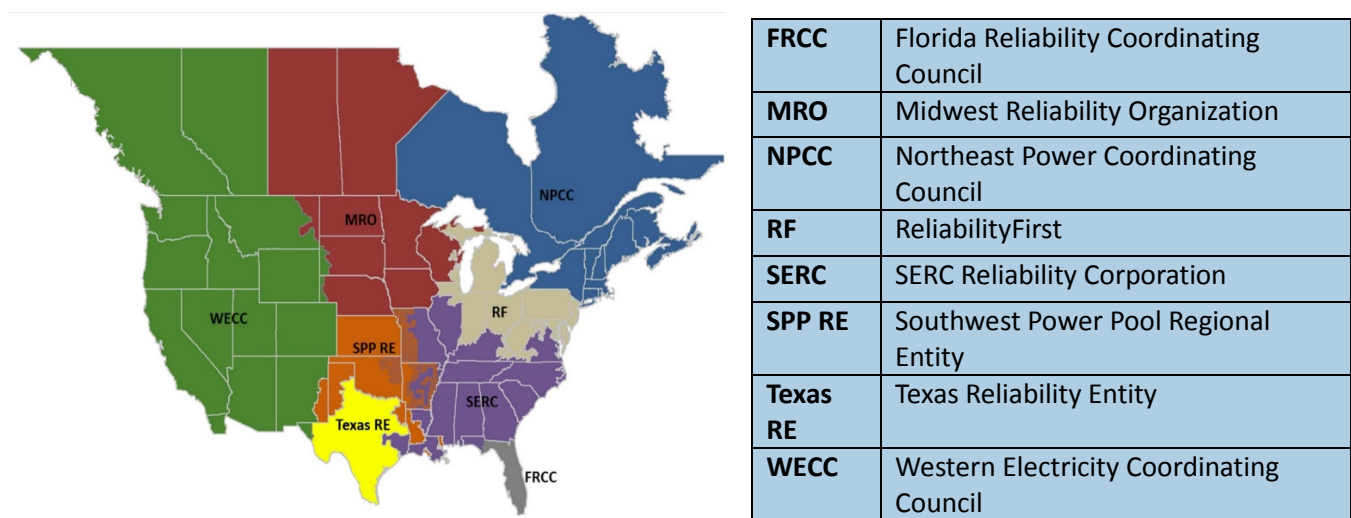
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Preface

The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose mission is to assure the reliability of the bulk power system (BPS) in North America. NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the BPS through system awareness; and educates, trains, and certifies industry personnel. NERC’s area of responsibility spans the continental United States, Canada, and the northern portion of Baja California, Mexico. NERC is the electric reliability organization (ERO) for North America, subject to oversight by the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada. NERC’s jurisdiction includes users, owners, and operators of the BPS, which serves more than 334 million people.

The North American BPS is divided into eight Regional Entity (RE) boundaries as shown in the map and corresponding table below.



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

This 2016 report presents the results of the RISC’s continued work to strategically define and prioritize risks to the reliable operation of the BPS and thereby provide recommendations to the Board regarding the approach that NERC should take to enhance reliability and manage those risks.

Chapter 1: Background and Introduction

Background

This 2016 annual report documents the results of the RISC’s continued work to identify key risks to the reliable operation of the BPS. This report proposes relative priorities and management effort pacing and provides input to the Board on recommended actions.

The RISC’s obligations are based on the NERC Board’s resolutions on the initial 2013 recommendations:

RESOLVED, that the Board hereby accepts the report of the Reliability Issues Steering Committee (RISC), expresses its appreciation to the RISC for the excellent report, and endorses continued work by the RISC on a gap analysis on the high-priority and then the medium-priority issues and requests continued reports to the Board.

FURTHER RESOLVED, that the Board hereby directs NERC management to continue to work with the RISC to consider how the priority rankings should be reflected in the development of the ERO’s business plan and in the work plans of NERC committees.

FURTHER RESOLVED, the Board hereby directs NERC management to work with the RISC and, as appropriate, NERC committee leadership to consider how NERC should utilize a data-driven reliability strategy development process that integrates with budget development and overall ERO planning (e.g., Standing Committee planning, department, and employee goal-setting).

There are important links between the risk priorities and the recommended actions for the ERO Enterprise and industry. The RISC acknowledges and appreciates the increased reliance of the NERC Board and ERO Enterprise leadership on this report as an input for the ERO’s multiyear Strategic Plan and its Business Plan and Budget.

The RISC participants include representatives from the NERC standing committees, the Member Representatives Committee (MRC), and “at large” industry executives. The observations, findings, and guidance presented in this report include input from industry forums, trade associations, and other industry groups. RISC also received feedback through policy input to the NERC Board of Trustees and an industry webinar.

The 2016 report builds on the comprehensive initial assessment of ongoing efforts and corresponding recommendations to the Board made in February 2013, which have been updated and refined annually. This report and recommendations reflect discussions with representatives from technical and standards committees, industry dialogue through a series of focused executive leadership interviews, the FERC Reliability Technical Conference, and technical reports and assessments. These results were presented to the ERO executive management group for integration in the development of the 2017–2020 ERO Enterprise Strategic Plan. The final report will be presented to the Board in November 2016.

Introduction

The RISC has carefully reviewed numerous inputs on BPS reliability from various stakeholders, and this report reflects the top priorities of the industry leadership represented on the committee. The RISC reviewed and assembled information from ERO Enterprise¹ stakeholders, policy makers,² and focused executive leadership interviews to develop a composite set of risk profiles and a graphic depiction of the key risks to the system. The

¹ ERO Enterprise is interpreted to mean NERC, the Regional Entities, and the necessary technical committees.

² Policy makers is interpreted to mean any entity that can impact the legal or regulatory framework in place at various levels, including local, state, federal, and provincial governmental authorities in addition to various trades and lobbying organizations.

depiction presents the likelihood of occurrence, the expected impact on reliability, and the trajectory of the associated risks.

The individual risk profiles have been categorized as High, Moderate, or Low. High-risk profiles present not only a possible severe impact on reliability but also a level of uncertainty. The High risks are evolving and the likely impact and necessary mitigation are often less clear. Thus, High risks require a larger amount of industry attention and resource focus to better understand and address impacts to the system. Moderate risks still represent a large potential impact to the BPS, but there is consensus that the industry understands the risk and necessary steps to improve reliability. Low risks do not mean that possible reliability impact is small, but rather the profiles are understood with clearly identifiable steps that can be taken to manage risk. Thus, even risks that are well understood and have measures in place for risk mitigation are included as risk profiles because the industry must remain vigilant in addressing these Lower or Moderate risks in order to prevent the profiles from being escalated higher.

A Low or Moderate ranking in this report does not mean the risk covered in the profile is not a threat to the system. These risks still require monitoring and action to mitigate or reduce the likelihood of instability, uncontrolled separation, or cascading outages that adversely impact the reliability of the BPS. Accordingly, the risk profiles were categorized as follows:

High Risk Profiles

- Cybersecurity Vulnerabilities
- Changing Resource Mix
- BPS Planning
- Resource Adequacy

Moderate Risk Profiles

- Loss of Situational Awareness
- Physical Security Vulnerabilities
- Extreme Natural Events

Low Risk Profiles

- Asset Management and Maintenance
- Human Performance and Skilled Workforce

Format of the Report and Method of Analysis

A majority of this report is comprised of risk profiles that detail the evolving status and mitigation efforts to address each specific risk. These profiles outline a summary of the risks and the potential impact to the BPS. Through the profiles, the RISC recommends activities to manage the risks in the near-term, mid-term, and long-term. The ERO Enterprise and industry can use the composite risk profiles and the risk map for baseline and recurring evaluation of reliability risks.

Where appropriate, the RISC identified the group or entity that should take mitigating action; however, some recommendations did not present a clear owner or responsible party. In these cases, the recommendation is presented as a more generalized action item that can apply to numerous entities, including policy makers, industry, and the various organizations in the ERO Enterprise.

The primary objective of this report is to highlight risks that merit a continued level of attention and recommended actions that align with the multidimensional aspects of the risk. This report differs from other ERO reports, such as the annual *State of Reliability*, in that it is forward-looking view of the BPS. The *State of Reliability* reviews data from previous years to draw objective conclusions.

Additionally, the committee evaluated risks based on impact to the BPS regardless of the source of the risk. In order to evaluate key risks to the system, the committee had to recognize various emerging issues in different areas of the grid and resources such as distributed energy resources. Operators and planners of the BPS are aware of the need to have a wide-area view to provide an understanding of external conditions that can affect them; therefore, the profiles note several risks where the BPS can be impacted at interfaces (*e.g.*, distributed resources, gas delivery, telecom, etc.). RISC determined it is important to shine a light on external factors that increase BPS risk and offered recommendations to address them. Given the changing nature of the system and acceleration of integrating distributed energy resources, the RISC is obligated to raise areas of concern since impacts from distributed resources may require mitigations at the BPS level.

Other inputs to the Risk Profiles

FERC Technical Conference

On June 1, 2016, FERC conducted a commissioner-led technical conference on reliability. The purpose of the conference was to discuss policy issues related to the reliability of the BPS. As part of its review of emerging risks to the reliable operation of the BPS, RISC used the inputs and active discussions at this conference to supplement its development of the risk profiles. The technical conference addressed three main topics: the 2016 State of Reliability, Emerging Issues, and Grid Security. These topics were addressed in four panel sessions:

- The first panel focused on the **2016 State of Reliability**. The participants of this panel affirmed several of the risks identified by the RISC. The panelist identified the most significant risks to the BPS as coordinated physical attacks on the system, interdependencies from other industries, extreme weather events, gas dependency, adequacy of models (past N-1), and aging infrastructure. This panel also highlighted necessary actions to address the adequacy and modeling of the distribution system. Panelists discussed the need for better modeling and increased visibility of the system. In addition, panelists noted a need to identify the difference between the distribution and transmission operator responsibilities.
- The second topic, **Emerging Issues**, was divided into two panels. The first panel provided an international perspective to the grid's emerging issues, and panelists from the European Union and Mexico added several perspectives. Market features were discussed that could improve reliability, such as protocols for buying capacity and markets designed around a reliability objective. The second panel continued the first panel's discussion on emerging trends and risks, but concentrated the discussion on distributed resources, vulnerability to natural gas fuel deliverability, and microgrids. The rapid acceleration of the changing resource mix and need to identify metrics around essential reliability services (ERS) was discussed. Additionally, the reliability concerns from the Aliso Canyon natural gas leak exemplified the challenges in the West. This panel stressed the need for better planning and the need for flexibility in order to mitigate risks from the changing resource mix.
- The final panel, addressing **Grid Security**, highlighted the need to share threat information and to support industry coordination. In addition, the need to develop a culture of cyber-awareness among the workforce was identified along with the suggestion the industry could invest in neutral ground-blocking devices.

Pulse Point Interviews

In order to expand the consideration of potential reliability risks from a strategic perspective, the RISC conducted one-on-one interviews with key industry executives and leaders to gain their insight. The goal was to focus on important reliability risks from different vantage points among regulators and utilities and to ensure that key areas

of reliability concern and relevant priorities were adequately identified for consideration by the RISC. A summary of these interviews are described below.

Several interviews validated the concerns presented in the risk profiles. The profiles of Changing Resource Mix and Cybersecurity Vulnerabilities were the most common themes in all of the interviews. In addition, several industry executives voiced concerns over fuel dependency and the greater reliance on natural gas. Many utilities commented that natural gas currently serves as the baseload fuel for their areas, heightening the need for greater focus on gas infrastructure in order to identify potential risks to the BPS.

Although several industry leaders acknowledged that NERC has no jurisdiction over markets, there is a growing concern that the existing markets do not accurately reflect products necessary to support the new resources being integrated today. For example, several markets may not include ancillary services necessary to support reliability when relying on more distributed resources. Several executives also expressed concern over the current rate structure where large investments to augment or maintain the system are precluded.

A continued theme from 2015 is some leaders are concerned about a workforce shortage, such as protection and control engineers. The aging workforce has been a consistent theme throughout the years, and some leaders provided support for continuing to monitor this risk.

A few leaders encouraged the ERO to place a stronger emphasis on the electro-magnetic pulse (EMP) threat, particularly with high altitude devices capable of causing widespread outages. Also one leader suggested changing the focus to constructing a more resilient distribution system to support reliability as more renewables and other resources are being added to the distribution system.

The following list identifies recommendations provided during the pulse point interviews. Policy makers should recognize the need to support the costs needed to manage, operate, and maintain system assets as these activities are part of an organization's ability to maintain and improve system performance and the reliable operation of the power system.

- The industry and the ERO Enterprise should collect more detailed data from larger areas ("bigger data") to support better analytics and larger studies.
- The industry should consider updating studies and not rely on just N-1 scenarios. This may entail fully studying the distribution system.
- RTOs/ISOs should consider studies beyond three years out in order to assess certain reliability needs.
- Expedite research and development to bring advancements to market sooner, specifically fuel and energy storage and fuel cell technology.
- Entities should have a clear communication protocol both internally and externally in the event of coordinated attacks or coincident events.
- Entities should begin considering how to build a new generation of back-up systems for natural disasters and extreme events.
- The industry must expand or introduce a true "security culture" to small electric utilities.
- The industry should collaborate on a common software platform for distribution management systems.

Focus Areas and Recommendations from the Risk Profiles

Outlined here are the highest priority focus areas identified in the 2016 risk profiles. Concentrated effort by the Industry on these areas, as well as inclusion of goals within the ERO Strategic Plan and the associated Business Plan and Budget, should improve BPS reliability. Additional detail can be found in the associated Risk Profiles.

Cybersecurity Vulnerabilities (Risk Profile #9)

- The ERO Enterprise and the industry should adopt a nimble, multipronged approach to address the continually evolving cybersecurity threat. Examples of nimble tools include increased Electricity information sharing and analysis centers (E-ISAC) participation and products, peer reviews and assistance visits to move to a best-practice model, and guides and recommendations for new and less-defined threats.
- The E-ISAC, the Telecommunications, and Natural Gas Information Sharing and Analysis Centers should enhance communications. Expand the use, availability, and value of cybersecurity threat and vulnerability information sharing, analytics, and analysis.
- The ERO Enterprise and all utilities should foster development of a security culture among their employees.

Changing Resource Mix (Risk Profile #1)

- The ERO Enterprise should:
 - Assess the risks associated with single points of disruption of natural gas as well as the uncertainty of supply.
 - Use special assessments and studies to inform and educate policy makers, regulators, and the industry of reliability effects and interconnection requirements.
 - Gather data and insights on distributed energy resources in an effort to improve visibility, predictability, and the dispatchability needed to support BPS reliability.
 - Continue to provide independent technical assessments on reliability issues stemming from proposed regulatory rules or statutes as well as any significant tariff rules related to the changing resource mix.
 - Further develop lessons learned based on operational experience with variable energy and distributed energy resources.
- To address the impact on ERS, NERC should benchmark and support technical studies on frequency and inertia response, voltage support, short-circuit analysis, and inter-area oscillations.

