1. Fewer, less severe events (Goals 1-5)*
2. Compliance violations (Goals 1 & 2)
3. Protection system misoperations rate and misoperations with loss of load (Goals 1-4)
4. Events caused by generating unit forced outages due to cold weather or fuel unavailability (Goals 1-4)
5. Reduce AC Transmission line forced outages (Goals 1-4)
6. Unauthorized physical or electronic access (Goals 1-3 & 5)
7. Disturbance control events greater than the most severe single contingency (Goals 1-4)
8. Interconnection Frequency Response (Goals 1-4)


Inferential statistics will be calculated when sample sizes are appropriate at a 95% confidence interval.
Metric Status Definitions*

*Dashboards are for illustrative purposes only and are not meant to represent current status or projections.

- **Green**: Risk indicator getting better
- **Neutral**: Risk indicator between getting better and getting worse
- **Red**: Risk indicator getting worse
- **Pass/Fail**: Risk indicator either met or not
Why is it important?
- Measures risk to the bulk power system (BPS) from events on the Bulk Electric System (BES)

How is it measured?
- Cumulative eSRI line in the composite daily event Severity Risk Index (eSRI) for Category 1–3 events (see pages 2-3 of ERO Event Analysis Process for category determination)

Data (Annual Measurement)
- No Category 3 or above events: Zero is green, else is red

Data (Compared to a 3-year rolling average)
- Slope of eSRI line is flat to decreasing and does not show an increase above zero that is statistically significant (95% Confidence Interval)
- “2019 Status” relates to the slope of the 3-year rolling average (Positive, Flat or Negative), not just the 2019 performance
• Why is it important?
  ▪ Reduce risk to BPS reliability from Standard violations by registered entities

• How is it measured?
  ▪ Compliance History* of moderate/serious risk noncompliance
  ▪ The number of violations discovered through self-reports, audits, etc.
  ▪ Risk to the BPS based on the severity of Standard violations

**Data (Annual Measurement)**
  ▪ Moderate and serious risk repeat violations filed with FERC on organizations that have Compliance History (based on 2017 metric)

<table>
<thead>
<tr>
<th>2019 Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
</tr>
<tr>
<td>45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2019 Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>75%</td>
</tr>
<tr>
<td>80%</td>
</tr>
</tbody>
</table>

**Data (Annual Measurement)**
  ▪ Percent of noncompliance self-reported (Self-certified noncompliance is not included) (same as 2018 metric)

<table>
<thead>
<tr>
<th>2019 Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
</tr>
<tr>
<td>4%</td>
</tr>
</tbody>
</table>

**Data (Compared to a 3-year rolling average)**
  ▪ The number of serious risk violations resolved compared to the total noncompliance resolved (based on 2018 metric)

* To measure the effectiveness of the risk-based CMEP in reducing noncompliance, NERC reviews moderate and serious risk violations and includes them in one of three categories: 1) noncompliance with no prior compliance history; 2) noncompliance with prior compliance history that does not involve similar conduct; and 3) noncompliance with compliance history that includes similar conduct.
• Why is it important?
  - Protection system misoperations exacerbate the impacts

• How is it measured?
  - Annual Misoperations rate and the annual cumulative loss of load for events with misoperations (cumulative rate through Q2 2019)

Data (Year-Over-Year Comparison)
  - Q3-Q2 comparison misoperations rate based on collection interval (95% Confidence Interval) (Based on 2018 Metric)

Data (Year-Over-Year Comparison)
  - Q3-Q2 comparison for qualified events with misoperations and loss of load (load loss/number of events) during the collection interval (95% Confidence Interval) (New)
Metric 4: Events Caused by Gas-Fired Unit Forced Outages Due to Cold Weather or Gas Unavailability

**Why is it important?**
- Reduce risk to BPS reliability due to gas-fired unit outages during cold weather or gas unavailability

**How is it measured?**
- Firm load loss due to cold weather or gas unavailability
- MWh of potential production lost initiated by cold weather and gas unavailability

**Data (Annual Measurement)**
- No firm load loss due to gas-fired unit outages during cold weather: Zero is green, else is red

**Data (Annual Measurement)**
- No firm load loss due to gas unavailability: Zero is green, else is red

**Data (Compared to a 5-year rolling average)**
- Percentage of winter period net MWh of potential production lost due to gas-fired unit outages during cold weather (Winter season January – March and December of the same calendar year)

**Data (Compared to a 5-year rolling average)**
- Percentage of annual net MWh of potential production lost due gas unavailability compared to a 5-year rolling average (Due to data availability, year defined as Q3-Q2) *(Numbers to be updated)*
• **Why is it important?**
  
  - Measures risks to BPS reliability from three priority causes:
    1. Operator or other human performance issues
    2. Substation equipment failures or failed circuit equipment
    3. Vegetation encroachment
• How is it measured?
  ▪ Number of transmission line outages caused by Human Error divided by the total inventory of circuits

Data (Compared to a 5-year rolling average)
  ▪ Annual outage rate* decreasing compared based to a 5-year rolling average collection interval (95% Confidence Interval) (Based on 2018 metric)

* Due to data availability, collection year defined as Q3-Q2

2019 Status
  - Increasing
  - Flat
  - Decreasing

Dashboards are for illustrative purposes only and are not meant to represent current status or projections.
• How is it measured?
  ▪ Number of transmission line outages caused by AC substation equipment failures and failed AC circuit equipment (such as transformers), divided by the total inventory of circuits

Data (Compared to a 3-year rolling average)
  ▪ Annual outage rate* decreasing compared based to a 3-year rolling average collection interval (95% Confidence Interval) (Based on 2018 metric)

2019 Status

* Due to data availability, collection year defined as Q3-Q2

Dashboards are for illustrative purposes only and are not meant to represent current status or projections.
**Metric 5c: Vegetation Encroachment**

