ERO Reliability Performance Update

Sam Chanoski, NERC Director of Situation Awareness and Event Analysis
Fall 2017 NPCC Compliance and Standards Workshop
November 9, 2017
2016 SRI was driven by days with multiple smaller Events
2017 SRI will be driven by major storm days
Event Severity Remains on Good Glideslope

Daily eSRI
(2011 - 12/31/2016)

SAS-calculated Baseline trend line slope = -0.00000765, with 95% confidence values between -0.00002365 and +0.00000835
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>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Target 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Category 3 or above events</td>
<td><img src="#" alt="Green Circle" /></td>
<td><img src="#" alt="Green Circle" /></td>
</tr>
<tr>
<td><strong>Threshold 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Target 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current slope of trend line is negative</td>
<td><img src="#" alt="Green Circle" /></td>
<td><img src="#" alt="Green Circle" /></td>
</tr>
</tbody>
</table>
Control Chart of Qualified Events

All Qualified Events (Cat 1 - Cat 5)

Process change: Started capturing Cat 1h events

9 Cat 1h events; EOP-004-2 in effect

1 entity had 4 repetitive modelling problems
674 Events have been cause coded with 2279 identified causes, through 12/31/2016
Things break...
... in ways unanticipated by design...
... in the context of an organization

674 Events have been cause coded with 2279 identified causes, through 12/31/2016
• **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 all Category 3–5 and select 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>Data Trend</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong></td>
<td><img src="Threshold1GreenQ2.png" alt="Green Circle" /></td>
<td><img src="Threshold1GreenQ3.png" alt="Green Circle" /></td>
</tr>
<tr>
<td>No Category 3 or above events; studying sample events of interest</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Target 1</strong></td>
<td><img src="Target1Q2.png" alt="Circle" /></td>
<td><img src="Target1Q3.png" alt="Circle" /></td>
</tr>
<tr>
<td>Gap analysis results reported at year-end</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• **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 deficiencies that caused load outages over 300 MW or Energy Emergency Alert Level 3s (EEA-3s) that were not identified in prior seasonal or long-term reliability assessments in the past three years

<table>
<thead>
<tr>
<th>Metric 3: Resource Deficiencies are Foreseen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Trend</td>
</tr>
<tr>
<td><strong>Threshold 1</strong></td>
</tr>
<tr>
<td><strong>Target 1</strong></td>
</tr>
</tbody>
</table>
Metric 4: No Unauthorized Physical or Cybersecurity Access Resulting in Disruption to BES Facilities

- **Why is it important?**
  - Measures risk to the BPS from cyber or physical security attacks

- **How is it measured?**
  - Number of load losses or disruptions to BES operations due to cyber attack
  - Number of load losses over 100 MW due to physical attack and the trend line for events over the most recent two year period
## Metric 4: No Unauthorized Physical or Cybersecurity Access Resulting in Disruption to BES Facilities

<table>
<thead>
<tr>
<th></th>
<th>Data Trend</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong></td>
<td>No load loss or disruption of BES operations due to cyber attack</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Target 1</strong></td>
<td></td>
<td><img src="false" alt="Green" /></td>
<td><img src="false" alt="Green" /></td>
</tr>
<tr>
<td><strong>Threshold 2</strong></td>
<td>No load loss over 100 MW due to physical attack</td>
<td><img src="false" alt="Green" /></td>
<td><img src="false" alt="Green" /></td>
</tr>
<tr>
<td><strong>Target 2</strong></td>
<td>Assessing trend of physical security events</td>
<td><img src="false" alt="Yellow" /></td>
<td><img src="false" alt="Yellow" /></td>
</tr>
</tbody>
</table>
Serious Risk Violations

[Bar chart showing the number of serious violations from 2007 to 2016, with a 12-month rolling average line.]