BPS Planning (Risk Profile #2)

- The ERO Enterprise should:
 - Coordinate with the industry, manufacturers and developers of asynchronous resources to develop and make available accurate dynamic models.
 - Identify the type and frequency of information needed from distributed energy resources.
 - Create guidelines and best practices for developing and maintaining accurate system, dynamic and electromagnetic models that include transmission, resources, load, and controllable devices for use in long-term and operational planning.
 - Continue to assess ERS performance to develop necessary guidelines and to determine if Reliability Standards are required.

- NERC should continue to collaborate with Planning Coordinators to expand development of interconnection-wide models commensurate with expected dispatches. This collaboration will support the ability to conduct more effective long-term planning assessments.

Resource Adequacy and Performance (Risk Profile #3)

- The ERO Enterprise should:
 - Continue to improve modeling and probabilistic methods with industry to evaluate resource adequacy to include impacts from ERS, unit retirements, and load and resource variability during different time frames (including shoulder months).
 - Assess and develop mitigation recommendations to address single points of disruption, such as fuel contingencies, that will result in large resource outages.
 - Develop new measures of reliability beyond reserve margins, including the sufficiency of ERS.
 - Continue to assess vulnerabilities of fuel availability as part of evaluating resource adequacy and operational capability.
- The industry should evaluate opportunities to develop more accurate short-term load forecast models.
- Analyze data requirements necessary to ensure there is sufficient detail on the capability and performance of the BPS as it is impacted by distributed energy resources. The industry should gather data beyond simple demand forecasts and expand to identify resource capacity, location, and ERS capability.

Themes and Takeaways from the Risk Profiles

In drafting the 2016 risk profiles, no new major risk profiles have been identified. However, several key themes from the profiles show where industry attention is needed.

Resilience and Recovery

Resilience and recovery actions can mitigate exposure from multiple risks. This is particularly important as threats to electric industry infrastructure from cyber and physical attacks are expected to increase, and customers and regulators have increasing expectations on the continuity of electric service. While this report addresses ways to address specific risks, not all possible risks can be anticipated or mitigated. Efforts and resources expended on resilience and recovery can address a wide range of risks and can also limit the extent of extreme or low-likelihood incidents. Resilience assessments in the planning and operating processes should be pursued to support BPS reliability. This was identified as a key recommendation during the 2015 Leadership Summit.

Part of the RISC's role is to identify trends and evolving issues that have the potential to degrade reliability so that actions based on sound technical judgment can be taken. As the character and reliability behavior of the BPS evolves, a wide range of reliability or resilience tools should be identified to guide industry, regulators, and the ERO in effectively managing these risks. The industry must improve forward assessments of reliability and identify resilience activities that anticipate changes.

Key points on resiliency and recovery include:

- In 2015, the top 10 most severe events were related to weather.³ The ERO Enterprise, the impacted organizations, and the respective forums and trade organizations should perform post-event reviews to capture lessons learned and how to reduce the impact of future events.

³ See the *State of Reliability* report.

- While the industry operates to the next worst contingency, the industry should be aggressive in identifying single points of vulnerability.
- Continue to leverage the North American Generator Forum (NAGF), North American Transmission Forum (NATF), Electric Power Research Institute (EPRI), and other industry-practice-sharing forums to enhance resilience and recovery.
- Leverage data sources such as event analysis, near miss databases, the Transmission Availability Data System (TADS), the Generating Availability Data System (GADS), the Demand Response Availability Data System (DADS), relay misoperations, EOP-004/OE-417 reports, and ac equipment failures to identify patterns and risks.
- Highlight applicable metrics in the *State of Reliability* report as benchmarks for resilience and recovery.
- Continue to include resilience goals in the ERO Enterprise's Strategic Plan.

The ERO Enterprise must have a complete understanding of the changing nature of, and associated risks to, the BPS. This includes a more comprehensive analysis of the BPS using NERC's special assessments. Further, markets and other tariffs will influence the changing nature of the reliability behavior of the power system and can provide the full complement of services required for the continued reliable operations of the BPS. The work on ERS is vital to understand the minimum requirements surrounding frequency response, voltage, and ramping resulting from the acceleration of the changing resource mix.

Adequate Data Visibility

Data is needed to understand the performance of and risks to the BPS. This includes information regarding distributed energy resources. Several profiles recommend the ERO Enterprise and industry use "bigger data" from multiple sources and larger areas to identify and manage risks. It is imperative that data requirements also include: 1) the data needed from distributed energy resources, including any necessary aggregated forms of data; 2) the entities should provide the data to system operators and planners; 3) logistics for how the data will be exchanged; 4) the frequency of the data updates; and 5) security and confidentiality measures for protecting necessary data.

Accurate Models

Since the rate of change of the resource mix is increasing, planners will place more emphasis on interconnection-wide studies that require improvement to and integration of regional models. In addition, enhancements to models will be needed to support probabilistic analysis to accommodate the energy limitations of resource additions (such as variable renewable resources). Resource adequacy must look beyond the calculation of reserve margins which assume actual capacity available during peak hours. More comprehensive dynamic load models will also be needed. One of the ways in which the industry can understand the system is by monitoring load characteristics and its changing nature due to distributed.

Natural Gas Deliverability

One common underlying risk that can be tied to multiple profiles is the increased use of just-in-time fuel delivery. More specifically, several profiles identify challenges from the single points of failure caused by the increased penetration of natural gas as a base load fuel. Natural gas deliverability and its impact on reliability must be fully studied to identify necessary mitigation strategies, including market, infrastructure, or regulatory solutions. The increased dependency on natural gas as a predominant fuel source presents challenges in real-time to system operators, and situational awareness must now include gas sources, pipeline, and deliverability concerns. Further, any cyber or physical attack on a pipeline highlights the need for increased coordination among pertinent information sharing and analysis centers (ISACs) and the industry to improve response and recovery times due to the interdependency of the gas and electric system. The ability to model and address fuel limitations or shortages in BPS planning is a critical part of system planning. Therefore, there is a need for improved models as well as required data and information to support this planning to ensure the continued reliable operation of the BPS.

Spare Equipment Strategy

Asset management, physical security, and extreme events highlight a need to maintain a focus on a spare equipment strategy. This strategy should encompass identifying critical spare equipment as part of a national or regional inventory. The strategy should also account for the transportation/logistics requirements for replacing critical assets. An improved spare equipment strategy or plan will lead to better planning and possibly faster response times for restoration and recovery.

Chapter 2: Discussion of Reliability Risks

NERC should continue to collaborate with Planning Coordinators to expand development of interconnection-wide models commensurate with expected dispatches. This collaboration will support the ability to conduct more effective long-term planning assessments.

Legend Guide to Figure 2.1

The solid numbered circles in the heat map denote the current state for each risk area, and they are mapped against likelihood and impact scales. The risk trend represents where the committee views the risk to be trending in the near future.

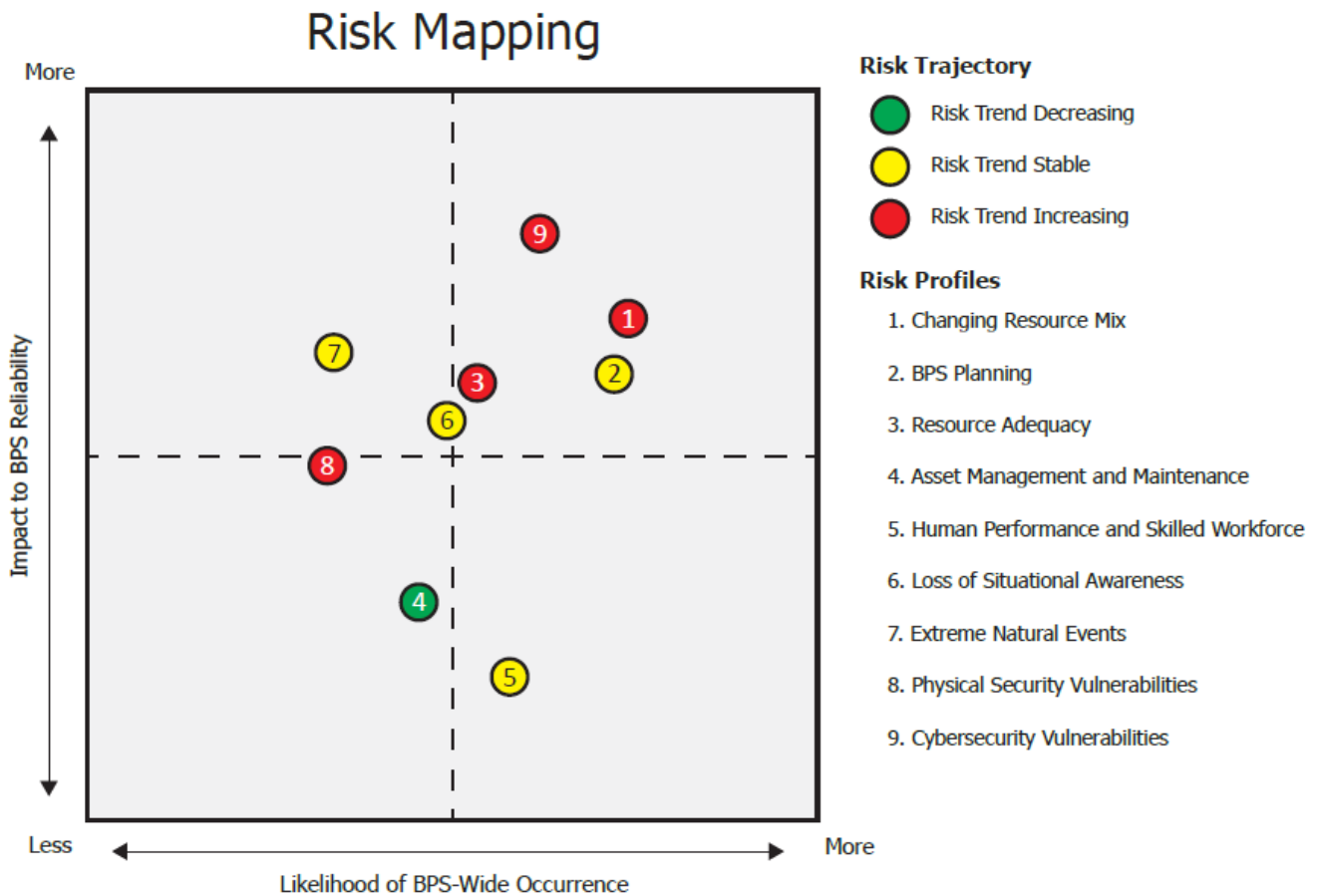


Figure 2.1: Risk Map of ERO Risk Profiles

Risk Groupings

This report provides a framework to categorize risks as High, Moderate, or Low. A Low ranking does not indicate that the risk covered in the profile is not a threat to the system; risks with Low or Moderate rankings still require industry action to reduce the likelihood of instability, uncontrolled separation, or cascading outages that adversely impact the Bulk Electric System. Regardless of the ranking or classification, all risk profiles warrant attention as the rapidly changing BPS can quickly raise the risk. High risks were based on the committee's sense of urgency or where industry focus was needed to fully understand the risks.

High Priority Risks:

- **Cybersecurity Vulnerability:** This risk profile is considered a High risk due to the increasing need for protection against a cyberattack. Cyber threats are becoming more sophisticated and increasing in number. Exploitation of cybersecurity vulnerabilities can potentially result in loss of control or damage to BPS-related voice communications, data, monitoring, protection and control systems, or tools. A cyber-attack can lead to equipment damage, degradation of reliable operations, and loss of load. Further, cybersecurity vulnerabilities can come from several sources, both internal and external, and in some instances the utility may have its cybersecurity fully tested.
- **Changing Resource Mix:** The 2015 risk profile on Regulatory Uncertainty was retired as most of the focus has transitioned to the specifics regarding the changing resource mix. The rapid rate at which fuel costs, subsidies, and federal, state, and provincial policies are affecting the resource mix are creating a new paradigm in which planners, balancing authorities, and system operators are reacting to resource additions and retirements. Further, the integration of new technologies and distributed energy resources are affecting the availability of as well as the ability of operators to see and control resources within their area.
- **Bulk-Power System Planning:** The two planning profiles from 2015 (Ineffective Planning Coordination and Ineffective Resource Planning) were combined into one profile. BPS planning is a risk closely tied to the changing resource mix because planners currently lack the ability to update or create system models and scenarios of potential future states to identify system needs based on the dynamic nature of the system. This changing system makes it increasingly difficult to evaluate BPS stability, including inertia and frequency response, voltage support (adequate dynamic and static reactive compensation), and ramping constraints.
- **Resource Adequacy and Performance:** With the acceleration of the changing resource mix, the risk profile on Generator Unavailability was revamped to include all resources and associated adequacy performance issues. Changes in the generation resource mix and new technologies are altering the operational characteristics of the grid and will challenge system planners and operators to maintain reliability in real time. Failure to take into account these changing characteristics and capabilities can lead to insufficient capacity and ERS to meet customer demands.

Moderate Priority Risks:

- **Loss of Situational Awareness:** This profile expands the profile from 2015 to encompass more than energy management system (EMS) outages. This profile also explains that the loss of situational awareness can be a precursor or contributor to a BPS event. It also highlights emerging challenges with visibility into distributed energy resource impacts on the grid. Loss of situational awareness due to insufficient communication and data regarding neighboring entities' operations is a risk as operators may act on incomplete information.
- **Extreme Natural Events:** Severe weather or other natural events (e.g., hurricanes, tornadoes, protracted extreme temperatures, geomagnetic disturbances (GMDs), floods, earthquakes, etc.) are some of the

leading causes of outages, and the industry must remain vigilant in improving preparation and coordination in order to minimize the effect of such events.

- **Physical Security Vulnerabilities:** Like cybersecurity, there is an increasing and evolving threat profile from physical attacks. Intentional damage, destruction, or disruption to facilities can potentially cause localized to extensive interconnection-wide BPS disruption for an extended period.

Low Priority Risks:

- **Asset Management and Maintenance:** The profile from 2015 on Protection Systems and Single Points of Failure was folded into the Asset Management and Maintenance and the Human Performance profile below. The failure to properly commission, operate, maintain, prudently replace, and upgrade BPS assets generally could result in more frequent and wider-spread outages, and these could be initiated or exacerbated by equipment failures. This profile highlights the need for prudent and timely equipment replacement and sound management of complex protection systems to prevent or mitigate events.
- **Human Performance and Skilled Workforce:** The continued need for skilled workers, such as protection engineers, is needed to prevent both active and latent errors both of which negatively affect reliability.

Perspectives and Conclusions

The preceding summarizes the RISC's conclusions regarding key reliability risks and areas where NERC and the industry should focus to preserve reliability in 2017 and beyond. These observations and conclusions are supported by the collective expertise within the RISC as well as the other inputs outlined in the report. Overall, these inputs provide a strong foundation for the NERC Board of Trustees for consideration as an important input to ERO Strategic Plan as well as the Business Plan and Budget.

Chapter 3: Risk Profiles

Risk Profile #1: Changing Resource Mix

Statement of the Risk

The change to the resource mix is accelerating due to fuel costs, subsidies, and federal, state, and provincial policies. Transmission planners, Balancing Authorities, and system operators of the BPS may not always have sufficient time to develop and deploy plans to mitigate reliability considerations with various resource additions and retirements.