*Dashboards are for illustrative purposes only and are not meant to represent current status or projections.*

### How is it measured?

- **Number of possible FAC-003 violations***

  
  **Year:** #
  
  - **2018:** 4
  - **2017:** 6
  - **2016:** 0
  - **2015:** 3
  - **2014:** 0

  *Mean = 2.6  Standard deviation = 2.33*

---

### Data* (Compared to a 5-year rolling average)

- Number of vegetation encroachments **reported as possible FAC-003 violations**, excluding fall-ins, decreasing (within one standard deviation, based on small sample size) (Based on 2018 metric)

<table>
<thead>
<tr>
<th>Year</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>4</td>
</tr>
<tr>
<td>2017</td>
<td>6</td>
</tr>
<tr>
<td>2016</td>
<td>0</td>
</tr>
<tr>
<td>2015</td>
<td>3</td>
</tr>
<tr>
<td>2014</td>
<td>0</td>
</tr>
</tbody>
</table>

*Mean = 2.6  Standard deviation = 2.33*

### Data** (Compared to a 5-year rolling average)

- Fall-ins: Number of vegetation encroachments **resulting in sustained outages** decreasing (within one standard deviation, based on 6-year sample)

<table>
<thead>
<tr>
<th>Year</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>27</td>
</tr>
<tr>
<td>2017</td>
<td>20</td>
</tr>
<tr>
<td>2016</td>
<td>20</td>
</tr>
<tr>
<td>2015</td>
<td>20</td>
</tr>
<tr>
<td>2014</td>
<td>19</td>
</tr>
<tr>
<td>2013</td>
<td>15</td>
</tr>
<tr>
<td>2012</td>
<td>16</td>
</tr>
</tbody>
</table>

**2019 Status**

- **Increasing:** 5
- **Flat:** 2
- **Decreasing:** 24

**2018 Status**

- **Increasing:** 15
- **Flat:** 15
- **Decreasing:** 24

---

Dashboards are for illustrative purposes only and are not meant to represent current status or projections.
• Why is it important?
  ▪ Measures risk and impact to the BPS from cyber or physical security attacks

• How is it measured?
  ▪ Based on industry-submitted OE-417 and/or EOP-004 Electric Emergency Incident and Disturbance Reports*
  ▪ No disruption** of BES operations due to physical attacks

Data (Annual Measurement), based on 2018 metric
  ▪ No disruption** of BES operations due to cyber attacks: Zero is green, else is red

Data (Annual Measurement), based on 2018 metric
  ▪ No disruption** of BES operations due to physical attacks: Zero is green, else is red

*As more data becomes available this metric will be enhanced to provide increased granularity of this risk.
**A disruption means that a BES facility was removed from service as a result of the cyber or physical incident.
Metric 7: Disturbance Control Events Greater Than the Most Severe Single Contingency

• Why is it important?
  ▪ Measures risk to the BPS by monitoring the number of Disturbance Control Standard (DCS) events that are greater than the Most Severe Single Contingency (MSSC)

• How is it measured?
  ▪ Information received by NERC based on the BAL-002 Reliability Standard
  ▪ Measures a rolling 7 year quarterly time trend testing for statistical significance

Data (Quarterly Measurement), New
  ▪ **Green**: a rolling 7 year trend line with a negative slope that compares the number of DCS events greater than the MSSC
  ▪ **Middle**: no statistically significant trend for the slope
  ▪ **Red**: a rolling 7 year trend line with a positive slope that compares the number of DCS events greater than the MSSC

*Calculated quarterly: Green, Middle or Red to 95% confidence level*

2019 Status

Dashboards are for illustrative purposes only and are not meant to represent current status or projections.
• Why is it important?
  ▪ Measures risk and impact to the BPS by measuring the interconnection frequency response performance measure (IFRM) for each BAL-003-1 event as compared to the Interconnection Frequency Response Obligation (IFRO)

• How is it measured?
  ▪ IFROs are calculated and recommended in the Frequency Response Annual Analysis Report for Reliability Standard BAL-003-1.1 implementation
  ▪ IFRM performance is measured for each event by comparing the resource (or load) MW loss to the frequency deviation

Data ( Quarterly & Annual Measurement ), New
  ▪ IFRM for each BAL-003-1 event is compared to the IFRO for each quarter of the 2019 operating year
  ▪ Success is no Interconnection experiencing a BAL-003-1 frequency event where IFRM performance is below their respective IFRO

2019 Status

Zero is green, else is red
Questions and Answers
1. Risk-responsive Reliability Standards
2. Objective, risk-informed entity registration, compliance monitoring, mitigation, and enforcement
3. Reduction of known reliability risks
4. Identification and assessment of emerging reliability risks
5. Identification and reduction of cyber and physical security risks
6. Improving ERO Enterprise efficiency and effectiveness
<table>
<thead>
<tr>
<th><strong>2019 Key Objectives</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Initiate CIP Standards Efficiency Review, and establish a process and timeline</td>
</tr>
</tbody>
</table>
| 3. Complete Supply Chain efforts  
  • Complete the final report and gain Board acceptance  
  • Develop a plan to realize the recommendations in the report  
  • Begin plan implementation  
  • Develop a plan to evaluate the effectiveness of the supply chain standard |
<table>
<thead>
<tr>
<th>2019 Key Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complete registration and certification of the new Western Reliability Coordinators on-time, consistent with dissolution of Peak Reliability</td>
</tr>
<tr>
<td>2. Review effectiveness of the Compliance Guidance program and develop plan to enhance; evaluate opportunities to expand the concept—industry-lead development of guidance to other program areas</td>
</tr>
<tr>
<td>3. Integrate Internal Control reviews in all scheduled ERO Enterprise audits and spot checks; Provide training and education on control evaluations to industry with supporting guidance to the Regional Entities for consistent implementation</td>
</tr>
<tr>
<td>4. Improve alignment in processes across Regional Entities and, when appropriate, memorialize the aligned processes into CMEP Tool design</td>
</tr>
</tbody>
</table>
## 2019 Key Objectives