NERC
NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

RELIABILITY | ACCOUNTABILITY
Metric 5: Reduced Reliability Risk from Noncompliance

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

• **How is it measured?**
  - Trend of compliance severity risk index (with and without CIP V5) and amount of repeat moderate and severe risk violations
  - Percentage of self-identified noncompliance
  - Mitigation completions rates
## Metric 5: Reduced Reliability Risk from Noncompliance

<table>
<thead>
<tr>
<th>Data Trend</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong>&lt;br&gt;<strong>Target 1</strong>&lt;br&gt;Compliance severity index (excluding CIP V5) reported at Q4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Threshold 2</strong>&lt;br&gt;<strong>Target 2</strong>&lt;br&gt;Compliance severity index (including CIP V5) reported at Q4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Threshold 3</strong>&lt;br&gt;<strong>Target 3</strong>&lt;br&gt;86.6% of all noncompliance is self-identified</td>
<td><img src="#" alt="Green" /></td>
<td><img src="#" alt="Green" /></td>
</tr>
<tr>
<td><strong>Threshold 4</strong>&lt;br&gt;<strong>Target 4</strong>&lt;br&gt;Current mitigation completion rates are 70.5% (2016), 97.6% (2015), and 99.8% (2014 &amp; older).</td>
<td><img src="#" alt="Green" /></td>
<td><img src="#" alt="Green" /></td>
</tr>
<tr>
<td><strong>Target 5</strong>&lt;br&gt;Repeat risk trends reported at Q4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Why is it important?

- Measures risks to BPS reliability from five priority causes:
  1. Generating unit forced outages due to cold weather
  2. Misoperations rate of performance
  3. Automatic AC transmission outages caused by human error
  4. Transmission outages due to AC substation equipment failures
  5. Transmission line outages due to vegetation
Seasonal Potential Production Lost Due to Forced Outages

- 2016
- 2015
- 2014
- 2013
- 2012

Net MWh of Potential Production Lost due to Forced Outages

- Summer MWh
- Winter MWh
- Spring/Fall MWh
**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 Effective Forced Outage Rate (EFOR) of generating units to previous years during the most extreme cold winter months

<table>
<thead>
<tr>
<th>Data Trend</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong></td>
<td>No events with firm load loss in winter months</td>
<td>![Green icon]</td>
</tr>
<tr>
<td><strong>Target 1</strong></td>
<td>Comparison to previous year EFORs underway</td>
<td>![White icon]</td>
</tr>
</tbody>
</table>
Misoperations Rates Continuing to Decline

- Year 1 (Q4 2012–Q3 2013)
- Year 2 (Q4 2013–Q3 2014)
- Year 3 (Q4 2014–Q3 2015)
- Year 4 (Q4 2015-Q3 2016)

Statistically Significant Increase between Connected Years

Statistically Significant Decrease between Connected Years
**How is it measured?**

- Annual Misoperations rate (cumulative rate through Q2 2017), with a threshold of less than 9% and target of less than 8%

<table>
<thead>
<tr>
<th>Threshold 1</th>
<th>Data Trend</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 State of Reliability report had an annual rate of 8.3%</td>
<td><a href="#">Green</a></td>
<td><a href="#">Green</a></td>
<td></td>
</tr>
<tr>
<td>Target 1</td>
<td></td>
<td><a href="#">Red</a></td>
<td><a href="#">Red</a></td>
</tr>
</tbody>
</table>
Continued Decline in Average Transmission Outage Severity

The graph shows the correlation between expected TADS event severity and the severity of transmission outages. The data points are color-coded to indicate different types of events:

- Red: Significant Positive Correlation With Transmission Severity
- Green: Significant Negative Correlation with Transmission Severity
- Blue: No Significant Correlation with Transmission Severity

The events are labeled and numbered as follows:

1. Misoperation
2. Failed AC Substation Equipment
3. Power System Condition
4. Human Error
5. Fire
6. Contamination
7. Lightning
8. Other
9. Failed AC Circuit Equipment
10. Combined Smaller ICC Groups
11. Weather, Excluding Lightning
12. Unknown
13. Foreign Interference