Level of Risk

High Priority

Descriptors of the Risk

1. The rate of change (penetration rates of certain resources) and the type of change (the specific resources) are influenced by economic factors in addition to state, provincial, and federal initiatives, which sometimes impact one region, province, or state more than another. Over time, regulatory initiatives, along with lower production costs, will likely alter the nature, investment needs, dispatch of generation considering the replacement of large rotating synchronous central-station generators with natural-gas-fired generation, renewable forms of asynchronous generation, demand response, storage, smart- and micro-grids, and other technologies. Planners and operators may not have the requisite time to reliably integrate these inputs and make necessary changes.
2. The ability of regulators and industry to foresee and address reliability issues associated with these changes to the resource mix is complicated by:
 - a. The lack of ancillary services, such as the ERS (e.g., voltage control and reactive support, frequency response, ramping) on the BPS, which is exacerbated by the retirement of many large rotating synchronous central station generating units.
 - b. The integration of large amounts of new resource technologies, distributed energy resources, and behind-the-meter resources; the lack of low-voltage ride through; inaccurate load data to accurately forecast anticipated demand; and the inability to observe and control distributed energy resources.
 - c. The need for data and information about the character of resources in the planning, operational planning, and operating time horizons so the system can be planned and operated while accounting for the contributions and implications to reliability of all resources, regardless of their location or configuration.

Recommendations for Mitigating the Risk

Near-term (1–2 year time frame):

1. The ERO Enterprise and industry should continue to conduct interconnection-wide technical studies, such as frequency and inertia response, voltage support, short-circuit analysis, inter-area oscillation assessments, and electric and gas dependency studies. Also, through a stakeholder outreach and input process, inform and educate policy makers and the industry of reliability effects and interconnection requirements for the changing resource mix.
2. The ERO Enterprise should develop an effective means to gather data and insights into distributed energy resources (i.e., customer, distribution, or otherwise), and formulate plans to achieve the appropriate level of transparency and control such that implications to the BPS can be better understood.

3. Expand the collaboration, through the technical committees, with the Regional Transmission Operators (RTO)/Independent System Operators (ISOs) Council, Balancing Authorities in non-RTO/ISO market areas, other registered entities, and regulators on ERS recommendations for effective implementation as they emerge.
4. The ERO Enterprise should continue to provide independent technical assessments of the reliability impacts from the changing resource mix driven by proposed state, provincial, or federal statutes and transmission provider tariffs.

Mid-term (3–5 year time frame):

5. Policy makers should engage in high-level collaboration among market operators (RTOs/ISOs), balancing authorities in non-RTO/ISO market areas, and provinces and states to establish long-term strategies for aligning policies with reliability needs.

Long-term (greater than 5-year time frame):

6. The ERO Enterprise should continue working with industry stakeholders and policy makers on reliability attributes essential to support the long-term reliability of the BPS, including equipment controls that enable system support from variable energy resources, accommodating distributed energy resources such as small end-use customer resources, distributed energy resource performance, and synchronous generation retirements.

Risk Profile #2: Bulk-Power System Planning

Statement of the Risk

BPS planning is transitioning from centrally planned and constructed resources based on forecasted load growth and reliability projects to more reactive, rather than proactive, planning based on the integration of new resources and technologies driven by policies and incentives. Due to the lack of visibility, certainty, and speed that these resources are being integrated in some areas, planners currently may lack the ability to update or create system models and scenarios of potential future states to identify system reliability needs. Planners may not have sufficient time to implement mitigation plans or reliability upgrades to address likely scenarios, driving the need for more real-time operating procedures.

Level of Risk

High Priority

Descriptors of the Risk

1. Planning and operating the BPS is becoming more complex due to:
 - a. The increased and accelerated rate of plant retirements, especially conventional synchronous generation, coupled with the increasing integration of renewable, distributed, and asynchronous resources.
 - b. Increased risks with the transition from a balanced resource portfolio, addressing fuel and technology risks, to one that is predominately natural gas and variable energy resources.
2. Planners need to evaluate BPS transient, mid-term, long-term, and small-signal stability, including consideration of inertia and frequency response, voltage support (adequate dynamic and static reactive compensation), and ramping constraints due to the timing and dynamic performance of the new resource mix that changes throughout the day. Planners need a complete understanding of all pertinent resources and their characteristics to identify system reliability needs and develop mitigation plans.
3. The ability to perform accurate long-term planning assessments is more difficult due to:
 - a. The need for more comprehensive load models.
 - i. The uncertainty and lack of visibility into load composition and resource mix along with imprecise or evolving models.
 - ii. Complex load model and interaction with power electronics devices on a large scale at the distribution level that may affect BPS operations during disturbances (e.g., fault-induced delayed voltage recovery).
 - b. An increasing need for transmission and system planning activities to include distributed energy resources; however, limited data availability, information sharing, enhanced models required for both system and electro-magnetic transients, and a lack of coordination can hinder the ability of planners to complete this analysis.
 - c. The increased deployment of distributed energy resources within the distribution or behind-the-meter configurations will impact how the BPS responds.
 - d. Uncoordinated integration of controllable device settings and power electronics installed to stabilize the system.
4. Common mode or single points of failure, such as fuel delivery systems, are emerging or have yet to be determined or evaluated.

Recommendations for Mitigating the Risk

Near-term (1–2 year time frame):

1. The ERO Enterprise should coordinate and work with industry and manufacturers and developers of asynchronous resources to develop accurate dynamic models and make them available.
2. The ERO Enterprise should identify the type and frequency of information needed from distributed energy resources.
3. The ERO Enterprise should develop guidelines and best practices for developing and maintaining accurate system and electromagnetic models that include the resources, load, and controllable devices that provide ERS. This would add the benchmarking of dynamic models with Phasor Measurement Units (PMU) measurements based on actual system response to disturbance.
4. NERC should continue to collaborate with Planning Coordinators to expand development of interconnection-wide models commensurate with expected dispatches. This collaboration will support the ability to conduct more effective long-term planning assessments.

Mid-term (3–5 year time frame):

5. Continue to assess the system performance to determine if the current body of planning Reliability Standards is sufficient to address ERS.
6. NERC should collaborate with Planning Coordinators to assess the impact on reliability from well-head, storage, and fuel delivery issues and how to assess them in long-term planning studies.
7. Improve load forecasting, generator modeling, and coordination between BPS and distribution system planners and operators.

Long-term (greater than 5-year time frame):

8. Encourage vendors of power system simulation software to develop programs to enhance dynamic load modeling capabilities.

Risk Profile #3: Resource Adequacy and Performance

Statement of the Risk

The resource mix and its delivery is transforming from large, remotely-located coal and nuclear-fired power plants, towards gas-fired, renewable energy limited, and distributed energy resources. These changes in the generation resource mix and the integration of new technologies are altering the operational characteristics of the grid and will challenge system planners and operators to maintain reliability. Failure to take into account these characteristics and capabilities can lead to insufficient capacity, energy, and ERS (sometimes called “ancillary services”) to meet customer demands.

Level of Risk

High Priority

Descriptors of the Risk

1. The traditional methods of assessing resource adequacy may not accurately or fully reflect the new resource mix ability to supply energy and reserves for all operating conditions.
2. Forecasting BPS resource requirements to meet customer demand is becoming more difficult due to the penetration of distributed energy resources, which can mask the customer’s electric energy use and the operating characteristics of distributed resources without sufficient visibility.
3. Conventional steam resources that operate infrequently due to economics may not operate reliably when dispatched for short peak-demand periods during seasonally hot or cold temperatures.
4. Historic methods of assessing and allocating ancillary services such as regulation, ramping, frequency response, and voltage support may not ensure ERS or sufficient contingency reserves are available at all times during real-time operations.
5. Fuel constraints and environmental limitations may not be reflected in resource adequacy assessments.

Recommendations for Mitigating the Risk

Near-term (1–2 year time frame):

1. The ERO Enterprise and the industry should continue to develop improved modeling and probabilistic methods to evaluate resource adequacy. This includes continued sharing of emerging trends and insights from assessments for effective resource planning and operating models. Adequacy and capacity may include augmenting the measurements of ERS, coordination of controls, balancing load with generation regardless of the location of resources, and energy adequacy in light of installed and available capacity from variable generation.
2. The ERO Enterprise should assess and develop mitigation recommendations as necessary to address single points of disruption, such as fuel contingencies, that will result in large resource outages.
3. The ERO Enterprise and the industry should continue to expand the use of probabilistic approaches to develop resource adequacy measures that reflect variability and overall reliability characteristics of the resources and composite loads, including other than seasonal peak conditions.
4. The ERO Enterprise should generate scenarios for reliability assessments that focus on the location of resource retirements and the impact on ERS.
5. Improve load forecasting, generator modeling, and coordination between BPS and distribution system planners and operators.

6. The ERO Enterprise should develop new measures of reliability beyond reserve margins, including measures on the sufficiency of ERS.
7. The ERO Enterprise and industry should continue to assess vulnerabilities from fuel availability as part of evaluating adequacy and capability to deliver resources.
8. Analyze data requirements necessary to ensure there is sufficient detail on the capability and performance of the BPS as it is impacted by distributed energy resources. The industry should gather data beyond simple demand forecasts and expand to identify resource capacity, location, and ERS capability.

Risk Profile #4: Asset Management and Maintenance

Statement of the Risk

As the system ages and operations are modified, asset management programs also change. Failure to properly commission, operate, maintain, prudently replace, and upgrade BPS assets, such as those nearing their end-of-life, could result in more frequent and wider-spread outages that are initiated or exacerbated by equipment failures or protection and control system failures.

Level of Risk

Low Priority

Descriptors of the Risk

1. A lack of visibility of common-mode failures:
 - Delayed or no industry-wide notice when new issues arise.
 - No trend information readily available.
2. Extended outage time needed to replace major equipment.
3. A lack of sufficient analytics and awareness of inadequately maintained or conditioned equipment at or above minimum standards or requirements.
4. Barriers for proactive equipment replacement programs.
5. A level of awareness and understanding of priority system upgrades.
6. Increasingly complex protection systems that must be managed and maintained to prevent or mitigate events.
7. Protection and control system misoperations exacerbate events, thereby increasing the risk for uncontrolled cascading of the BPS.

Recommendations for Mitigating the Risk

Near-term (1–2 year time frame):

1. Increase the use of NERC's Alert program to provide more detail on information requests from industry on specific assets, earlier dissemination of detailed reports, and potential follow-up activities involving maintenance and management of assets.
2. The ERO Enterprise, in coordination with industry, should improve data gathering for equipment failure modes and improve the dissemination among equipment owners, manufacturers, and associated vendors.
3. Continue to conduct webinars on equipment event lessons learned, equipment maintenance, and seasonal preparedness.
4. Continue to evaluate performance trends using additional data collected by event analysis to extract insights, issues, and trends for dissemination across industry participants.
5. Industry forums and trade groups should learn from successful asset management programs, maintenance, and lessons learned to gain insights on trends in effective asset maintenance and increase dissemination of best practices.
6. The ERO Enterprise should work with industry experts to develop industry guidelines on protection and control system management to improve performance.

7. Assess system performance to determine whether the current family of protection and control standards needs to be enhanced.

Mid-term (3–5 year time frame):

8. Coordinate with the forums, research organizations, and technical committees to establish sharing of technologies or processes that aid in condition monitoring, failure prevention, spare sharing, and recovery.
9. Coordinate with the US, Canadian, and Mexican energy agencies and industry to support power transformer reserve programs.
10. The ERO Enterprise should provide technical basis for industry to support recovery of upgrade and maintenance costs for reliability purposes.

Long-term (greater than 5-year time frame):

11. The industry should implement best practices from the sharing of technologies or processes that aid in condition monitoring, failure prevention, spare sharing, and recovery.

Risk Profile #5: Human Performance and Skilled Workforce

Statement of the Risk

The BPS is becoming more complex, and as the industry faces turnover in technical expertise, it will have difficulty staffing and maintaining necessary skilled workers. In addition, inadequate human performance (HP) makes the grid more susceptible to both active and latent errors, negatively affecting reliability. HP weaknesses may hamper an organization's ability to identify and address precursor conditions to promote effective mitigation and behavior management.

Level of Risk

Low Priority

Descriptors of the Risk

1. Organizations not implementing improvements based on past events or experiences or keeping an eye on the implementation of new technologies can hinder future operations improvements; gaps in skillsets or organizational improvement must be a priority.
2. Turnover of key skilled or experienced workers (e.g., relay technicians, operators, engineers, IT support, and substation maintenance) will lead to more protection system misoperations.
3. A lack of training programs prevents closing skillset gaps quickly.
4. Inadequate management oversight or controls leads to organizational weaknesses and inefficiencies.
5. Ineffective corrective actions lead to repeated human performance errors.
6. Legacy systems and new technology result in disparity of the skillsets needed for BPS reliability.

Recommendations for Mitigating the Risk

Near-term (1–2 year time frame):

1. The HP groups at the ERO Enterprise and industry forums should expand their communication of insights throughout the industry regarding best practices for increasing HP effectiveness (publishing lessons learned/best practices and supporting the NERC HP conference and other related workshops).
2. NERC should encourage industry and key trade associations to determine the extent of expected skill gaps and develop recommendations to address the skill gaps (e.g., curricula, programs, industry support).
3. The ERO Enterprise, trade associations, and industry should promote expanding training and education programs to include HP and recruitment of the next generation of skilled workers.
4. The ERO Enterprise and the industry should promote the use of NERC cause codes to establish a common understanding of HP triggers, collect and evaluate trends in data, and develop metrics as needed.
5. Explore the development and widespread use of a near-miss database which will leverage data sources such as event analysis, near miss databases, Transmission Availability Data System (TADS), Generating Availability Data System (GADS), Demand Response Availability Data System (DADS), relay misoperations, EOP-004/OE-417 Reports, and AC equipment failures to identify patterns and risk.

Mid-term (3–5 year time frame):

6. Consider and implement high-value recommendations developed to address skills gaps identified in the short-term mitigation mentioned in the 1–2 year time frame.

Long-term (greater than 5-year time frame):

7. Industry should develop and implement a sustainable process to analyze and disseminate best practices for HP.

Risk Profile #6: Loss of Situational Awareness

Statement of the Risk

Information sharing will be vital for visibility and a complete understanding of the impacts and contributions of distributed energy resources to the BPS. Inadequate situational awareness can be a precursor or contributor to BPS events. Loss of situational awareness can also occur when control rooms are not staffed properly or operators do not have sufficient information and visibility to manage the grid in real-time. Additionally, insufficient communication and data regarding neighboring entity's operations is a risk as operators may act on incomplete information.

Level of Risk

Moderate Priority

Descriptors of the Risk

The following items can lead to inappropriate operator response or lack of action:

1. Limited real-time visibility to and beyond the immediate neighboring facilities.
2. A lack of common status information on infrastructures and resources on which operators rely (e.g., gas, dispersed resources, distributed energy resources, and data and voice communications).
3. Information overload during system events.
4. Inadequate tools or fully capable back-up tools to address reliability.
5. Lack of training on the tools and information to assess system reliability at a given point in time.
6. Incomplete data and model accuracy used to feed into real-time operations.