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| **1.** | For five priority risk areas 1) Protection system misoperations, 2) Performance of inverters and associated control systems during frequency and voltage perturbations (PRC-024), 3) Planning and operating a bulk power system with increased dependency on natural gas, 4) Compromised situational awareness from the loss of Energy Management Systems, and 5) Distributed energy resources  
  - Identify the extent of condition and bulk power system reliability risks from loss of situation awareness and distributed energy resources  
  - Develop and begin to execute strategy for to mitigate the these risks from protection system misoperations, performance of inverters, and planning and operating a bulk power system with increased dependency on natural gas:  
    - Enhancements to existing Reliability Standards  
    - New Reliability Guidelines and other tools  
    - Best Practices |
<p>| <strong>2.</strong> | Finalize business case and begin implementation (as appropriate) of new SAFNR Tool |</p>
<table>
<thead>
<tr>
<th><strong>2019 Key Objectives</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong></td>
<td>Develop and implement a plan to expand the consistent use of probabilistic-based assessment processes for reliability assessments with common tools and practices</td>
</tr>
<tr>
<td><strong>2.</strong></td>
<td>Expand the 2020 Long-Term Reliability Assessment to include considerations of energy assurance risks</td>
</tr>
<tr>
<td><strong>3.</strong></td>
<td>Scope out options and determine if work should be undertaken on the use of reserve margin targets given a) changing levels of resource “firmness,” b) uncertainty around actual loads due to DER expansion, and c) recent experiences at managing tight reserve margins without incident (e.g., summer 2018 in ERCOT)</td>
</tr>
</tbody>
</table>
**Goal 5: Identification and Reduction of Cyber and Physical Security Risks**

<table>
<thead>
<tr>
<th>2019 Key Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Information sharing:</strong></td>
</tr>
<tr>
<td>• Enhance data collection capabilities (membership, technology improvements, range of collected data)</td>
</tr>
<tr>
<td>• Establish two-way sharing of machine readable cyber indicators through the Cyber Automated Information Sharing System</td>
</tr>
<tr>
<td>• Implement E-ISAC Watch 24 hours/5 days per week by executing hiring plan (4 watch officers, 4 cyber analysts, 1 threat and countermeasures analyst), recognizing the need for some flexibility to address changing needs</td>
</tr>
<tr>
<td><strong>2. Analysis:</strong></td>
</tr>
<tr>
<td>• Increase the identification of indicators of compromise</td>
</tr>
<tr>
<td><strong>3. Engagement:</strong></td>
</tr>
<tr>
<td>• Expand the Industry Engagement Program (IEP) and host minimum of 6 IEP sessions covering each Regional Entity footprint</td>
</tr>
<tr>
<td>• Execute Canadian Engagement Strategy, including meetings with each interconnected province and gain Canadian support for 2020 Business Plan and Budget</td>
</tr>
<tr>
<td>• Develop plans to address key findings for E-ISAC identified in the 2018 biennial Effectiveness Survey</td>
</tr>
<tr>
<td>• Design and execute GridEx V with expanded participation with special focus on cross-sector interdependencies and international collaboration</td>
</tr>
<tr>
<td>2019 Key Objectives</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>1. NERC-based initiatives:</td>
</tr>
<tr>
<td>• Develop and implement meeting and travel policy to support NERC stakeholder groups</td>
</tr>
<tr>
<td>• Finish the 2019 year <strong>within 1% over or under</strong> at or below budget and maintain at least $3.0M in operating reserves</td>
</tr>
<tr>
<td>• Develop plans to address key findings from the 2018 biennial Effectiveness Survey</td>
</tr>
<tr>
<td>• Work with the Members Executive Committee to develop metrics measuring the effectiveness of the E-ISAC</td>
</tr>
<tr>
<td>2. ERO-Enterprise “coordination” initiatives</td>
</tr>
<tr>
<td>• Meet all milestones associated with CMEP tool development</td>
</tr>
<tr>
<td>• Evaluate opportunities to “centralize” and/or “standardize” processes (e.g., Consolidated Hearing Body)</td>
</tr>
<tr>
<td>• Develop and implement meeting and travel policy for ERO Enterprise working groups</td>
</tr>
<tr>
<td>3. Stakeholder Engagement:</td>
</tr>
<tr>
<td>• In concert with Stakeholder Committees (MRC, Technical Committees), develop and implement plan to reconceive and transform Technical Committees to a lower cost model that preserves/improves effectiveness of stakeholder engagement</td>
</tr>
</tbody>
</table>
2018 ERO Enterprise Metrics

2018 Final

Mark Lauby, Senior Vice President and Chief Reliability Officer
Corporate Governance and Human Resources Committee Meeting
February 6, 2019

RELIABILITY | ACCOUNTABILITY
Metric Status Definitions

**Green**
- On schedule and expected to meet by year-end (YE)

**Yellow**
- Behind schedule but expected to meet by YE

**Red**
- Not expected to meet by YE

**No Color**
- Status not available or too early to tell
Metric 1: Fewer, Less Severe Events

- **Why is it important?**
  - Measures risk to the bulk power system (BPS) from Bulk Electric System (BES) events

- **How is it measured?**
  - Number of Category 3–5 events
  - Cumulative trend line in the composite daily event Severity Risk Index (eSRI) for Category 1–3 events