The graph visually represents the correlation between these events and their impact on transmission outages.
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 (target is 5% decline with reduced impacts)
  ▪ Comparison of outages caused by human error resulting in firm load loss to previous five-year average
### Metric 6c: Number of Automatic AC Transmission Outages Caused by Human Error

<table>
<thead>
<tr>
<th>Data Trend</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong> No events with load loss greater than 300 MW from human error</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td><strong>Target 1</strong> Outages per circuit caused by human error currently not declining by 5%</td>
<td>❌</td>
<td>❍</td>
</tr>
<tr>
<td><strong>Target 2</strong> Average number of events currently fewer than five-year average</td>
<td>✓</td>
<td>❍</td>
</tr>
</tbody>
</table>
• How is it measured?
  ▪ Number of load losses greater than 300 MW due to AC substation equipment failures
  ▪ Trend of outages per circuit caused by AC substation equipment failures (target is 5% decline with reduced impacts)
  ▪ Comparison of outages caused by AC substation equipment failures resulting in firm load loss to previous five-year average
Metric 6d: Number of Transmission Outages Due to AC Substation Equipment Failures

<table>
<thead>
<tr>
<th>Data Trend</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong> No events with load loss greater than 300 MW from substation equipment failures</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td><strong>Target 1</strong> Outages per circuit caused by substation equipment are declining by greater than 5% and outages are declining</td>
<td>🟠</td>
<td>✅</td>
</tr>
<tr>
<td><strong>Target 2</strong> Average number of events currently fewer than five-year average</td>
<td>✅</td>
<td>✅</td>
</tr>
</tbody>
</table>
Metric 6e: Number of Transmission Line Outages Due to Vegetation

• **How is it measured?**
  - Number of FAC-003 violations that are identified, processed, and filed
  - Number of vegetation-related outages that are not violations of FAC-003 gathered through quarterly data submittals

<table>
<thead>
<tr>
<th>Data Trend</th>
<th>Q2</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold 1</strong></td>
<td>At least one outage due to FAC-003 violations in Q2</td>
<td>[Green]</td>
</tr>
<tr>
<td><strong>Target 1</strong></td>
<td>13 vegetation-related outages through Q2 that were not FAC-003 violations</td>
<td>[Red]</td>
</tr>
</tbody>
</table>
• Retirement/displacement of conventional generation
  ▪ Variable energy resources
  ▪ Rapid penetration of electronically-coupled resources
• Essential Reliability Services
  ▪ Frequency Response
  ▪ Voltage Support
  ▪ Ramping and flexibility needs
• Rapid penetration of new loads
• System controls and protection coordination
• Increasing interface with distribution-centric resources
• Increasing importance of cybersecurity
California Load, Wind & Solar Profiles --- Base Scenario
January 2020

Net Load = Load - Wind - Solar
Questions and Answers
NPCC 2017 Fall Compliance and Standards Workshop

Event Analysis Update

November 7-9, 2017
Agenda

• Correlation between eSRI neoCategories & Events Analysis Program (EAP) Categories
  – Background
  – Review Summary
  – Conclusions
Agenda continued

• “What-If” Methodology Trial
  – eSRI
  – neoCategory
  – Methodology
  – Overview
  – What if #1 - Cat 1.a.i
  – What if #2 - Cat 1.a.i
  – Conclusions
Correlation - Background

- NPCC Events Analysis (EA) staff reviewed all 2016 & 2017Q1 NPCC Category 1 – 5 Events
- NERC calculates each event’s severity risk index (eSRI)
- Staff performed a correlation assessment between eSRI scores and Categories
- Staff created five neoCategories based on eSRI ranges
Correlation - Review Summary

- 72 incidents
- 44 events went through the process
  - 25 Category 1.h - which is the loss of EMS/SCADA
  - 19 other events
    - 11 events have eSRI = 0 (zero)
    - 8 other events with non-zero eSRI
Correlation - Review Summary (continued)