Recommendations for Mitigating the Risk

Near-term (1–2 year time frame):

1. The ERO Enterprise should develop new measures of reliability beyond reserve margins, including sufficiency of ERS.
2. The ERO Enterprise should develop real-time notification of interconnection anomalies and outliers (e.g., large load or resource losses, large oscillations, large angle changes, low inertia).
3. The ERO Enterprise should continue to perform a root cause or common mode failure analysis of partial and full loss of key EMS capability using events analysis information and provide lessons learned and recommendations to reduce the likelihood of failure.
4. Work with the forums on an approach for ongoing identification, cataloging, and sharing of good practices related to operating tools.
5. The ERO Enterprise should develop a guideline on situational awareness for the industry to address data modeling and information sharing.
6. The ERO Enterprise should identify the type and frequency of information needed from distributed energy resources for real-time situational awareness.

Mid-term (3–5 year time frame):

7. Develop and implement a set of real-time indicators of interconnection health.

8. The ERO Enterprise should engage industry and trade organizations to develop a list of key tasks and learning objectives for wide-area monitoring as well as assessing status following system events.
9. The ERO Enterprise should engage EPRI to develop a supplement or companion to the Interconnected Power System Dynamics Tutorial that deals with wide-area monitoring under a changing resource mix based on the near-term deliverables above.

Long-term (Greater than 5-year time frame):

10. The ERO Enterprise should engage industry and trade organization and the North American Synchrophasor Initiative (NASPI) to develop a suite of supplemental and back-up tools that use synchrophasor data.
11. Establish a forum with EMS vendors to leverage the near-term and mid-term suggestions for improvement of situational awareness tools.

Risk Profile #7: Extreme Natural Events

Statement of the Risk

Severe weather or other natural events (e.g., hurricanes, tornadoes, protracted extreme temperatures, GMDs, floods, earthquakes, etc.) are one of the leading causes of outages. Severe weather can cause BPS equipment damage, fuel limitations, and disruptions of voice and data communications, which can cause loss of load for an extended period.

Level of Risk

Moderate Priority

Descriptors of the Risk

1. Extreme natural events can damage equipment and limit fuel supplies, which may lead to localized loss of load.
2. Unmitigated GMDs could lead to widespread loss of load due to voltage instability in certain regions.
3. Widespread damage to certain types of BPS infrastructure can extend outages due to unavailability of nearby replacement equipment or specialized capabilities.
4. Physical damage to generation fuel sources, such as natural gas pipelines or storage facilities, can degrade reliable operations of the BPS.
5. Damage to voice and data communications, as well as water supplies, can make certain critical facilities vulnerable and reduce the ability to serve load.
6. The industry does not have full knowledge or coordination in accessing the existing spare equipment inventory.

Recommendations for Mitigating the Risk

Near-term (1–2 year time frame):

1. Complete the GMD Reliability Standards and start geomagnetic induced currents (GIC) data gathering and analysis.
2. E-ISAC and industry should expand communications among ISACs, including the Telecommunications, Water, and Natural Gas ISACs.
3. Study multiple simultaneous limitations on natural gas deliveries during extreme weather.
4. Participate in exercises that incorporate extreme physical events and implement recommendations from exercise or drills such as GridEx.
5. Incorporate E-ISAC and Electricity Subsector Coordinating Council (ESCC) communications protocols into industry disaster preparedness processes.
6. The industry, trades, and forums should evaluate inventories of critical spare transmission equipment and increase as required.
7. The Department of Energy, the industry, trades, and forums should identify appropriate mitigations to prevent spare equipment gaps and improve transportation logistics.
8. The ERO Enterprise and the industry should leverage best practices and the sharing of lessons learned to expand coordination during extreme weather events among Reliability Coordinators, Balancing Authorities, and Transmission Operators.

9. NERC and industry should plan a workshop that is coordinated with U.S. federal agencies, Canadian, and Mexican governmental authorities to address high-impact low-frequency event response, recovery, and communications vulnerabilities.

Mid-term (3–5 year time frame):

10. Identify and promote specific resiliency best practices to plan for extreme events.
11. The ERO Enterprise should conduct more detailed special assessments that integrate:
 - a. Natural gas availability, pipeline capacity, and storage facility impacts on reliability under severe scenarios.
 - b. Other interdependencies, such as long-haul communications and water supply.
 - c. Analytic data trend insights regarding resiliency under severe weather conditions, identifying preventable aspects for BPS reliability.
12. The ERO Enterprise should apply the severity risk index (SRI), on a more granular regional level to measure system resilience and restoration performance for loss of generation, transmission, and load. These efforts should consider or develop new comparative and descriptive metrics.
13. The ERO Enterprise should perform trend analysis on historical impacts on the BPS of extreme natural events.

Long-term (greater than 5-year time frame):

14. Analyze data from GMD events to further the understanding of GIC effects on Bulk Electric System facilities to support enhancements to models and standards.
15. Institutionalize relationships among ESCC, government, and industry partners to enhance the culture of recognizing and addressing extreme physical event preparedness across industry.
16. Develop a plan to review and improve the trend of SRI as indicative measure of system resilience and restoration performance for loss of generation, transmission, and load.
17. To facilitate preparedness, consider preparing sensitivity analyses to simulate the impacts from the most extreme natural events experienced to date in a planning area.

Risk Profile #8: Physical Security Vulnerabilities

Statement of the Risk

Intentional damage, destruction, or disruption to facilities can cause localized to extensive interconnection-wide BPS disruption potentially for an extended period.

Level of Risk

Moderate Priority

Descriptors of the Risk

1. The increasing and evolving threat around physical attacks.
2. The exposed nature of the grid, which is vulnerable and difficult to protect.
3. Long lead times associated with manufacturing and replacing some equipment, which can increase complexity of restoration after physical attacks that damage BPS equipment.
4. The level of industry knowledge or coordination in accessing the existing spare equipment inventory.
5. Physical damage to generation fuel sources, such as natural gas pipelines, which will degrade the reliable operations of the BPS.
6. Damage to long-haul telecommunications and water supplies, which will make certain critical facilities vulnerable and reduce the ability to serve load.
7. An EMP event, which could lead to widespread loss of load in certain regions.

Recommendations for Mitigating the Risk

Near-term (1–2 year time frame):

1. The ERO Enterprise should continue to oversee the implementation of NERC's Physical Security Reliability Standard entitled Critical Infrastructure Protection (CIP-014-2).
2. E-ISAC and industry should expand communications among ISACs, including the Telecommunications, Water, and Natural Gas ISACs.
3. The ERO Enterprise should develop effective metrics formulated to understand the trend of physical attacks and potential threats.
4. Assess the risks of physical attack scenarios on midstream or interstate natural gas pipelines, particularly where natural gas availability will impact generation and the reliability of the BPS in NERC's long-term reliability assessments and planning activities.
5. Promote existing and new efforts to improve a spare equipment strategy and prioritization.
6. Develop a catalog of regional/national exercises that incorporate extreme physical events and share with industry, thus supporting increased participation across industry. Whenever possible, expand exercises to include more facilities and industries.
7. The forums and trades should perform the following activities:
 - a) Identify and promote specific resiliency and vulnerability assessment best practices with planning for extreme events, including good physical security assessment practices.
 - b) Develop an event guideline outlining prevention strategies and event response and recovery protocols for sabotage scenarios.

8. In collaboration with the Critical Infrastructure Protection Committee and industry stakeholders, develop a risk process to address the potential impacts of physical security threats and vulnerabilities.

Mid-term (3–5 year time frame):

9. The industry should review and update restoration plans while accounting for physical security scenarios.
10. Develop performance and metrics reporting on joint E-ISAC and Telecommunications ISAC assessments of potential physical attack disruptions while differentiating from vandalism or theft incidents.
11. Conduct a special regional assessment that addresses natural gas availability and pipeline impacts under physical attack scenarios.
12. The Department of Energy, the industry, trades, and forums should identify appropriate mitigations to spare equipment gaps and transportation logistics.
13. The ERO Enterprise, the industry, trades, and forums should evaluate inventories of critical spare transmission equipment as necessary based on a spare equipment strategy and prioritization.
14. The industry should evaluate mechanisms for cost recovery of implementing specific resiliency strategies by the industry.
15. Industry should work with the technical committees and forums to develop mitigation strategies and physical security assessment best practices.
16. Expand participation in security exercises other than GridEx in order to reflect extreme physical events.
17. Facilitate planning considerations to reduce the number/exposure of critical facilities.

Long-term (greater than 5-year time frame):

18. Institutionalize relationships among ESCC, government, and industry partners to enhance the culture of recognizing and addressing extreme physical event preparedness across industry.
19. Foster the development of methods, models, and tools to simulate system reliability impacts for the planning and operational planning time horizons.

Risk Profile #9: Cybersecurity Vulnerabilities

Statement of the Risk

Exploitation of cybersecurity vulnerabilities can potentially result in loss of control or damage to BPS-related voice communications, data, monitoring, protection and control systems, or tools. Successful exploitation can damage equipment, causing loss of situational awareness and, in extreme cases, can result in degradation of reliable operations to the BPS, including loss of load.

Level of Risk

High Priority

Descriptors of the Risk

1. Cybersecurity threats result from both external and internal vulnerabilities:
 - a. Exploitation of employee and insider access.
 - b. Weak security practices of host utilities, third-party vendors, and other organizations.
 - c. Growing sophistication of bad actors, nation states, and collaboration between these groups.
2. Interdependencies from the Department of Homeland Security Critical Infrastructure Sectors⁴ (Communications, Financial Services, Oil and Natural Gas Subsector, and Water) with their own cyber vulnerabilities can impact BPS reliability.
3. Legacy architecture coupled with the increased connectivity of the grid expands the attack surface of BPS protection and control systems:
 - a. Increased automation of the BPS through control systems implementation.
 - b. Business needs accelerating the convergence of information technology (IT)/operational technology (OT).
 - c. IT/OT infrastructure management, out-of-date operating systems, and the lack of patching capability/discipline.
4. Ineffective teamwork and collaboration among the federal, provincial, state, local government, private sector and critical infrastructure owners can exacerbate cyber events.
5. A lack of staff that is knowledgeable and experienced in cybersecurity, control systems, and the IT/OT networks supporting them (historically separate organizations and skillsets), symptomatic across all industries, hinders an organization's ability to detect and prevent cyber incidents.

Recommendations for Mitigating the Risk

Near-term (1–2 year time frame):

1. Address FERC critical infrastructure protection (CIP) directives in *Revised Critical Infrastructure Protection Reliability Standards*, 154 FERC ¶ 61,037 (2016).
2. Address FERC directives in *Revised Critical Infrastructure Protection Reliability Standards*, 156 FERC ¶ 61,050 (2016) on supply chain risk management.
3. In collaboration with the Critical Infrastructure Protection Committee (CIPC) and industry stakeholders, develop a risk process to address the potential impacts of cyber security threats and vulnerabilities.

⁴ <https://www.dhs.gov/critical-infrastructure-sectors>

4. NERC should continue information sharing protocols among interdependent ISACs.
5. The E-ISAC should continue outreach to industry to increase registration and utilization of E-ISAC portal.
6. The E-ISAC should mature the cybersecurity risk information sharing program (CRISP) and encourage expanded participation.
7. NERC and the CIPC should prioritize lessons learned from regional and national exercises (*e.g.*, GridEx) and publish lessons learned and guidelines as needed.
8. Facilitate planning considerations to reduce the number/exposure of critical facilities.
9. The industry should encourage the development of a peer review process for emerging risks.
10. The industry should create and foster an internal culture of cyber awareness and safety.
11. NERC should develop effective metrics formulated to understand the trend of cyber-attacks and potential threats.

Mid-term (3–5 year time frame):

12. The ERO Enterprise should develop a feedback mechanism from CIP standards implementation to evaluate the standard and lessons learned from technology deployment.
13. The ESCC should operationalize the cyber mutual assistance framework to address issues with recovery after a cyber-attack.
 - a. Cross-industry sharing of best practice incident response plans.
 - b. Creation and/or expansion of security operations centers that incorporate the BPS (IT/OT convergence areas).
14. Assist industry efforts to address supply chain vulnerability.
15. The ERO Enterprise with industry should develop agreed-upon levels of cyber-resilience suitable for BPS planning and operations.

Long-term (greater than 5-year time frame):

16. The ERO Enterprise and industry should develop methods, models, and tools to simulate cyber impacts on system reliability, enabling BPS planning to withstand an agreed-upon level of cyber resiliency.
17. The ERO Enterprise and industry should develop industry operating guidelines that incorporate an agreed-upon level of cyber resiliency.
18. The ERO Enterprise should create and document pathways that enable the integration of new technologies while maintaining or enhancing the agreed-upon level of cyber resiliency.

2017–2020 ERO Enterprise Strategic Plan and Metrics

Action

Approve *2017–2020 ERO Enterprise Strategic Plan and Metrics*.

Background

As will be discussed during the Member Representatives Committee (MRC) meeting on November 1, 2016, the [2017–2020 ERO Enterprise Strategic Plan and Metrics](#), will be submitted to the Board of Trustees (Board) for approval at its November 2, 2016 meeting, including the ERO Enterprise Reliability Metrics (see Appendix 1).

The draft [NERC Performance Metrics](#) (currently in a separate document) will continue to be refined, taking into consideration MRC and stakeholder input from the November 1, 2016 MRC meeting. These metrics will be added to the *2017–2020 ERO Enterprise Strategic Plan and Metrics* document once approved by the Corporate Governance and Human Resources Committee.

NERC Rules of Procedure Amendment – Consolidated Hearing Process

Action

Approve the proposed revisions to Section 400 and Appendices 2 and 4C to the NERC Rules of Procedure (ROP) and direct staff to file the revised ROP with the appropriate regulatory authorities for approval.

Attachment 1 [Redline Changes to Section 400](#)

Attachment 2 [Redline Changes to Appendix 2](#)

Attachment 3 [Redline Changes to Appendix 4C](#)

Attachment 4 [Consideration of Comments](#)

Background

The current NERC ROP contemplate that hearings to resolve contested noncompliance, mitigation plans, remedial action directives, penalties, or sanctions may be held at each Regional Entity. NERC is proposing the introduction of a Consolidated Hearing Process, which would allow Regional Entities the *option* to move the hearing process to NERC. The proposed revisions are designed to streamline costs, enhance consistency, and increase efficiencies.

Summary of Proposed Consolidated Hearing Process

The proposed revisions include input from the Regional Entities. Under the proposed process, the consolidated Hearing Body will generally be composed of five members, including the Hearing Officer. To preserve a Regional perspective, up to two members may be nominated by the Regional Entity from which the case originates. The NERC Board of Trustees Compliance Committee (BOTCC) will appoint two members, chosen among NERC trustees not serving on the BOTCC at the time of the request for hearing. The goal is to have a balance between NERC and Regional Entity appointed Hearing Body members.