<table>
<thead>
<tr>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold 1 Target 1</td>
<td>No Category 3 or above events</td>
</tr>
<tr>
<td>Threshold 2 Target 2</td>
<td>Slope of trend line is negative</td>
</tr>
</tbody>
</table>
Metric 2: No Gaps in Reliability Standards and Compliance Monitoring

• Why is it important?
  ▪ Reduces risk to BPS reliability from potential gaps in standards and compliance by employing corrective action

• How is it measured?
  ▪ Using a consistent process, analysis of categorized events for any gaps in standards and compliance and mitigation implementation
  ▪ Any gaps result in action plans to address reliability risks

<table>
<thead>
<tr>
<th></th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold 1</td>
<td>No Category 3 or above events to study</td>
<td></td>
</tr>
<tr>
<td>Target 1</td>
<td>Ongoing assessments for Category 2 and below events; no gaps identified</td>
<td></td>
</tr>
<tr>
<td>Target 2</td>
<td>No gaps identified/no action plans needed</td>
<td></td>
</tr>
</tbody>
</table>
Metric 3: Resource Deficiencies are Foreseen

• Why is it important?
  ▪ Ensures ERO Enterprise is performing comprehensive and timely reliability assessments that identify and spotlight resource adequacy deficiencies

• How is it measured?
  ▪ Number of resource or essential reliability services deficiencies or common mode failures that caused load outages over 300 MW, or Energy Emergency Alert Level 3s (EEA-3s) that did not lead to load shedding or were not identified in reliability assessments in the past three years

<table>
<thead>
<tr>
<th>Threshold 1</th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No firm load outages over 300 MW due to resource or essential reliability services deficiency or common mode failures</td>
<td></td>
<td>![Green Circle]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target 1</th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>One EEA-3 issued; did not lead to load shedding</td>
<td></td>
<td>![Green Circle]</td>
</tr>
</tbody>
</table>
• **Why is it important?**
  - Measures risk to the BPS from cyber or physical security attacks

• **How is it measured?**
  a) Number of load losses or disruptions to BES operations due to cyber attack
  b) Number of load losses over 100 MW due to physical attack and the trend line for events over the most recent two year period
  c) Reduction in rate of cases resulting in malware inside a network or device
  d) Favorable trending of cyber and physical readiness
Metric 4a: Number of Disruptions to BES Facilities Caused by Unauthorized Physical or Electronic Access

<table>
<thead>
<tr>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong></td>
<td></td>
</tr>
<tr>
<td>Target 1</td>
<td>No load loss or disruption of BES operations due to cyber attack</td>
</tr>
<tr>
<td><strong>Threshold 2</strong></td>
<td></td>
</tr>
<tr>
<td>No load loss over 100 MW due to physical attack</td>
<td></td>
</tr>
<tr>
<td><strong>Target 2</strong></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Event Count</td>
</tr>
<tr>
<td>2016</td>
<td>121</td>
</tr>
<tr>
<td>2017</td>
<td>177</td>
</tr>
<tr>
<td>2018</td>
<td>153</td>
</tr>
</tbody>
</table>
## Metric 4b: Rate of Cases Resulting in Malware Inside a Network or Device that Require Remediation

<table>
<thead>
<tr>
<th>Target 1</th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This metric is being refined for 2019, but will not be in place for 2018</td>
<td>![Red Circle]</td>
</tr>
<tr>
<td>Target 1</td>
<td>Data Trend</td>
<td>Q4</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
<td>----</td>
</tr>
<tr>
<td></td>
<td>This metric is being refined for 2019, but will not be in place for 2018.</td>
<td></td>
</tr>
</tbody>
</table>
Metric 5: Reduced Reliability Risk from Noncompliance

• **Why is it important?**
  - Incent discovery and mitigation of violations by registered entities and measures violation severity as well as completion of mitigations

• **How is it measured?**
  - Percentage of self-identified noncompliance
  - Mitigation completions rate
  - Number of serious risk violations resolved as compared to the total noncompliance result
  - Trend of repeat moderate and serious violations
<table>
<thead>
<tr>
<th>Target</th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold 1</td>
<td>76% of all noncompliance was self-reported. Met Threshold (75%), but not Target 1 (80%)</td>
<td>🟠</td>
</tr>
<tr>
<td>Target 1</td>
<td></td>
<td>🟥</td>
</tr>
<tr>
<td>Threshold 2</td>
<td>Mitigation completion rates are 63.6% (2017), 89.9% (2016), and 99.9% (2015 &amp; older). Missed 100% for 2015 &amp; older Target 2.</td>
<td>🟠</td>
</tr>
<tr>
<td>Target 2</td>
<td></td>
<td>🟥</td>
</tr>
<tr>
<td>Target 3</td>
<td>Serious risk violations resolved (excluding CIP V5 and beyond): 2014-2016 at 4.9%; 2015-2017 at 4.4%; and 2016-2018 at 3.4%</td>
<td>🟠</td>
</tr>
<tr>
<td>Target 4</td>
<td>Serious risk violations resolved for CIP standards (all versions): 2014-2016 at 5.9%; 2015-2017 at 5.7%; and 2016-2018 at 3.9%</td>
<td>🟠</td>
</tr>
<tr>
<td>Target 5</td>
<td>Downward trend of repeat moderate and serious risk violations: 111 (2016); 48 (2017); 22 (2018)</td>
<td>🟠</td>
</tr>
</tbody>
</table>
Metric 6: Reduced Risks in Targeted Areas

• Why is it important?
  ▪ Measures risks to BPS reliability from five priority causes:
    a. Generating unit forced outages due to cold weather
    b. Misoperations rate of performance
    c. Automatic AC transmission outages caused by human error
    d. Transmission outages due to AC substation or circuit equipment failures
    e. Transmission line outages due to vegetation
Metric 6a: Reduced Events Caused by Generating Unit Forced Outages Due to Cold Weather