Of remaining events with non-zero eSRIs

• 5 were Category 1.a.i

• 1 was Category 1.a.ii

• 1 was Category 1.c

• 1 was Category 2.f
Correlation - Conclusions

• Generally EAP Categories and neoCategories align
• Members may want to look deeper at Events where EAP Categories and neoCategories do not align or eSRI values for an event are close to the top end of the range.
• The eSRI values are more a measure of impact than risk. As such, EAP Categories whose Events usually have eSRI = 0, although less impactful should be evaluated based on their risk to reliability.
“What-If” Methodology Trial

Application of the “What-If” methodology on actual events
What-If - eSRI

NERC’s Performance Analysis Subcommittee (PAS) created the Severity Risk Index (SRI). Each event has its own Severity Risk Index called an eSRI.

Input to the eSRI are 1) Load Loss, with varying Durations, 2) Transmission Loss (weighted by voltage class) and 3) Generation Loss
What-if - neoCategories

- NPCC staff analyzed continent-wide events and their associated eSRIs and developed eSRI ranges to correspond to the Categories in NERC’s Event Analysis Program
- These eSRI ranges are called neoCategories
- As provided to RCC in May 2017, NPCC staff developed a “What-If” methodology for evaluating continent-wide EAP qualifying events using neoCategories and eSRIs
What-If - neoCategory Ranges (continued)

<table>
<thead>
<tr>
<th>neoCategory</th>
<th>min(eSRI)</th>
<th>max(eSRI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.00000</td>
<td>0.28489</td>
</tr>
<tr>
<td>2</td>
<td>0.28490</td>
<td>0.49999</td>
</tr>
<tr>
<td>3</td>
<td>0.50000</td>
<td>3.79999</td>
</tr>
<tr>
<td>4</td>
<td>3.80000</td>
<td>9.00000</td>
</tr>
<tr>
<td>5</td>
<td>9.00001</td>
<td>999.99999</td>
</tr>
</tbody>
</table>
What-if - Methodology Trial

The trial will illustrate:

• The ability to gauge an event’s impact within its neoCategory range

• A quantitative assessment of the amount of additional Load, Transmission, or Generation (individually) needed to increase the neoCategory

• An evaluation of a credible worst case scenario (if provided by the entity) to ascertain whether an event could evolve into a higher neoCategory range, thereby having had a higher impact.
What-If - Overview

• Evaluated
  Two External (outside of NPCC) Category 1.a.i type Events

• What changes to the actual Baseline eSRI inputs / variables (“What-If”) would result in this event becoming a higher category (i.e. a more impactful event?)
What-if - Category 1.a.i

The definition of a Category 1.a.i event is an event that results in an unexpected outage that is contrary to the design of three or more BES Facilities caused by a common disturbance.
What-If - Chart Illustration

- Baseline is the actual event variables
- Individual changes to eSRI variables to see how much additional would be needed to change neoCategory
  - Load & Duration
  - Transmission
  - Generation
- Real
  - Provided by Entity
  - What additional Load-Transmission-Generation could have credibly been lost had the event occurred under different conditions . . . “what If”?
## What-If – Event #1 Results

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Load</th>
<th>Load + Duration</th>
<th>Gen</th>
<th>Trans</th>
<th>Real</th>
<th>Real (max Gen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>eSRI</td>
<td>0.146543</td>
<td>0.284922</td>
<td>0.284922</td>
<td>0.285148</td>
<td>0.28482</td>
<td>0.253112</td>
<td>0.287593</td>
</tr>
<tr>
<td>Load</td>
<td>0</td>
<td>450</td>
<td>225</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Duration</td>
<td>0</td>
<td>0</td>
<td>240</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gen</td>
<td>1328</td>
<td>1328</td>
<td>1328</td>
<td>2755</td>
<td>1328</td>
<td>1883</td>
<td>2238</td>
</tr>
<tr>
<td>Trans</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;600</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&gt;400</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&gt;300</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&gt;200</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>&gt;100</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
What-If – Event #1
(continued)

For this event to jump into the neoCategory 2 range its eSRI would have to be above 0.28489