A Hearing Officer will be selected by the four Hearing Body members. If a Regional Entity chooses to appoint one or no representative, then the BOTCC will select additional members to fill those vacancies among NERC trustees not serving on the BOTCC at the time of the request for hearing. In the event a Regional Entity chooses not to appoint members to the Hearing Body and there are not four NERC trustees available to participate in the Hearing Body, as determined by the BOTCC, the Hearing Body may be composed of three members (three NERC trustees not serving on the BOTCC). If two stakeholder members are appointed by the Regional Entity, the stakeholders shall not represent the same industry segment.

To ensure that hearings are conducted in a full, fair and impartial manner, the ROP provisions governing ex parte communications that prevent communications directly or indirectly with any person concerning any issue in the proceeding outside of the hearing process remain applicable to Hearing Body members. Hearing Body members must also be free from any applicable

conflict of interest or the existence of any other circumstance that could interfere with the impartial performance of his or her duties.

Unless noted below, the conduct of the hearing under either the Regional Entity Hearing Process or the Consolidated Hearing Process would follow the existing rules, among others, relating to timing of activities, filings, service, participation, and evidence.

In addition, under either hearing process, the decision of the Hearing Body would be appealable as a matter of right to the NERC BOTCC. The appealed issues would be reviewed under a *de novo* standard, meaning the NERC BOTCC would act as if it were hearing the case for the first time, affording no deference to the Hearing Body's decision. In the Federal Energy Regulatory Commission's (FERC) order certifying NERC as the Electric Reliability Organization (ERO), FERC directed NERC to review appealed matters *de novo*.¹ The BOTCC would generally have one hundred and eighty (180) days to render its decision, subject to extension for good cause with written notice to all participants. The remaining ROP timing provisions related to Hearing Body decisions were also revised to allow for good cause extensions with notice to all participants.

Regional Entities will select either the existing Regional Entity Hearing Process or the proposed Consolidated Hearing Process. The selection will be in effect for each Regional Entity for a minimum of six months. Hearings will be conducted pursuant to the process in effect at the Regional Entity at the time the registered entity submits a hearing request. A Regional Entity may change its selected process by giving notice to NERC six (6) months prior to the change becoming effective.

Benefits of the Consolidated Hearing Process

The key benefits of the proposed Consolidated Hearing Process are increased efficiency and reduced cost to the ERO Enterprise. The proposed process allows the ERO Enterprise to centralize the hearing process, eliminating duplicative processes at the Regional Entity level. At the same time, the proposed process preserves a regional perspective by having up to two members on the Hearing Body nominated by the Regional Entity. Moreover, to the extent that the Regional Entities select this proposed Consolidated Hearing Process, it also provides the ERO Enterprise with increased consistency of process.

There are also additional cost savings from consolidated training sessions for potential Hearing Body members. Rather than each Regional Entity developing and implementing training on the hearing process to its board members and staff, there could be joint training sessions. This would also allow for consistent messaging regarding the hearing process.

Public Comment Period

NERC posted its proposed revisions publicly on July 26, 2016 for a comment period ending on September 9, 2016. NERC received four sets of comments from industry stakeholders. The commenters suggested a consolidated Hearing Body of either five or three members to prevent impasse. Under the proposed revisions, the Hearing Body would include up to two members

¹ "[T]he ERO should have *de novo* review authority on appeal in matters where consistency is desirable, such as the interpretation of standards, the application of penalty factors to specific facts, and whether the factual record supports a particular penalty or remedial action." *Order Certifying N. Am. Elec. Reliability Corp. as the Elec. Reliability Organization and Ordering Compliance Filing*, 116 FERC ¶ 1,062 at P 491 (2006).

appointed by the Regional Entity, two NERC Trustees, and a Hearing Officer serving as the tie-breaker. This Hearing Body composition strikes the appropriate balance of adjudicators to ensure a Regional perspective is maintained.

The commenters also raised concerns regarding removing ex parte communications restrictions. Nonetheless, under the proposed revisions, there were no changes made to the rules governing ex parte restrictions. Additionally, Hearing Body members must be free from conflicts of interest and the existence of any other circumstances that could interfere with the impartial performance of his or her duties. Finally, commenters raised concerns regarding inconsistencies in the summary of the proposed revisions and ROP redlines regarding the timing provisions. For clarification, the timing provisions were revised to require written notification of any extension for good cause, not for the timing provisions to include identical timeframes.

All of the comments received are described and addressed in Attachment 4, through the hyperlink provided above. The actual submittals are also posted on the ROP page of the NERC website. Lastly, this agenda item and accompanying materials were posted on the NERC website on October 17, 2016, at least 15 days prior to consideration of these revisions by the Board of Trustees, as contemplated in NERC's process for proposed ROP revisions.

ROP Revisions

As described below, the majority of the proposed changes to ROP Sections 403, 407, 408, 409, 412, 413, and 414 relate to consistency with terminology. The proposed revisions also describe the Regional Entity Hearing Process and Consolidated Hearing Process, in addition to explicitly inserting the standard of review related to appeals and a time frame for the BOTCC to render a decision on an appeal. The disposition of certified questions is also clarified. The proposed revisions to Section 400 are summarized below.

- Section 403.4 provides that the Regional Entity board or compliance panel reporting directly to the Regional Entity board will designate a "Hearing Body" (with appropriate recusal procedures) that will be vested with the authority for conducting all compliance hearings pursuant to the selected process under Section 403.15.
- Section 403.15 would require Regional Entities to select either the Regional Entity Hearing Process or the Consolidated Hearing Process to conduct all hearings. Section 403.15 also provides that a Regional Entity may change its selected hearing process by giving notice to NERC six (6) months prior to the modification becoming effective. Sections 403.15(A) and (B), respectively, propose the composition of the Hearing Body involved in each hearing process.
- The proposed revisions to numerous Section 400 rules remove references to the defined term "Regional Entity Hearing Body" and replace it with the defined term "Hearing Body," which is discussed further below.
- Section 409.1 sets forth that the BOTCC shall render a decision to an appeal from a final decision of a Hearing Body within one hundred and eighty (180) days, subject to an extension for good cause with written notice to all participants, following the receipt by NERC's Director of Enforcement.
- Section 409.5 provides that the BOTCC would review an appeal of a Hearing Body's decision under a *de novo* standard.

- The proposed revisions to Section 412.1 added references to the “Compliance Committee” to be consistent with existing references to the “Compliance Committee” in Section 412, among other relevant provisions, including Sections 408.8, 409.5, and 414.4.

Appendix 2 (Definitions) Revisions

The proposed modifications to Appendix 2 definitions are as follows:

- “Clerk” is revised to explicitly include NERC as a Compliance Enforcement Authority that can assign an individual to perform administrative tasks relating to the conduct of hearings as described in Attachment 2, Hearing Procedures, to Appendix 4C.
- “Confirmed Violation” is modified to delete reference to the Regional Entity Hearing Body and replace it with Hearing Body.
- “Consolidated Hearing Process” is added for clarity. Consolidated Hearing Process means the process pursuant to Section 403.15B used to conduct hearings and issue decisions concerning disputed compliance matters in accordance with Attachment 2, Hearing Procedures, of Appendix 4C.
- “Director of Enforcement” is added because the ROP references Director of Enforcement, among other instances, in Section 409 (appeals from final decisions of hearing bodies) and Section 414 (appeals of decisions of hearing bodies granting or denying motions to intervene in hearing body proceedings). Director of Enforcement means the NERC Director of Enforcement or of the Compliance Enforcement Authority, as applicable, or other individual designated by the Compliance Enforcement Authority who is responsible for the management and supervision of Enforcement Staff, or his or her designee.
- “Hearing Body” is revised to mean the body designated by the Compliance Enforcement Authority to conduct hearings and issue decisions concerning disputed compliance matters in accordance with Attachment 2, Hearing Procedures, of Appendix 4C.
- “Hearing Officer” is revised to refer to, among others, an individual employed or contracted by the Compliance Enforcement Authority or NERC to preside over hearings conducted pursuant to Attachment 2, Hearing Procedures, of Appendix 4C.

Appendix 4C (Compliance Monitoring and Enforcement Program) Revisions

The proposed revisions to Appendix 4C account for both hearing processes in the hearing procedures. Among others, the following revisions were made in Appendix 4C:

- Section 1.1.1(b) was revised to reflect both hearing processes, including clarifying that Hearing Body decisions, under either hearing process, would require a majority vote to be consistent with other provisions addressing interlocutory reviews (1.4.4(e)) and Hearing Body final orders (1.7.8(b)).
- Section 1.1.4(b) regarding the interpretation of hearing procedures was deleted because it was no longer consistent with the proposed composition of hearing bodies under both hearing processes.
- The definitions contained in Section 1.1.5 were deleted and intentionally left blank because they were duplicative of the definitions contained in Appendix 2.

- Several proposed revisions relate to modifying procedural rules to incorporate both hearing processes involving issues such as the submission of documents (1.2.3), service (1.2.4), computation of time (1.2.5), location of hearings (1.2.10), disqualification (1.4.5), ex parte communications (1.4.7(b)(4)), and documents that may be withheld by staff (1.5.7(b)).
- Section 1.3.1(h) was added to explicitly incorporate the Consolidated Hearing Process in the procedural rules governing initiation of the hearing process. Likewise, Section 1.9.1(c) was added to incorporate the Consolidated Hearing Process in the initiation of a remedial action directive hearing.
- Section 1.3.4(h) regarding the shortened hearing procedure was revised to require that the Hearing Body issue a final order within one hundred and twenty (120) days of the notice of hearing, subject to an extension for good cause with written notice to all participants.
- Section 1.4.3(7) was added to provide that if the Compliance Enforcement Authority has adopted the Consolidated Hearing Process under ROP Section 403.15B, the Hearing Officer will cast the deciding vote in the event any Hearing Body vote results in a tie.
- Section 1.5.12 adds references to the “Compliance Committee” to be consistent with ROP Section 412.1 that provides that the BOTCC considers and resolves certified questions.
- Section 1.7.8(c) governing the Hearing Body final order was revised to require that the Hearing Body issue a final order within thirty (30) days following the last to occur of the initial opinion, exceptions or replies thereto, or oral argument, subject to an extension for good cause with written notice to all participants.

E-ISAC Quarterly Update

Action

Information

Background

The Electricity Information Sharing and Analysis Center's (E-ISAC) mission is to reduce cyber and physical security risk to the Electricity Subsector across North America by providing unique insights, leadership, and coordination. The E-ISAC gathers security information, coordinates incident management, and communicates mitigation strategies with stakeholders within the Electricity Subsector, across interdependent sectors, and with government and private partners. This quarterly report covers activity during the months of July through September 2016.

Summary

During the third quarter of 2016, the E-ISAC continued to increase the amount of data collection, analysis, and reporting for cyber and physical events affecting the Electricity Subsector. Activity that the E-ISAC reported from July to September included:

- 198 E-ISAC staff posts to the portal
- 33 member responses to portal items
- 17 additional posts to the portal from members
- 42 calls to the E-ISAC hotline
- 211 new portal accounts

The E-ISAC publishes a weekly summary to the Electricity industry every Monday morning and a monthly summary report in conjunction with our monthly webinar. The webinars averaged 250 participants. The E-ISAC also publishes a daily report, as well as a quarterly CRISP report.

In July, the E-ISAC published a mid-year report for 2016. The report highlighted information shared with the E-ISAC during the first six months of the year across the physical and cyber security domains. It provided high-level trending analysis of threats to the grid as well as information on E-ISAC programs and services, exercises, and outreach.

In August, the E-ISAC published *Engaging the E-ISAC*, a lengthy document that explains how to join the E-ISAC and use our services, how the E-ISAC is organized internally, the benefits available to members, and the procedures for sharing sensitive information with the E-ISAC. It also explains how the E-ISAC is functionally separated from NERC's standards compliance and enforcement roles. The document was produced with input from the Member Executive Committee (MEC) and other stakeholders. It will be periodically updated as the E-ISAC continues to evolve.

In September, the E-ISAC published *Security Management in the North American Electricity Sub-Sector*, a joint guideline produced between NERC's Critical Infrastructure Protection Committee (CIPC), the E-ISAC's Physical Security Advisory Group (PSAG), and the Canadian Electricity Association's (CEA) Security and Infrastructure Protection Committee. The purpose of the guideline is to provide a framework for comprehensive security protection of the electricity subsector in North America. The guideline applies to owners and operators of electrical generation, transmission, and distribution facilities in North America.

Also in September the E-ISAC published *Recommendations to Oblenergoes*, a short document intended to assist the Ukraine government with its ongoing cyber security concerns. The document included a timeline of issues that arose over the past several years in the physical and energy supply areas, an assessment including a detailed list of recommendations, tactics observed that will likely be used again, and a checklist of actions that should be directly implemented by operations staff and managers as soon as possible.

The E-ISAC filled the membership engagement manager position in August and recruited a Manager of Training and Exercises as recommended by the Electricity Subsector Coordinating Council (ESCC). We are actively recruiting a new director for the Watch Operations Team. The E-ISAC has 17 employees working in the Washington, D.C. office, one in the Atlanta office, plus three additional contract support personnel.

The E-ISAC's web portal upgrade project started in the third quarter and will finish in November 2016. This project addresses priority items identified by the Member Executive Committee that will make the current site easier to use and navigate. A full transition to a new platform will begin in January 2017. In addition, preliminary efforts were initiated in the third quarter to increase our unclassified CRISP data analytical capability and to build a STIX/TAXII automated information sharing pilot system. Acquisition of hardware and software for both projects should begin in the fourth quarter.

The E-ISAC's Member Executive Committee (MEC), established in July 2015 by the ESCC, met in Colorado Springs in September. The E-ISAC also participated in face-to-face meetings at the Sandia Laboratory in Albuquerque, New Mexico in September. The E-ISAC works closely with the MEC, as well as two working groups—the Operations, Tools, and Technology Working Group, and the Member Engagement, Products, and Services Working Group—to address the ESCC's Strategic Review recommendations. At the end of the third quarter, all of the items in the MEC/E-ISAC 2016 work plan remained on track for completion by year end.

Mexico Update

Action

None

Background

In 2013 and 2014, Mexico enacted comprehensive energy reforms. The reforms strengthen and expand the authority of Mexico's energy regulator, *Comisión Reguladora de Energía* (CRE), including giving CRE explicit regulatory authority over reliability. In addition, the reforms restructure and functionally unbundle the country's power sector, replacing the vertically integrated state-owned utility, *Comisión Federal de Electricidad* (CFE) with an independent system operator (CENACE), multiple state-owned generation subsidiaries that must compete in the market with private participants, and separate transmission and distribution companies.¹

NERC and WECC have had relationships with CFE prior to the reforms, and WECC has an agreement with CFE to monitor compliance of the Balancing Authority in Baja California Norte to an agreed-upon set of Reliability Standards.² Over the past year, NERC and WECC have been in discussions with Mexican authorities to educate them on ERO program areas, Reliability Standards development and content, and cyber security.

These discussions have led Mexican authorities to request that NERC and WECC management begin outlining the terms to formalize broader engagement, including possible recognition of NERC as the North American ERO. Appropriate staff will be working with Mexico on terms of an agreement, to be brought to the NERC Board of Trustees (Board), as appropriate, at a future meeting.

Summary

NERC management will update the Board on the status of discussions with Mexico.