• How is it measured?
  - Number of load losses from generating units forced outages due to cold weather
  - Comparison of annual Weighted Effective Forced Outage Rate (WEFOR) of generating units to previous years during the most extreme cold winter months

<table>
<thead>
<tr>
<th>Threshold 1</th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No events with firm load loss caused by cold weather</td>
<td>[Green Circle]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target 1</th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRCC (0.04%), MRO (22.2%), SERC (8.3%) and Texas RE (12.7%) had increases in the WEFOR compared to the five year benchmark rolling average.</td>
<td>[Red Circle]</td>
<td></td>
</tr>
</tbody>
</table>
**Metric 6b: Annual Misoperations Rate of Performance**

- **How is it measured?**
  - Annual Misoperations rate (cumulative rate through Q2 2018), with a threshold of less than 7.5% and target of less than 7%

<table>
<thead>
<tr>
<th></th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong></td>
<td>Q3 2017 thru Q2 2018; Misoperations rate was 7.4%. Met Threshold 1 (7.5%),</td>
<td></td>
</tr>
<tr>
<td></td>
<td>but missed Target 1 (7.0%)</td>
<td></td>
</tr>
<tr>
<td><strong>Target 1</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Metric 6c: Number of Automatic AC Transmission Outages Caused by Human Error**

### How is it measured?

- Number of load losses greater than 300 MW caused by human error
- Trend of outages per circuit caused by human error
- Trend of outages caused by human error resulting in firm load loss compared to previous five-year average

<table>
<thead>
<tr>
<th>Threshold 1</th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong></td>
<td>One event with load loss greater than 300 MW resulting from human error</td>
<td>![Red Circle]</td>
</tr>
<tr>
<td><strong>Target 1</strong></td>
<td>Number of transmission line outages per circuit caused by human error are not declining</td>
<td>![Red Circle]</td>
</tr>
<tr>
<td><strong>Target 2</strong></td>
<td>Average number of events was fewer than the five-year average (average is 4 events; there was 1 event in 2018)</td>
<td>![Green Circle]</td>
</tr>
</tbody>
</table>
**How is it measured?**

- Number of load losses greater than 300 MW due to AC substation or circuit equipment failures
- Trend of outages per circuit caused by AC substation or circuit equipment failures, and the impact of the outages (outage duration weighted by MVA)
- Trend of outages caused by AC substation or circuit equipment failures resulting in firm load loss compared to five-year average
### Metric 6d: Transmission Outages due to AC Substation or Circuit Equipment Failures

<table>
<thead>
<tr>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong></td>
<td>No events with load loss greater than 300 MW from substation equipment failures</td>
</tr>
<tr>
<td><strong>Target 1</strong></td>
<td>Number of transmission line outages and circuit equipment failures per circuit caused by AC substation equipment failures are not declining by 5% (-2.8%), but the impact of the outages declined (-46%).</td>
</tr>
<tr>
<td><strong>Target 2</strong></td>
<td>Average number of qualified events was fewer than the five-year average (average is 8.2 events; there was one event in 2018)</td>
</tr>
</tbody>
</table>
**Metric 6e: Number of Transmission Line Outages Due to Vegetation**

- **How is it measured?**
  - Number of transmission line outages due to possible FAC-003 violations

<table>
<thead>
<tr>
<th>Target 1</th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>There has been a steady flow in sustained outages resulting from vegetation encroachments, several have been submitted in 2018 as possible FAC-003 violations</td>
<td></td>
</tr>
</tbody>
</table>
Metric 7: Efficiency and Effectiveness

• Why is it important?
  ▪ Measures performance in meeting important financial and operational objectives:
    a. Financial performance
    b. Implementation of ERO Enterprise technology solutions
    c. ERO Enterprise Effectiveness Survey
    d. Program efficiencies
Metric 7a: Execution of Business Plan and Budget

- **How is it measured?**
  - NERC and each Regional Entity performance against annual financial performance parameters established by their respective governing bodies.

<table>
<thead>
<tr>
<th>Target 1</th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NERC and all Regions are expected to operate within their respective financial performance parameters however, there is some uncertainty due to the transition of SPP</td>
<td></td>
<td>![Green Circle]</td>
</tr>
</tbody>
</table>
Metric 7b: Implementation of ERO Enterprise Technology Solutions

**How is it measured?**

- Quantitative and qualitative value of ERO Enterprise applications
- Completion of ERO Enterprise CMEP Technology Project 2018 milestones within budget guidelines

<table>
<thead>
<tr>
<th>Target 1</th>
<th>Conducted assessment of the quantitative and qualitative value, including productivity gains, with weighted score at 4 or above:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scored Projects</td>
</tr>
<tr>
<td></td>
<td>Score</td>
</tr>
<tr>
<td>UMR</td>
<td>4.271</td>
</tr>
<tr>
<td>Enterprise Reporting - MIDAS</td>
<td>3.727</td>
</tr>
<tr>
<td>Entity Registration - CFRs</td>
<td>4.036</td>
</tr>
<tr>
<td>MIDAS Portal</td>
<td>4.188</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4.11</td>
</tr>
</tbody>
</table>

**Target 2**

11 milestones set for 2018. All 2018 milestones were complete except for one: *Configuration on Release 1 - Build and Test*, which was 50% complete. Missing this milestone will not affect the release of the CMEP tool. Impacted by unexpected SPP IT transition activities.
• **How is it measured?**
  - Improvement in favorability percentages for the top three unfavorable questions from the last survey

<table>
<thead>
<tr>
<th>Target 1</th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Three most unfavorable items improved</td>
<td>✅</td>
</tr>
</tbody>
</table>
**How is it measured?**