To accomplish that one of the following scenarios on the next slide would have to occur in addition to the loss of 1328MW of generation and the loss of the one 200-300kV class transmission circuit, which actually did happen.
What-If – Event #1
(continued)

Some possible scenarios could be:

• Lose 450 MW of load restored within 4 hours or Lose 225 MW of load for 4 or more hours
• Lose a total generation of 2755 MW (1328 MW plus 1427 MW additionally)
• Two 400-600 kV class transmission circuits along with one 300-400 kV class circuit and two 100-200 kV class circuits along with the original base transmission loss of two 200-300 kV class line.
What-If – Event #1 (continued)

• These values are considered extreme amounts of increase to each individual variable alone, which in addition to what was actually lost during the event, would effectively raise this event’s eSRI value into a higher neoCategory.

• In some cases these amounts are not actually achievable; however, they act as a relative gauge of what would be required.
What-If – Event #1  
(continued)

• Although not illustrated here, any combination of any two or all three of the variables could also be varied to determine a relative exposure to an increase in risk.
What-If - Event #1
(continued)

Furthermore, to zero in on a more reasonable evaluation of any categorized event, one could analyze a true worse case scenario associated with the event by the entity providing a credible worst case contingency that could have occurred had this event occurred at a different time, configuration, dispatch, etc.
What-If – Event #1 Evaluation  
(continued)

Entity provided “credible” worst case scenario:

• Additional loss of three 200-300 kV class transmission circuits (4 in total)
• Along with an increase in loss of generation to 1883 MW

This resulted in increasing the eSRI to 0.253112, which is still below the 0.28490 and therefore still neoCategory 1
What-If – Event #1
(continued)

Additionally, a further comparison was made to the credible contingency provided (see last column) which increased the possible max loss of generation from 1883MW (which was derated due to a blended fuel mix being used) to its actual maximum of 2238MW.

This addition along with the possible loss of transmission previously described was enough to push the eSRI value above the Threshold for neoCategory 2.
## What-If – Event #2 Results

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Load</th>
<th>Load + Duration</th>
<th>Gen</th>
<th>Trans</th>
<th>Real 1</th>
<th>Real 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>eSRI</td>
<td>0.168017</td>
<td>0.285853</td>
<td>0.285053</td>
<td>0.285052</td>
<td>0.288387</td>
<td>0.186984</td>
<td>0.205770</td>
</tr>
<tr>
<td>Load</td>
<td>0</td>
<td>310</td>
<td>155</td>
<td>0</td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Duration</td>
<td>0</td>
<td>0</td>
<td>240</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gen</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1205</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trans</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;600</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&gt;400</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&gt;300</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>&gt;200</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</table>
“What-If” – Event #2 Evaluation  
(continued)

Once again, the Baseline column depicts the event’s actual eSRI value of 0.168017 and the associated outages that occurred on that day.

For this case, the event resulted in the loss of five transmission circuits of the > 300 but <400 kV voltage class and one transmission circuit of the >100 but <200 kV voltage class.
What-If – Event #2

(continued)

In order for this event to jump into the neoCategory 2 range its eSRI would have to be above 0.28489, as with the previous event.
What-If – Event #2

(continued)

To achieve that, any of the following would have had to occur in addition to the loss of the elements lost that day:

• Lose 310 MW of load for less than 4 hours or lose 155 MW of load for 4 or more hours

• Lose 1205 MW of generation

• Lose a total of eight 300-400 kV (3 additional) transmission circuits, one 200-300 kV transmission circuit and two (1 additional) 100-200 kV transmission circuits
What-If – Event #2  
(continued)

• These values are extreme amounts of each individual variable, that are considered in addition to what was actually lost during the event, would make this event move into a higher neoCategory, should this be capable of occurring.

• Although not illustrated here, any combination of all three of the variables could also be calculated/varied to determine a relative exposure to an increase in risk.
What-If – Event #2
(continued)

Entity provided “credible” worst case scenario:
• Additional loss of either 50 MW of load (Real 1) or 100 MW of load (Real 2).