¹ CRE Commissioner Marcelino Madrigal presented an overview of Mexico's reforms at the February 2016 NERC Board meeting. http://www.nerc.com/gov/bot/Agenda%20highlights%20and%20Mintues%202013/NERC_Saratosa_Florida_Dr%20%20Madrigal_Final_f.pdf.

² The Mexican power system is interconnected to the U.S. power grid at various points along the Mexico-U.S. border, but currently the only high-voltage, synchronous connection between the two countries is between the Mexican state of Baja California Norte and California. The power system in Baja California is not interconnected with the power system in the rest of Mexico, but Mexico's long term transmission expansion plan includes a project to connect Baja California Norte to the main part of Mexico. Other planned projects, if realized, may increase the interconnection of Mexico to the North American bulk power system.

Operating Committee Report

Action

Information

Operating Committee's (OC) Major Accomplishments for 2016 (Year-to-date)

1. Reliability Guidelines – The OC is developing reliability guidelines addressing:
 - a. Integrating Reporting Area Control Error (ACE) with the NERC Reliability Standards –This Reliability Guideline provides recommended practices for calculating and using Reporting ACE in the Tie Line Bias Control program integrated with the NERC Reliability Standards. The OC approved posting the draft Reliability Guideline: Integrating Reporting ACE with the NERC Reliability Standards for a 45-day public comment period.
 - b. Inadvertent Interchange - This Reliability Guideline provides recommended practices for the management of Inadvertent Interchange accounting. With the goal of ensuring that, over the long term, Balancing Authority (BA) Areas do not excessively depend on the BA Areas in the Interconnection for meeting their demand or Interchange obligations. The OC approved posting the draft Reliability Guideline: Inadvertent Interchange for a 45-day public comment period.
 - c. Situational Awareness for the System Operator - This Reliability Guideline provides a global recognition of the importance for the system operator to maintain situational awareness while operating the Bulk Electric System (BES). It is meant to assist Transmission Operators (TOPs), BAs, Reliability Coordinators (RCs), Generator Operators (GOPs) and other operating entities to use as they deem appropriate with the primary goal of supporting BES reliability. The OC approved posting the draft Reliability Guideline: Situational Awareness for the System Operator for a 45-day public comment period.
 - d. Real Power Energy Storage Applications
 - e. A revision to the Reliability Guideline: Primary Frequency Control to include asynchronous generation
 - f. The OC approved Version 4.0 of the Time Monitoring Reference Document at its September 13-14 meeting. The reference document outlines responsibilities of RCs serving as time monitors in the North American Interconnections and specifies how manual Time Error Corrections (MTEC) are to be implemented. The document also outlines how to resolve issues if needed and outlines procedural responsibilities assigned to the time monitor. The process to monitor time error remains the same; however, the NERC Resources Subcommittee (RS) will determine future needs for time error corrections and whether approval from the OC is needed for any proposed changes.
2. OC Strategic Plan – At its March 2016 meeting, the OC formed a task team to review and revise its 2015-2019 Strategic Plan. The OC approved a revised strategic plan at its September 2016 meeting. The OC leadership and NERC staff continue to monitor progress.
3. OC and Subcommittee Work Plans – The OC Executive Committee and the leadership of its subcommittees met in early February to draft the 2016 Work Plans. At the September 2016

OC meeting, the OC continued to review and refine these Work Plans as well as track progress on the work plan items.

4. Essential Reliability Services Working Group (ERSWG) – The OC reviewed and accepted the ERSWG scope, the Distributed Energy Resources Task Force (DERTF) scope, and the ERSWG work plan and continues to monitor the progress of the ERSWG and DERTF.
5. Event Analysis Process – The OC approved posting a revision to the Event Analysis Process for a 45-day industry comment period.

OC's Major Initiatives for 2016

1. Essential Reliability Services Working Group and Distributed Energy Resources Task Force – The OC is providing leadership to the ERSWG and the DERTF. The DERTF expects to complete its report to the ERSWG and the OC by year end 2016. The ERSWG is studying the sufficiency of the proposed measures. The OC's RS will play a key role in the further development of the frequency response and ramping measures.
2. Resources Subcommittee – The RS will review and revise several reliability guidelines, reference documents and training guides under its purview.
3. Personnel Subcommittee (PS) – The PS has started development of Continuing Education Program Manual, Version 4.4.
4. Event Analysis Subcommittee (EAS) – The EAS will reach out to the North American Transmission Forum and the North American Generator Forum regarding the development of Lessons Learned.
5. OC Strategic Plan – The OC reviewed and revised its 2015-2019 Strategic Plan. The OC approved a revised strategic plan at its September 2016 meeting.

September 2016 Meeting Summary:

The following is a summary of the OC's September 2016 meeting, which highlights the latest activities of the OC and its associated subcommittees in support of the NERC or OC mission and corporate goals. The [September 2016 OC Meeting Minutes](#) are posted on the NERC website.

1. SOL and IROL Monitoring Tool Leads to Unnecessary Manual Load Shedding - Stephane Desbiens and Maxime Nadeau, Hydro Quebec TransEnergie (HQT) briefed the OC on an event that occurred on the HQT system when a shunt reactor at La Verendrye substation, which is connected to a high voltage transmission line, was de-energized for voltage control. When the shunt reactor was de-energized, a fault occurred in the shunt reactor breaker, which resulted in tripping of the high voltage transmission line. This sequence of events resulted in two IROL exceedances. HQT system operators implemented emergency operation control actions to restore the interface flows below the IROLs. These control actions included: 1) starting 400 MW of gas turbines, 2) curtailment of 1,000 MW of interchange transactions, 3) importing 1,000 MW of emergency energy and 4) reducing voltage in the south region.

Within 23 minutes, the interface flow was under the IROL, but still above the SOL. However, the system operator still thought he was exceeding the IROL, since he was confused from his interpretation of the operator displays. Therefore, 28 minutes after the event the system operator initiated 1,990 MW of manual load shed to restore the system within the 30 minute IROL criteria. The high voltage transmission line was restored to service 37 minutes after the event and all load was restored 35 minutes after it was shed. HQT experienced a similar event on December 4, 2014.

HQT analyzed all the EMS monitoring tools to determine if SOLs and IROLs are clearly differentiated and determined that the SOL/IROL exceedance time display was misleading and the system operators were managing emergency situations with a static control actions list in which the operator had to identify by himself the control actions to apply. As a result of this analysis, HQT upgraded the timer display to make it more ergonomic and make sure the IROLs and SOLs are more clearly differentiated and created a new tool for system operators that would help them quickly select the required control actions according to the type of exceedance. Mr. Nadeau provided an overview of the revised system operator displays and the new limit exceedance management tool.

In summary, lessons learned from this event include:

- Adequately differentiate the SOL and IROL limits in the EMS displays and the control room timer display for SOL/IROL exceedances.
 - Improve system operator simulation type training to add more stressful conditions in order to enhance their situational awareness and response during emergency operations.
 - Review on a regular basis the system operator's understanding of the SOL and IROL limits and the emergency operation control actions permitted.
2. Joint Planning and Operating Committee Meeting - James Merlo, NERC Staff, reported that NERC is planning on conducting a joint session of the Planning and Operating Committees during their December 2016 meetings. Current plans are to hold this joint session from 10:00 a.m. to 12:00 p.m. on December 13, 2016. The joint session will allow the committees to discuss agenda items of mutual interest to both committees, for example the ERSWG report, the DERTF report, and the schedule for the State of Reliability report.

Operating Reliability Subcommittee (ORS) – The ORS approved the NPCC Regional Reliability Plan and the Reliability Plan for the SERC Southeastern Subregion Reliability Coordinator. At the June 2016 OC meeting OC Chair Jim Case tasked the ORS with conducting a further review of the need for reliability plans in light of the new requirements stated in IRO-014 and to report its recommendation to the OC at its September 2016 meeting. The subcommittee had an extensive discussion related to the continued development of reliability plans and passed two motions which support their continued development.

Motion 1: The ORS recommends to the OC that the Reliability Coordinators continue to develop and maintain Reliability Plans. The ORS recommends that the current NERC "Guideline for Approving Regional and Reliability Coordinator Reliability Plans" be updated by the ORS to reflect the ORS expectations around Reliability Plans, such as removing RROs from the process, retaining ORS endorsement of Reliability Plan changes, removing the periodic review requirement, and including criteria for what plan changes need to be brought to the ORS. The ORS agrees that reliability plans could include multiple RCs, if preferred.

Motion 2: The ORS recommends to the OC that the OC recommend to NERC that the NERC Certification process be enhanced to ensure adequate transparency (including OC endorsement of significant changes) and oversight of significant changes that could impact reliability on external systems. The formal mechanism for neighboring entities to raise issues of significant impacts due to changes in RC/BA footprints or other substantive changes in RC/BA areas will be removed with the new NERC IRO standards. The standard requirement being retired enabled the OC to withhold approval if neighboring system impacts were not properly addressed. The ORS recommends that the NERC certification process evaluate broader impacts of such changes to the BES earlier in the process to allow for time for entities

to coordinate and resolve potential issues that may require special operating procedures be developed or facilities upgraded. NERC could delay or withhold certification if credible neighboring entity concerns are not addressed.

The OC accepted ORS Motion 1 as recorded above and decided to table ORS Motion 2 pending further discussion internally to NERC. The OC expects a report back from NERC Staff at its December 2016 meeting.

3. Events Analysis Subcommittee (EAS) – EAS Chair Hassan Hamdar reviewed proposed changes to the Event Analysis Process and reviewed a Justification for the Event Category 1g and 3a Changes for ERCOT. The OC approved the revised Event Analysis Process for a 45-day public posting.
4. Frequency Response Initiative – RS Chair Troy Blalock noted that frequency response is essential to the reliability of the Interconnections, is essential for system restoration, and is essential for compliance with the BAL Reliability Standards. For these reasons, the RS developed the Reliability Guideline: Primary Frequency Control. Chair Blalock suggested that every BES Generator, with some exceptions (e.g. nuclear), should have a working governor and be set in accordance with the Frequency Response Guideline for system reliability and system restoration and provide primary frequency response between Pmin and Pmax.

The next step in the frequency response initiative is to conduct periodic generator surveys based on selected events over multiple years to measure generator individual performance in the Western, Eastern and Quebec Interconnections. The survey would be voluntary. Webinars would be conducted in advance of the surveys to advise generator operators of the survey requirements. Chair Blalock reported that the North American Generator Forum supports this activity. The OC approved conducting a multiyear, voluntary generator survey, based on no more than several real-time events per year, in the Eastern, Western and Quebec Interconnections, to measure individual generator performance. James Merlo reported that the OC needs to communicate to industry what is expected to be accomplished by this survey.

OC Strategic Plan and Charter Revisions - Jerry Rust provided a summary of proposed revisions to the OC's strategic plan and charter. Topics addressed in Mr. Rust's presentation included: 1) OC Charter, 2) OC Strategic Plan and Goals, 3) Tracking change form documentation and 4) Use of the terms endorse, accept and approve. With regard to the use of terms, the task team recommends no action on the establishment of definitions for the use of certain terms. The task team noted that in many instances it would be unwieldy to prepare a tracked change document for presentation to the OC. Therefore, the decision as to whether to develop a tracked change document will, for the most part, be left to the document development team.

Mr. Rust reviewed suggested revisions to the OC strategic plan and goals. The team recommended revisions to Goals 1 through 4 and the addition of Goal 5. The OC approved the 2016-2020 OC Strategic Plan.

Mr. Rust reviewed proposed revisions to the OC Charter and suggested that the OC further consider the proposed revisions at its December 2016 meeting. Patricia Poli asked if NERC could review the current definition of the State Government sector. James Merlo will review the definition with NERC Legal.

5. Time Monitoring Reference Document, Version 4 – RS Chair Blalock, provided an overview of proposed revisions to the Time Monitoring Reference Document. He also provided a brief summary of the comments received during the 45-day public posting of the reference

document. One issue that was raised by commenters was the use of the “schedule offset methodology.” The team that reviewed the comments decided to keep this methodology in the reference document. Chair Blalock reported that the RS recommends OC approval of the revised reference document. Following a brief discussion, which focused primarily on the use of the schedule offset methodology, the OC approved Version 4 of the Time Monitoring Reference Document. Robert Blohm presented a methodology developed with Howard Illian as to why the schedule offset method of manual time error corrections contravenes Balancing Authority ACE Limit (BAAL) and CPS. During his presentation, Mr. Blohm stated that schedule offset removes the BAAL from where it belongs and imposes a BAAL where it doesn’t belong. In response, some OC members noted that the Reliability Standards are very clear on the calculation of BAAL and CPS. Use of schedule offset or frequency offset is immaterial. In addition, it was noted that some BAs use the schedule offset methodology.

6. Final Status Update on the BAL-001-2 Field Trial - Glenn Stephens, chair of the BAL-001-2 Standard Drafting Team, reported that the BAL-001-2 field trial started in the Eastern Interconnection in July 2005. This was followed by ERCOT in December 2009, Quebec in September 2010 and by BAs in the Western Interconnection in March 2010. Mr. Stephens discussed the shortfalls of CPS2 metric that led to the development of the BAAL metric. Some of the conclusions drawn from the field trial were 1) BAAL requirement focuses on frequency control for the Interconnection, the correlation between CPS1 and BAAL always drives corrective actions to support frequency, and 3) the standard drafting team has not been able to establish any direct correlation between BAAL and any adverse impacts on frequency error.

Planning Committee Report

Action Information

The Planning Committee (PC) has updated its report to the Board of Trustees (Board) to present pertinent information, not only on its recent achievements, but also to give you a glimpse of what the PC will be addressing prior to the next Board meeting. We feel that this update will provide a clear understanding of what our future planning needs and assessments will be in the next three months.

Upcoming Activities and Board Approvals for late 2016 and early 2017

- **2016 Long-Term Reliability Assessment (2016 LTRA)**

Conference Call for Report Approval Scheduled for December 14, 2016

The PC Reliability Assessment Subcommittee and NERC staff are continuing efforts to develop the 2016 LTRA. In accordance with NERC's Strategic Plan, the report will include the following enhancements: data and analysis related to essential reliability services; operational and planning applications of PMU devices; summarized probabilistic assessment metrics; and improved data validation, including alignment between individual unit data and interconnection planning cases.

- **Essential Reliability Services (ERS) Sufficiency Guidelines White Paper**

Will be provided to the Board Information-Only in early 2017

The ERSWG will be identifying, evaluating and developing "Sufficiency Guidelines" for each quantifiable ERS measure. The methodology to develop these sufficiency guidelines will be explained in a white paper that will be presented to the PC for approval in December 2016 and subsequently presented to the Board as information-only.

- **Distributed Energy Resources Report**

Approval Scheduled for early 2017

This report will examine potential reliability implications of increasing DERs on the on the bulk power system (BPS). It will also explore existing policies oriented toward supporting the reliable integration of DERs and will further examine the interplay with other Essential Reliability Services.

- **NERC Special Assessment: Single Point of Disruption**

No Board Approval Needed

NERC requested PC volunteers to join a steering committee for the development of the next special assessment on single points of disruption related to natural gas-fired resources. The report will be developed and presented to the PC in March 2017, with the final report to the Board in May 2017.