- Identification of opportunities to reduce combined ERO Enterprise budgeted operating and fixed asset costs

<table>
<thead>
<tr>
<th></th>
<th>Data Trend</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong></td>
<td>Opportunities identified for at least a 1% budget reduction in 2018</td>
<td>![Green Circle]</td>
</tr>
<tr>
<td><strong>Target 1</strong></td>
<td>Action plan developed and implementation begun</td>
<td>![Green Circle]</td>
</tr>
</tbody>
</table>
Questions and Answers
Board Self-Assessment and MRC Assessment of Board of Trustees Effectiveness Results

Prepared by Survey Design & Analysis
<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives &amp; Methods</td>
<td>Page 3-6</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>Page 7-9</td>
</tr>
<tr>
<td>Overall Effectiveness</td>
<td>Page 10-14</td>
</tr>
<tr>
<td>Strategy</td>
<td>Page 15-21</td>
</tr>
<tr>
<td>Oversight</td>
<td>Page 22-28</td>
</tr>
<tr>
<td>Stakeholder Relations</td>
<td>Page 29-34</td>
</tr>
<tr>
<td>Board Functioning</td>
<td>Page 35-37</td>
</tr>
<tr>
<td>Final Comments</td>
<td>Page 38-39</td>
</tr>
<tr>
<td>Area Overall Summaries</td>
<td>Page 40-42</td>
</tr>
<tr>
<td>Appendix – Assessment Questionnaire</td>
<td>Page 43-46</td>
</tr>
</tbody>
</table>
Objectives & Methods
• To assess the performance and effectiveness of the NERC Board of Trustees (Board).

• NERC engaged SDA to design a new assessment questionnaire for 2018. The topics were the same but questions were modified and rating scales changed.

• The assessment has 28 questions (see appendix) to be answered by Board members, 22 of which are also answered by MRC members.

• 10 out of 10 Board members participated in the assessment. 26 out of 29 MRC members participated, for response rates of 100% and 90%, respectively.
Breakouts (MRC vs. Board) are shown only when differences are significant at a 95% confidence level. Significant differences exist between Board and MRC members for most questions, those questions with no significant differences are indicated as such.

For this report “Effectiveness Level” is defined as the percent of respondents selecting “Very effective” or “Effective;” the top two boxes of the 5-point effectiveness scale.

For this report “Satisfaction Level” is defined as the percent of respondents selecting “Very satisfied” or “Satisfied;” the top two boxes of the 5-point satisfaction scale.

For this report “Agreement Level” is defined as the percent of respondents selecting “Strongly agree” or “Agree;” the top two boxes of the 5-point agreement scale.

Section summary measures include only those questions using a 5-point scale. This includes all questions except the questions that ask about the amount of Board involvement.
Executive Summary
Positive Highlights

- Excellent response rate as in past years: Board, 100% (10 of 10); MRC, 90% (26 of 28).
- Board and MRC members show commitment to the process by providing thoughtful comments, a total of 72 in all, many with suggestions for the Board.
- The Board was seen as clearly effective in their overall function. They received overall effectiveness levels of 100% by the Board and 96% by MRC.
- 100% of Board members are “Satisfied” (40%) or “Very satisfied” (60%) with the job they do on the Board.
- 91% of Board and MRC members rate the Board’s involvement in NERC’s CEO’s day-to-day management as “About the right amount”.
- 97% of Board and MRC agree the Board “Listens to input from NERC management” and 96% agree the Board “Works effectively with management”.
- Although the survey questions changed in 2018, the topics were the same and the results are similar to those from previous years.
Potential Focus Areas (based on scores and analysis of verbatim comments):

• Request that management produce a first draft budget for comment that is as close as possible to the budget that will be ultimately requested for approval.
• Board focus on effectiveness and efficiency should be across the ERO Enterprise, not just on NERC meetings and travel expenses.
• Overall cost effectiveness, including with reliability standards, should remain a key focus.
• Board should continually assess with management the prioritization of programs and expenses.
Overall Effectiveness
Overall, how effective is the Board of Trustees at performing their responsibilities?

- **Very Effective**: 20% (MRC, N=25) - 100% (Board, N=10)
- **Effective**: 0% (MRC, N=25) - 76% (Board, N=10)
- **Neither effective nor ineffective**: 0% (MRC, N=25) - 0% (Board, N=10)
- **Ineffective**: 4% (MRC, N=25) - 0% (Board, N=10)
- **Very ineffective**: 0% (MRC, N=25) - 0% (Board, N=10)

Overall how satisfied are you personally with the job you do working on the Board of Trustees?

- **Very satisfied**: 60% (Board Only, N=10)
- **Satisfied**: 40% (Board Only, N=10)
- **Neutral**: 0% (Board Only, N=10)
- **Dissatisfied**: 0% (Board Only, N=10)
- **Very dissatisfied**: 0% (Board Only, N=10)
Most Important Board Functions

What are the Board of Trustees' MOST important functions at NERC? [Select No More Than 3]

- Ensuring adherence to NERC's mission, vision and values: 64%
- Guiding and approving the development of annual budgets and business plans: 58%
- Providing vision for the future: 50%
- Setting company and management priorities: 50%
- Overseeing NERC management: 25%
- Approving NERC's Senior Management and Officer Hires*: 22%
- Uncertain: 3%

*Board 50%, MRC, 12%
Strategy
Please rate the Board's effectiveness in overseeing NERC Management or staff to produce a final annual business plan and budget.

- Very effective: 19% (MRC, N=26) / 80% (Board, N=10)
- Effective: 20% (MRC, N=26) / 65% (Board, N=10)
- Neither effective nor ineffective: 12% (MRC, N=26) / 0% (Board, N=10)
- Ineffective: 4% (MRC, N=26) / 0% (Board, N=10)
- Very ineffective: 0% (MRC, N=26) / 0% (Board, N=10)
Please rate how effective the Board of Trustees is at each of their following functions:

- **Incorporating the international charter of the North American bulk power system N=34**
  - Very ineffective: 0%
  - Ineffective: 12%
  - Neither effective nor ineffective: 59%
  - Effective: 29%

- **Staying in tune with issues and trends affecting NERC and the industry N=36**
  - Very ineffective: 3%
  - Ineffective: 6%
  - Neither effective nor ineffective: 53%
  - Effective: 39%

Board and MRC together.
### Setting company and management priorities.

<table>
<thead>
<tr>
<th></th>
<th>MRC, N=25</th>
<th>Board, N=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very effective</td>
<td>15%</td>
<td>50%</td>
</tr>
<tr>
<td>Effective</td>
<td></td>
<td>77%</td>
</tr>
<tr>
<td>Neither effective nor ineffective</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td>Ineffective</td>
<td>4% 0%</td>
<td></td>
</tr>
<tr>
<td>Very ineffective</td>
<td>0% 0%</td>
<td></td>
</tr>
</tbody>
</table>

### Providing Leadership.

<table>
<thead>
<tr>
<th></th>
<th>MRC, N=25</th>
<th>Board, N=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very effective</td>
<td>31%</td>
<td>70%</td>
</tr>
<tr>
<td>Effective</td>
<td></td>
<td>54%</td>
</tr>
<tr>
<td>Neither effective nor ineffective</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td>Ineffective</td>
<td>8% 0%</td>
<td></td>
</tr>
<tr>
<td>Very ineffective</td>
<td>0% 0%</td>
<td></td>
</tr>
</tbody>
</table>
How satisfied are you with how the Board incorporates advice and/or recommendations from the MRC?

- Very satisfied: 19% (MRC), 70% (Board)
- Satisfied: 30% (MRC), 62% (Board)
- Neutral: 15% (MRC), 0% (Board)
- Dissatisfied: 4% (MRC), 0% (Board)
- Very dissatisfied: 0% (MRC), 0% (Board)

MRC, N=26  Board, N=10
Oversight
Please rate the amount of involvement the Board has in each of the following:

Day-to-day management by NERC's CEO N=26
- About the right amount: 88%
- Too little: 0%
- Too much: 12%

ERO Enterprise's annual business planning and budgeting process N=32
- About the right amount: 91%
- Too little: 6%
- Too much: 3%

Board and MRC together.
**Board Monitoring I**

### Efficiency of ERO Enterprise processes

- **Very effective**
  - MRC, N=26: 0%
  - Board, N=10: 20%

- **Effective**
  - MRC, N=26: 54%
  - Board, N=10: 80%

- **Neither effective nor ineffective**
  - MRC, N=26: 27%
  - Board, N=10: 0%

- **Ineffective**
  - MRC, N=26: 12%
  - Board, N=10: 0%

- **Very ineffective**
  - MRC, N=26: 8%
  - Board, N=10: 0%

### Standards Development

- **Very effective**
  - Board & MRC N=36: 12%

- **Effective**
  - Board & MRC N=36: 56%

- **Neither effective nor ineffective**
  - Board & MRC N=36: 14%

- **Ineffective**
  - Board & MRC N=36: 6%

- **Very ineffective**
  - Board & MRC N=36: 3%
### Compliance Monitoring and Enforcement

- **Very effective:**
  - MRC, N=26: 38%
  - Board, N=10: 80%
- **Effective:**
  - MRC, N=26: 42%
  - Board, N=10: 20%
- **Neither effective nor ineffective:**
  - MRC, N=26: 12%
  - Board, N=10: 0%
- **Ineffective:**
  - MRC, N=26: 0%
  - Board, N=10: 0%
- **Very ineffective:**
  - MRC, N=26: 8%
  - Board, N=10: 0%

### Reliability Assessments

- **Very effective:**
  - MRC, N=25: 16%
  - Board, N=10: 50%
- **Effective:**
  - MRC, N=25: 56%
  - Board, N=10: 50%
- **Neither effective nor ineffective:**
  - MRC, N=25: 0%
  - Board, N=10: 24%
- **Ineffective:**
  - MRC, N=25: 0%
  - Board, N=10: 4%
- **Very ineffective:**
  - MRC, N=25: 0%
  - Board, N=10: 0%
Board Monitoring III

E-ISAC

- Very effective: 8% (MRC, N=25) and 50% (Board, N=10)
- Effective: 76% (Board, N=10)
- Neither effective nor ineffective: 8% (MRC, N=25) and 0% (Board, N=10)
- Ineffective: 8% (MRC, N=25) and 0% (Board, N=10)
- Very ineffective: 0% (MRC, N=25) and 0% (Board, N=10)
Stakeholder Relations
"The Board listens to input from the MRC"

- **MRC, N=26**
  - Strongly agree: 24%
  - Agree: 60%
  - Neither agree nor disagree: 8%
  - Disagree: 0%
  - Strongly disagree: 0%

- **Board, N=10**
  - Strongly agree: 80%
  - Agree: 20%
  - Neither agree nor disagree: 0%
  - Disagree: 0%
  - Strongly disagree: 0%

"The Board listens to input from NERC management."

- **Board & MRC N=33**
  - Strongly agree: 58%
  - Agree: 39%
  - Neither agree nor disagree: 3%
  - Disagree: 0%
  - Strongly disagree: 0%
Stakeholder Relations

“The Board listens to input from Regional Entities.”