- **Two Reliability Guidelines Approved for Posting**

No Board Approval Needed

The committee approved the posting of two Reliability Guidelines: **Modeling Distributed Energy Resources in Dynamic Load Models** and **PMU Placement and Installation**. Interested stakeholders can provide feedback using the comment forms provided with the announcement, during the ongoing 45-day comment period. The PC expects to finalize these guidelines in late 2016.

- **PC Input on NERC's Functional Model**

No Board Approval Needed

The committee continues to provide technical input on the planning aspects of the Functional Model Advisory Group (FMAG). Input is expected to conclude in December, as enhancements to the Functional Model (FM) are made to provide additional clarity and alignment.

- **2016-17 Winter Reliability Assessment (WRA)**

No Board Approval Needed

The PC will hold an approval vote of the *2016-17 Winter Reliability Assessment* via an email in late October. The draft report notes that all assessment areas project adequate reserve margins for the upcoming winter. The report continues the use of a format that emphasizes key resource adequacy and reliability findings that allow stakeholders to more effectively understand potential reliability risks to the BPS.

- **SAMS White Paper on FERC Order 786**

No Board Approval Needed

The NERC Project 2015-10 TPL Single Points of Failure Standards Authorization Request (SAR) Drafting Team (DT) requested the NERC Planning Committee (PC) to provide technical input regarding FERC directives in Order No. 786. The NERC System Analysis and Modeling Subcommittee (SAMS) was directed by the PC to provide a technical analysis of the two FERC directives (¶140 & ¶189 in Order No. 786). The analysis was compiled in a white paper that included discussions for Standard Drafting Team (SDT) consideration regarding relevant changes to TPL-001-4 (specifically to address the FERC directives). Results of this white paper were summarized during the September PC meeting, with a request by the PC Chair for a 30-day review period for PC members to provide feedback. There will be no PC approval of this deliverable; SAMS will further review feedback before sending the white paper to the SDT.

Recently Completed

- **PC Charter Revision**

The PC prepared updates to the PC Charter to provide involved stakeholders with more clarity on committee processes, timelines, and structure.

- **Probabilistic Assessment Guideline Document**

The PC approved the release of the *Probabilistic Assessment Guideline Document* that provided recommendations for consistency when conducting core probabilistic assessments.

- **Final Reliability Guideline Approved**

The committee approved a final Reliability Guideline: [Power Plant Model Verification Using Phasor Measurement Units \(PMUs\)](#). The purpose is to raise industry awareness and utilization of dynamic disturbance recorders (DDR) such as Phasor Measurement Units (PMUs) and synchrophasor data for dynamic model verification of power plant models.

- **Discontinuance of NERC Spare Equipment Database and SEWG Disbandment**

With the new spare equipment efforts forthcoming, the PC approved the disbandment of the SEWG, as NERC discontinues its Spare Equipment Database. NERC Staff will continue to monitor all efforts and will advocate for changes based upon those other advancement efforts. Drivers behind these developments includes ongoing efforts outside of NERC. The SED data will be discontinued and shifted in the appropriate manner to other organizations, such as the Edison Electric Institute's Spare Transformer Equipment Program, Grid Assurance, SpareConnect and a program funded by the Department of Energy.

- **System Analysis and Modeling Subcommittee (SAMS) Restructuring**

The PC approved the restructuring of SAMS to include the Modeling Working Group (MWG). This will allow for more efficient and effective operation of their respective objectives.

Future Meetings

- December 13-14, 2016 – Atlanta, GA

Critical Infrastructure Protection Committee Report

Action

Information

Summary

1. On September 20, 2016, Critical Infrastructure Protection Committee (CIPC) members were given a tour of Sandia National Laboratories (“Sandia”), New Mexico. During the tour, CIPC members had the opportunity to see work in progress at the physical security and robotics lab, the electromagnetic pulse lab, and receive additional presentations on cyber security, resiliency, and physical security modeling. Many areas presented during the tour were directly relevant to the work CIPC is currently doing in industry, particularly as we work to mitigate the new and expanding threats associated with unmanned aerial systems and electromagnetic pulse.
2. The September 2016 CIPC meeting featured an opening address to the group from Mr. Mike Mertz, Director of NERC Reliability Governance and Operations Technology for PNM Resources (PNM). Mr. Mertz welcomed the committee to Albuquerque, New Mexico and gave a brief overview of his company and the technology challenges that PNM and industry faces when implementing cyber-security on the Bulk Electric System (BES). He discussed PNM’s views on security, how they extend well beyond the baseline provided in the CIP standards, and requires PNM to be mindful of emerging threats and lessons learned from the Ukraine security event.
 - a. Mr. Marc Sachs, NERC Senior Vice President and Chief Security Officer provided a review of recent Electricity-Information Sharing and Analysis Center (E-ISAC) activities. Mr. Sachs introduced Ms. Beth Gannet of the E-ISAC, who will be the new Membership Manager assigned to encourage industry participation to the E-ISAC. Roughly, 40 percent of industry is not accessing the E-ISAC portal information and Mr. Sachs is encouraging smaller entities to sign up. Two additional staff announcements were made; Mr. Carl Herron recently joined the E-ISAC to lead physical security E-ISAC coordination and Mr. Ben Miller announced his resignation in May 2016. The E-ISAC published a new advisory on ransomware. Mr. Sachs announced that the Member Executive Committee approved the 2017 E-ISAC Work Plan. A request was made by the CIPC Chair to provide E-ISAC cybersecurity automation training to the CIPC or a CIPC sub-team.
 - b. Mr. Joseph Januszewski, Senior Watch Officer of the NERC E-ISAC provided an update on cybersecurity. The update included an overview of cyber-security related incidents reported across all industries. Over half of reported incidents were related to phishing and common office and email related threats. Mr. Januszewski stated by looking at other industry verticals, the E-ISAC can anticipate when issues would impact the electric sector.

- c. Ms. Charlotte de Sibert, Principal Physical Security Analyst of the NERC E-ISAC provided an update on physical security. Ms. de Sibert stated that the E-ISAC is in place to “connect the dots” regarding security events in which she proceeded to provide an overview of security techniques: deter, detect, delay, minimize, respond, and preserve.
- d. Mr. Bill Lawrence of NERC’s E-ISAC provided a briefing on the development activities for the 2016 GridSecCon and 2017 GridEx. Mr. Lawrence discussed that the planning for the October 2017 GridEx should be completed with additional advanced timing to allow industry to better prepare local planning and coordination activities. GridSecCon will take place October 17-24, 2016 in Quebec, Canada.
- e. Mr. Marc Child, CIPC Chair representing Great River Energy, discussed the development of the CIPC’s strategic plan. The plan would be developed in alignment with NERC’s strategic plan. He reminded the CIPC that the plan is updated periodically and that the executive committee would meet directly after the CIPC meetings to begin updating the plan. As part of the meeting, the CIPC tasks, deliverables, and committees would be critically evaluated. In addition, the CIP standard drafting team is working to address the following topics: Transient Devices, Control Center Protection of Communication Networks, Definitions and Concepts, Transmission Owner Control Centers, Virtualization, and CIP Exceptional Circumstances. In closing, Mr. Dave Revill, CIPC Vice-Chair, representing Georgia Transmission, reported that the Supply Chain drafting team has been finalized and will be convening soon to begin developments on that standard.
- f. Mr. Revill shared an update with the CIPC regarding the CIP Standards. The CIP drafting team is addressing eight areas of issue, three of which are responses to the Federal Energy Regulatory Commission (FERC) directives. The first language proposal balloted for Low Impact External Routable Connectivity, did not receive industry approval. The standard drafting team is working to respond to industry feedback of making the language more effective.
- g. For the legislative update, Mr. Nathan Mitchell of American Public Power Association and Vice Chair of the CIPC provided an update. The FAST Act 2015 has passed legislation and is in the implementation phase. The act enables the Secretary of Energy the authority to address grid security issues. Secondly, the Cyber Information Sharing Act was discussed, which enables the U.S. Department of Homeland Security (DHS) to be responsible for sharing Cyber Threat Indicators and Defensive Measures by the Federal Government. Mr. Mitchell stated that the CIPC will push for the E-ISAC to be the lead for the electric sector. Mr. Mitchell discussed the North American Energy Security and Infrastructure Act of 2016 bill, which has been approved by the Senate and House. The bill (S.2012) is currently in conference to allow the legislature to refine the bill for the President to sign. Highlights of Secretary Moniz’ testimony was provided to describe the Department of Energy’s role in establishing energy security. Several points were made in the testimony, but included comments regarding rapidly changing technology, hardening infrastructure to withstand natural events, and collaboration with key federal agencies.
- h. Mr. Mitchell also provided an update on the Reliability Issues Steering Committee (RISC). He stated that the role of the RISC is to identify issues that could potentially degrade reliability. The RISC report will be used by the NERC Board of Trustees to support Strategic Planning. Three RISC topics were identified as high or medium priorities that may impact CIPC planning: cyber- security vulnerabilities, loss of situational awareness, and physical security vulnerabilities.

- i. The Electric Subsector Coordinating Council (ESCC) update was provided by Ms. Melanie Seader. She provided an update from the September 9, 2016 ESCC meeting and the Cyber Mutual Assistance Program. The ESCC met with Sandia to focus on research and development opportunities to align the needs with industry and government with regard to the electric sector as part of an innovation roadmap. The Cyber Mutual Assistance Program coordinators have been identified to make decisions in the event of a grid emergency.
- j. Mr. Tobias Whitney presented a proposed approach for NERC and industry to collaborate on risk assessments of emerging technologies to spotlight effective implementation of innovative solutions. This is intended to counter the perception of NERC CIP Standards inhibiting industry's willingness or ability to adopt certain new technologies, such as GOOSE messaging, virtualization, and cloud computing. The proposed approach involves holding a technology seminar, including vendors, to discuss the technology and explore a particular issue, then work with a CIPC working group to write a white paper to capture the current understanding of the challenges and opportunities. In addition, Mr. Whitney provided an update on data regarding the compliance trends on initial implementation of CIP Version 5.
- k. As part of the other agency updates, the following individuals provided updates: Mr. Dave Norton from FERC; Mr. Jim McGlone from Department of Energy; and Mr. Ben Mayo from the U.S. Department of Homeland Security. Mr. Norton addressed CIPC member questions about the FERC-led audits of the CIP standards. Mr. McGlone provided an update on the U.S. Department of Energy activities, which included a project to collaborate with DHS to evaluate the infrastructure of the future and to provide a yearly brief in Atlanta. Lastly, Mr. Mayo mentioned that the National Infrastructure Response Plan, due to the president on December 22, 2016, will be posted for public comment in October 2016. He also added discussion points with regard to the plan to regionalize DHS by leveraging the ten Federal Emergency Management Agency regions to better respond to regional issues.

Future Meetings

The next CIPC meeting will take place on December 13-14, 2016, in Atlanta, GA.

Personnel Certification Governance Committee Report

Action

Information

Background

This report summarizes the key activities of the Personnel Certification Governance Committee (PCGC) during 2016. The PCGC meets four times per year. Standing Task Force meetings via conference call and/or ReadyTalk are held as needed between meetings. The second quarter 2016 meeting minutes are under review and pending approval. Draft minutes were posted to the NERC website during the third quarter of 2016.

System Operator Certification Exam Development

The next set of exams are scheduled to use the Linear on the Fly Testing (LOFT) process. LOFT will reduce the exam development cycle and increase the integrity of exams. The ability to implement LOFT is dependent upon the number of items (exam questions) in the Item Bank. The items in the Item Bank have been locked for the next publication of exams. The entire Item Bank has been translated into French Canadian for the candidates in Quebec, Canada. The Exam Working Group (EWG) will continue to write new items for the Item Bank. The PCGC will seek new item input from industry via an Item Writing Workshop (IWW) during fourth quarter of 2016.

Exam Development Activities Scheduled for 2016

Assemble Item Pool for Content Outlines/New Cut Scores - Completed	Aug 2016
Item Writing Workshop	Nov 2016
Assembly of Exams to Vet LOFT	Oct-Dec 2016
Vetting of LOFT	2016-2017

Strategic Planning

The PCGC will kick off its Strategic Planning Initiative with an extra meeting day during the fourth quarter November meeting. The System Operator Certification Program has been in existence since 1998 as it has evolved into a solid certification program through continuous improvement. It is now time to take a step back and look at what is functioning well and what needs improvement so the program can continue to be well served. The PCGC will focus on strengthening the current program through a set of directions and priorities aligned with the goals of the System Operator Certification Program.

Accomplishments for 2016

- Categorization of Exam Items in Item Bank
- Completed Program Manual Review and Update
- Completed PCGC Charter Review and Update
- Review and Updated Appendix A (Based on Job Task Analysis results)

- French Translation of Item Bank
- Item Writing Workshop

Future Tasks

- Test center options for Canadian provinces
- Review Exam Development Process
- Implement LOFT

Standards Committee Report

Action

Information

Background

This report highlights some of the key activities of the Standards Committee (SC) during the third quarter of 2016.

2017-2019 Reliability Standards Development Plan

The 2017–2019 Reliability Standards Development Plan (RSDP) recognizes the diligent work of the last few years to bring the body of NERC Reliability Standards to the initial stage of steady state while transitioning to focusing on Enhanced Periodic Reviews (EPRs), FERC directives, emerging risks, Standard Authorization Requests, and the standards grading initiative. The 2017-2019 RSDP contemplates that the work of the Integration of Variable Generation Task Force and Essential Reliability Services Working Group may result in one or more Standard Authorization Requests and subsequent standards projects.

As with the 2016-2018 RSDP, Enhanced Periodic Reviews will occur at a measured pace, compared to the level of activity and pace of standards development during the past three years, and they will be aligned with strategic considerations of reviewing standard families that are interrelated. The addition of the standards grading metric, which uses an enhanced version of the template developed by the Independent Experts Review Panel (IERP), will inform the EPRs as to the quality and content of the standards.

The 2017-2019 RSDP also includes plans for completing the EPRs initiated in 2016, and for commencing additional EPRs in 2017.

While most of the work in the next three years will focus on EPRs, there may be new or emerging risks identified that would generate new standards development projects.¹ NERC and the SC will continue to seek input and recommendations from the RISC with regard to emerging or potential risks to reliability that may require revisions to existing standards or new standards development.

¹ For example, in response to FERC's 2016 order on cybersecurity supply chain risk management, the SC has initiated a project to ensure standards development may be completed within the twelve month filing deadline specified by the order. A drafting team was seated on September 14, 2016, and they have already begun work to support an initial framework, planning for a November 2016 technical conference, and targeting an initial posting of the draft Reliability Standard in January 2017.

Reliability Issues Steering Committee Report

Action

Information

Background

The risk profiles drafted by the Reliability Issues Steering Committee (RISC) were presented for policy input in June, and this input was taken into consideration in the development of the final report being presented to the Board of Trustees (Board) for acceptance on November 2, 2016.

The RISC will be soliciting nominations to the committee in December. Currently four (4) positions are set to expire in January 2017. The recommended nominees will be presented to the Board for approval in February 2017.

Finally, the 2017 Leadership Summit has been scheduled for March 21, 2017 in Washington, DC.

The Chair of the RISC will provide an update on committee activities.

Compliance and Certification Committee

Action

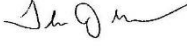
Information

Highlights

- The ERO Monitoring Subcommittee (EROMS) continues to review and analyze the responses to the questions in the ERO Enterprise Effectiveness Survey associated with CCC areas of responsibility with NERC Management and TalentQuest. The evaluation of the results and proposed report will be presented at the November CCC meeting for endorsement. It is anticipated the results will be transmitted to the NERC Board of Trustees (Board) Enterprise-wide Risk Committee (EWRC) in February 2017.
- The Organization Registration and Certification Subcommittee (ORCS) leadership developed the initial CCC comments for committee consideration on the recently posted NERC Functional Model proposed revisions. The comments were endorsed by the CCC and submitted by the CCC Chair on behalf of the CCC. The ORCS is working with NERC staff to determine specific areas for support of the Organization Registration and Certification Program.
- The Compliance Processes and Procedures Subcommittee (CPPS) approved the revised Criteria for Annual Regional Entity Program Evaluation (CCCPP-010-4). This procedure continues to build on the growing maturity of the Risk-Based Compliance Monitoring and Enforcement Program and improvements achieved by ERO Enterprise staff. The CCC appreciates the collaboration with NERC and Regional Entity Management in the development of this revision. The revised procedure was approved by the CCC and was transmitted to the EWRC for endorsement at the October meeting. In addition, CPPS continues to support NERC in providing compliance experts to review Reliability Standards Audit Worksheets and conduct Quality Reviews of various items as requested by NERC.
- In response to NERC's request in Q4, 2015 for input on the Standard Development Quality Review program, CPPS provided NERC Standards Development personnel with a Criteria document to assist NERC in considering how to take compliance monitoring-oriented concerns into account during Standard drafting.
- CCC member observers reviewed and provided input to the NERC/CCC Independent Auditor during development of the final audit report for the audit conducted of the NERC Compliance Monitoring and Enforcement Program and the NERC Organization Registration and Certification Programs. NERC is reviewing the draft audit report. It will be transmitted to the EWRC upon approval by the CCC observer team.
- The CCC continues its efforts to complete 2016 Work Plan deliverables and collaborative development of the 2017 Work Plan with NERC. The 2017 Work Plan will be reviewed for approval by the CCC at the November meeting and delivered for approval to the EWRC at the February 2017 meetings.

- As requested by the Board, the CCC continues working with the ERO to determine if the CCC can provide recommendations for improvements to ERO processes for oversight of Regional Entities. NERC and the CCC are considering additional tools or changes to existing monitoring tools to address concerns voiced by stakeholders of inconsistencies in the implementation of the risk-based CMEP and the associated sections of the Rules of Procedure.
- At the November 2016 meeting, the CCC will begin discussions and planning for the 2017 audit of NERC's adherence to Section 300 of the Rules of Procedure related to the Reliability Standards Development Process. In addition, NERC Enforcement staff will conduct hearing training for the CCC members.
- The CCC and its associated subcommittees held meetings at the SPP offices in Little Rock, AR on September 14-15, 2016. The next CCC meeting will be November 29-30, 2016, hosted by NRECA in Arlington, VA.

TO: NERC Board of Trustees (BOT)

FROM: Thomas J. Galloway, NATF President and CEO 

SUBJECT: NATF Periodic Update to the NERC BOT – November 2016

Attachments: 1. Selected Program Highlights (Peer Reviews, Practices, Training)

The North American Transmission Forum (NATF) mission is to promote excellence in the reliable operation of the electric transmission system, with the vision to see reliability continuously improve. To augment our strategic goals, the NATF has focused on several topics that serve as the base for trilateral collaboration between the NATF, EPRI, and INPO. The 2016 focus areas are:

1. Resiliency (All hazards, including severe weather, cyber/physical security, and GMD/EMP)
2. Human Performance (reduced frequency and consequences of human error)
3. Equipment Performance and Asset Management
4. Operating Experience Exchange – cause analyses, corrective action, and lessons learned
5. Continuous performance improvement mechanisms / processes including risk reduction

Some of the specific activities associated with the above are summarized as follows:

- Member coordination NERC Alert 2 – High Bandwidth Distributed Denial of Service Attacks
- **Vegetation Management workshop – focus on vegetation contacts including causes / actions**
- Stratification of member performance regarding key equipment failure rates
- Misoperation reductions via detailed analyses, measures, training, and superior practices
- Comprehensive risk assessment practices document and self-assessment tools
- Switchyard reliability assistance on-site visits and self-assessment tools
- Training for risk assessment and controls, human error reduction, and fundamentals
- **Operations practices / tools for loss of system visibility (traditional & non-traditional events)**
- **Resiliency Summit (Jan 10-11, 2017) focused on recovery/restoration**
- Member assistance to support comprehensive event review and corrective action
- Human performance “road-map” / supporting documents to advance maturity levels
- Joint NATF/NERC Human Performance Summit – March 2017

The NATF shares many common objectives with NERC. To advance these common objectives, and avoid redundant or conflicting efforts, we have undertaken periodic coordination meetings between the senior leadership of both organizations. The next such session is scheduled for October 25, 2016, with expected agenda topics including:

1. NERC sharing of select entity data / information (with authorization) to NATF staff
 - NATF to provide updated list of authorizing members
 - Review content / sharing protocols
2. Equipment issues for prospective coordination (based on risk identification)
3. Protection System misoperation reduction
 - Adoption of common metrics to promote alignment
 - Specific NERC concerns for added NATF focus
4. 2017 Joint Human Performance Conference
 - March 2017 Atlanta
 - Alignment on structure, themes, logistics details, and respective accountabilities
5. Resiliency / security
 - Status strategic transformer reserve, EMP / IEMI
 - Recovery / restoration including:
 - NATF summit 1/10-11/17
 - NERC / FERC PRASE effort
 - NATF "Spare Tire" Operations (during non-traditional events)
6. NERC Alert – cyber vulnerabilities
7. Vegetation management – events, causes, corrective actions

Also, given the extremely complex and dynamic nature of the industry currently, the NATF has decided to make certain, specific work products available beyond the membership. Two noteworthy areas involve recent NATF work on both physical security and modeling.

NATF member subject matter experts (SMEs) have produced high-quality work products on both of these topics. And, with NATF Board concurrence, we have decided to make selected documents public – to the benefit of the entire industry. Such documents are available via www.natf.net and are listed below.

- **NATF TPL-001-4 and Transient Voltage Criteria reference documents**
- NATF Modeling Data Request Guide (MOD-032)
- NATF Reference Documents – CIP-014 R1, R4, and R5
- NATF Reference Document – Generator Specifications
- NATF Reference Document – Power Flow Modeling
- NATF Reference Document – Reporting and Verification of Generating Unit Reactive Power Capability for Synchronous Machines

We plan to make other selected NATF work-products available outside the membership on a case by case basis.

cc:

ERO: G. Cauley, M. Lauby, J. Merlo, A. Koch, K. McIntyre, C. Edge, T. Buzzard

NATF: R. Carter, K. Keels, C. Sills, Letter Log

Attachment 1: Selected Program Highlights Practices

Practices/Products Developed in 2016

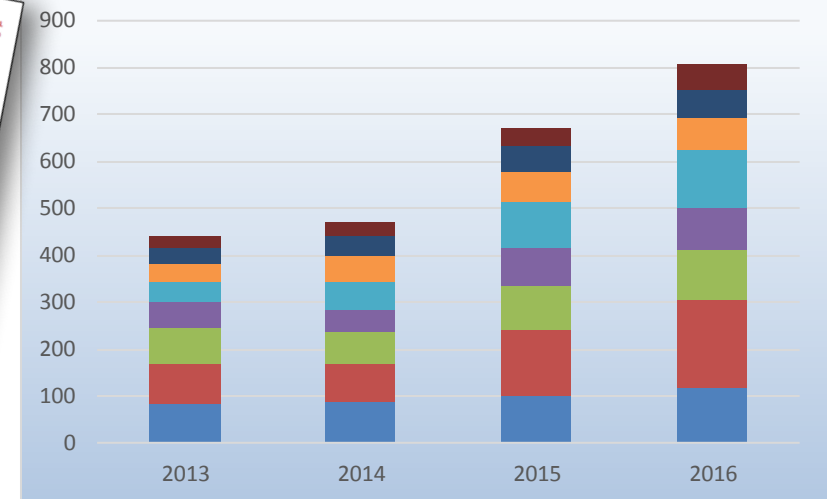
- TPL 001-4 Reference Document*
- Transient Voltage Criteria Reference Document*
- Next Terminal Out Assessment Guide
- Nuclear Plant Interface Requirements Training
- Concept of Operations for Central Security Control Center
- Protection Systems - Automated Testing
- Short Circuit Modeling
- Risk Assessment
- Job Task Analysis Practice
- Instructor Curriculum
- Simulator Training
- HP Roadmap

Practices/Products in progress

- DC Trip Circuit Design & Testing
- Arrestor Testing
- Switchyard Risk Evaluation and Mitigation
- Alarm Process Monitor
- Real-Time Data Quality Management
- Vegetation Management Contractor Workforce
- Vegetation Management Easements
- System Protection Coordination
- Protection System Maintenance and Testing
- Situational Awareness
- Power Line Carrier
- Outage Coordination
- SF6 Breaker Power Factor Testing
- Systematic Approach to Training
- System Protection Commissioning

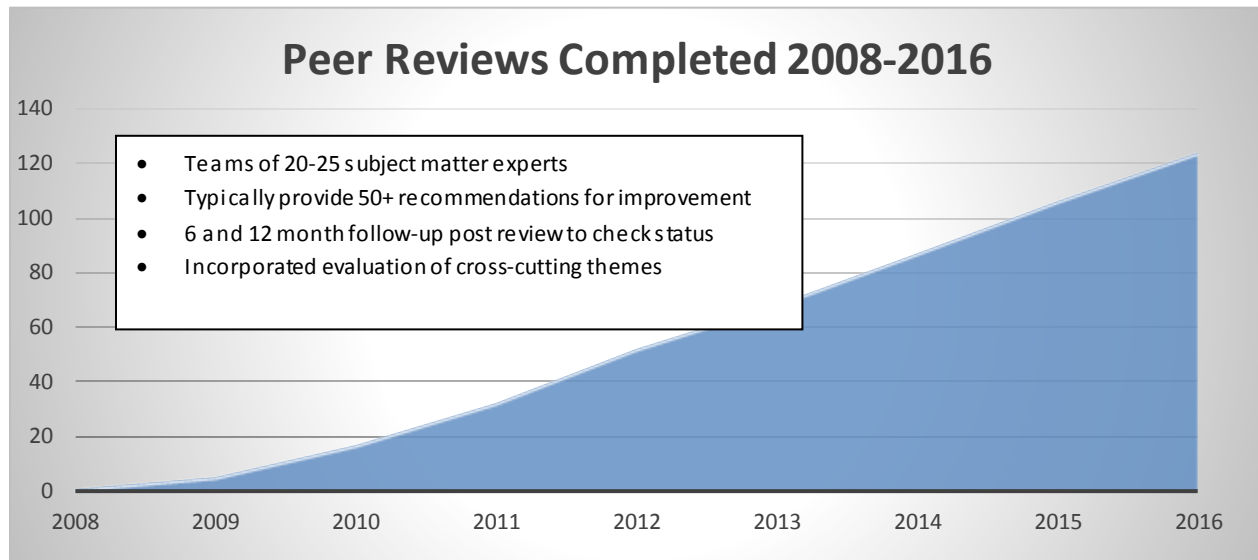


Practice Group Monthly Calls
Average Number of Participants: 2013 - 16



***Open Distribution (public) documents posted to
www.natf.net**

Peer Reviews



Training

Risk Assessment/Internal Controls Webinars

- Internal Control Framework and Governance
- Risk Assessment
- Internal Control Design and Implementation
- Monitoring and Testing of Internal Controls

System Protection Webinars

- Directional Element Settings Practices
- Directional Comparison Blocking Settings Practices

Training Modules

- Electrical Transmission Basics
- *Math Review, Impedance, Power Principles and Phase Angle, Transformer Theory, Power Flow on AC Transmission Lines, Generator Theory*
- System Loads, Transmission Facilities, Generation Unit Basics, Relay Applications
- Causal Analysis

Future

- Human performance error reduction "Roadmap"
- System protection basics

North American Generator Forum

TO: NERC Board of Trustees
Gerry Cauley, NERC President and CEO

FROM: Allen D. Schriver
Chief Operating Officer, North American Generator Forum (NAGF)

DATE: October 18, 2016

SUBJECT: NAGF 2016 Fall Report

The NAGF would like to thank NERC and Gerry Cauley for providing meeting space at the NERC Atlanta Office for the NAGF to hold its Board meeting followed by the NAGF Annual Meeting on October 4 -6, 2016. The meeting began with guest speaker David Ortiz, FERC Deputy Director of the Office of Electric Reliability who discussed current reliability concerns.

The following is a list of topics and presenters.

FERC Keynote Speaker - David Ortiz, FERC Deputy Director of the Office of Electric Reliability
IRA, ICE & Everything Nice – Dueling Perspectives - Andrew Gallo, Austin Energy and Brent Read, Texas Reliability Entity
Power Plant Modeling: DDRs and PMUs for PRC-026/-027, PRC-002, BAL-003 – Ryan Quint, NERC
Upcoming Standards Impact on Generation - Steven Noess, NERC
PRC-005-6 – Sudden Pressure Relays - Ted Risher, The Energy Group / Live Wire
Voltage Ride Through and Reactive Capability – Eddy Lim, FERC
Regulatory Expectations During Audits – Earl Shockley, GridSME
CIP Low Impact Implementation – WECC Pilot Study – Angie McCarroll and Khang Vodinh, Southwest Generation
PRC-005: Battery Testing – Tom Carpenter, TVA
Primary Frequency Response – Bob Cummings, NERC
Supply Chain Risk Management - Mark Olson, NERC
Event Analysis NEI-NITF Whitepaper for LOOP Reporting – Allison MacKellar, Exelon Generation
PMU, MOD-026, and MOD-027 – Dennis Kane, WE Energies
Standard Drafting Team Panel (693 Standard Projects) – Howard Gugel, NERC and Various Standard Developers
Standards: future vision and Cost Effectiveness Pilot – Howard Gugel, NERC
GADS for Wind – Donna Pratt, NERC
CIP Standard Drafting Team Updates – Jay Cribb, Southern Company

On Thursday September 29, 2016, the NAGF participated on WebEx discussing Primary Frequency Response. The WebEx was hosted by NERC in coordination with Troy Blalock, SCANA. Attendees included members of the Resources Subcommittee, OEM's, NAGF Subject Matter Experts, NERC staff and FERC staff. The goal of the WebEx was to provide feedback to FERC staff to clarify technical and operational questions pertaining to the capability of providing PFR with the topics including:

- New Resources: How should outer loop control issues be addressed
- Cost of providing primary frequency response for new resources
- New/ Additional equipment for new resources to provided primary frequency response
- Resource limitations in providing primary frequency response such as Nuclear/ Environmental/ Pmin/Pmax