- **MRC, N=21**
  - Strongly agree: 24%
  - Agree: 30%
  - Neither agree nor disagree: 0%
  - Disagree: 0%
  - Strongly disagree: 0%

- **Board, N=10**
  - Strongly agree: 70%
  - Agree: 76%
  - Neither agree nor disagree: 0%
  - Disagree: 0%
  - Strongly disagree: 0%

“The Board works effectively with management.”

- **MRC, N=22**
  - Strongly agree: 32%
  - Agree: 64%
  - Neither agree nor disagree: 0%
  - Disagree: 0%
  - Strongly disagree: 0%

- **Board, N=10**
  - Strongly agree: 100%
  - Agree: 0%
  - Neither agree nor disagree: 5%
  - Disagree: 0%
  - Strongly disagree: 0%
Please indicate your agreement or disagreement with each of the following statements about stakeholder relations:

- The Board maintains a positive working relationship with Canadian federal and provincial regulators. N=35
  - Strongly disagree: 3%
  - Disagree: 14%
  - Neither agree nor disagree: 60%
  - Agree: 23%

- The Board maintains a positive working relationship with State regulators. N=31
  - Strongly disagree: 10%
  - Disagree: 32%
  - Neither agree nor disagree: 55%
  - Agree: 3%

- The Board maintains a positive working relationship with Federal regulators. N=34
  - Strongly disagree: 6%
  - Disagree: 3%
  - Neither agree nor disagree: 59%
  - Agree: 32%

Board and MRC together.
Board Functioning
Please indicate your agreement or disagreement with each of the following statements about Board functioning:

- The Board has established procedures to ensure meetings are able to be run effectively. 50% Agree, 50% Strongly agree.
- Board members communicate effectively with each other. 20% Disagree, 80% Agree.
- The frequency of Board meetings is appropriate. 60% Agree, 40% Strongly agree.
- Board meetings are an effective use of my time. 70% Agree, 30% Strongly agree.
- Board meetings are efficient. 10% Disagree, 70% Agree, 20% Strongly agree.

Board only.
Area Overall Summaries
Strategy Summary

Strategy – Six Questions, five Effectiveness, one Satisfaction

- Very effective (or satisfied) - MRC: 25%, Board: 57%
- Effective (or satisfied) - MRC: 43%, Board: 60%
- Neither effective nor ineffective (or Neutral) - MRC: 10%, Board: 0%
- Ineffective (or dissatisfied) - MRC: 4%, Board: 0%
- Very ineffective (or dissatisfied) - MRC: 0%, Board: 0%

MRC, N=154  Board, N=60
Oversight – Five Questions

- **Very effective**
  - MRC, N=128: 17%
  - Board, N=50: 44%

- **Effective**
  - MRC, N=128: 55%
  - Board, N=50: 56%

- **Neither effective nor ineffective**
  - MRC, N=128: 18%
  - Board, N=50: 0%

- **Ineffective**
  - MRC, N=128: 0%
  - Board, N=50: 6%

- **Very ineffective**
  - MRC, N=128: 0%
  - Board, N=50: 4%
Appendix
• Board of Trustees/Member Representatives Committee Proposed 2018 Survey Questions

• Levels of Effectiveness (Rating Scale)
  ▪ 5 = Very effective, 4 = Effective, 3 = Neither Effective nor ineffective. 2 = Ineffective, 1 = Very ineffective

• Levels of Satisfaction (Rating Scale)
  ▪ 5 = Very satisfied, 4 = Satisfied, 3 = Neutral, 2 = Dissatisfied, 1 = Very dissatisfied

• Levels of Agreement (Rating Scale)
  ▪ 5 = Strongly agree, 4 = Agree, 3 = Neither agree nor disagree, 2 = Disagree, 1 = Strongly disagree

The survey included a prompt requiring comment for any item rated a “1” or a “2”.

Overall Effectiveness
• Overall, how effective is the Board of Trustees at performing their responsibilities?
• Overall how satisfied are you personally with the job you do working on the Board of Trustees?*
• What are the Board of Trustees' MOST important functions at NERC? [Select No More Than 3]

*Board Only Questions
Assessment Questionnaire P2

Strategy

• Please rate the Board's effectiveness in overseeing NERC Management or staff to produce a final annual business plan and budget.

• Please rate how effective the Board of Trustees is at each of their following functions.
  
  Staying in tune with issues and trends affecting NERC and the industry
  Setting company priorities
  Providing leadership
  Incorporating the international charter of the North American bulk power system

• How satisfied are you with how the Board incorporates advice and/or recommendations from the MRC?

Oversight

• Please rate the amount of involvement the Board has in each of the following:
  
  ERO Enterprise’s (NERC and the Regional Entities) annual business planning and budgeting process
  Day-to-day management by NERC’s CEO

• Please rate the Board's effectiveness at monitoring each of the following:
  
  Efficiency (cost effectiveness) of ERO Enterprise processes
  Standards Development
  Compliance Monitoring and Enforcement
  Assessments
  E-ISAC
Assessment Questionnaire P3

Stakeholder Relations
• Please indicate your agreement or disagreement with each of the following statements about stakeholder relations.
  The Board listens to input from the MRC.
  The Board listens to input from NERC management.
  The Board listens to input from Regional Entities
  The Board works effectively with management.
  The Board maintains a positive working relationship with Federal regulators.
  The Board maintains a positive working relationship with State regulators.
  The Board maintains a positive working relationship with Canadian federal and provincial regulators.

Board Functioning*
• Please indicate your agreement or disagreement with each of the following statements about Board functioning.
  Board meetings are efficient.
  Board meetings are an effective use of my time.
  The frequency of Board meetings is appropriate.
  Board members communicate effectively with each other.
  The Board has established procedures to ensure meetings are able to be run effectively, including delivery of agendas and appropriate background material in time to prepare in advance of meetings

*Board Only Questions