Although the resulting eSRI is higher, it is below 0.28490, therefore remains a neoCategory 1
Questions
Fall 2017 Compliance and Standards Workshop
November 7-9, 2017

Criteria Services Update

Gerry Dunbar
Manager, Reliability Criteria
Outline

• Remedial Action Schemes (RAS)

• A-10 Classification of BPS Elements

• 2017 Criteria Services Activity:
  – Directories #9 and #10 – Retired (eff. 7/01/19)
  – Directory #8 – Revised
  – Directories #2 and #5 – Under Review
Remedial Action Schemes (RAS)

• RAS Definition Approved by FERC 11/19/2015
  – Continent wide need to establish a uniform definition.
  – NERC Glossary term for SPS revised (‘See RAS’)
• PRC-012-2 (RAS) Approved by FERC 9/20/2017
  – PRC-12-1, PRC 13-1, PRC -14-1 Withdrawn
  – PRC -15-1 and PRC -16-1 Retired
• PRC -012-2
  – Enforcement Date 1/1/2021
  – Limited Impact RAS (NPCC Type III)
  – Regional Review
Remedial Action Schemes (RAS) NPCC Transition

• NERC Rules of Procedure
  – Regional Criteria ‘not inconsistent’ with ERO Standards

• Task Force on Coordination of Planning (TFCP)
  – Provides Oversight of Existing SPS Review Process

• NPCC Transition to RAS:
  – Existing NPCC RAS/SPS List:
    • SPS conforms to Revised Definition of RAS
    • SPS does not conform
    • Newly Identified RAS
  – NPCC Glossary Term SPS
    • ‘See NERC RAS’
  – NPCC Directory #7
    • Other NPCC Documents
A-10
BPS Classification

• Scope of Review:
  – Identify critical facilities for the applicability of NPCC more stringent criteria
  – Simplify the existing methodology to make it less labor intensive
  – Improve consistency across areas in application and outcomes

• Action Plan --- Phase #1 2017
  – Review Existing Methodology
    • Identify Problems
    • Propose Improvements
  – Develop New Methodologies

• Present Recommendation to RCC
  – December 2017
A-10
BPS Classification

• Action Plan Phase #2 2018:
  – Validate Phase #1 Proposals
  – Consider BPS Applicability to Directories
  – Provide Final Recommendation
  – Revise A-10 Document

• Existing and Alternative Methodologies:
  – Goal:
    • Identify Critical Facilities
    • Simplify Methodology (less resources required)
    • Greater Regional Consistency
      – Application
      – Outcome
NPCC Criteria Services
2017 Activity

• Directories #9 and #10 --- Verification Criteria
  – MOD-25-2
  – D#9 and D#10 Retirement Effective 7/01/19

• Directory #8 --- System Restoration
  • Battery Testing Requirements (PRC -005)
  • NPCC Glossary Terms
    – Basic Minimum Power System
    – Key Facilities
    – Critical Components

• Directory #2 Emergency Operations

Directory #5 Reserve
  – Currently Under Review
  – Anticipate Open Process Posting 2018

11/09/2017
NPCC Criteria

- **NPCC Full Members Develop and ‘Own’ Criteria**
  - **Who:**
    - NPCC Full Members Obligated to Comply
    - Non-Members Other Agreements (Tariff and Interconnection)
  - **What:**
    - NPCC Bulk Power System (Defined via A-10 Methodology)
      - More Stringent Criteria
      - Section 313 NERC Rules of Procedure
  - **Why:**
    - Promote Reliability
      - Augment and Enhance ERO Standards

11/09/2017
Questions or Comments?
Misoperation Information Data Analysis System Portal (MIDAS)

NPCC Compliance & Standard Workshop
Hartford, Connecticut, Fall 2017
Rafael Sahiholamal
Senior RAPA Engineer
Protection System

**M**: Misoperation

**I**: Information

**D**: Data

**A**: Analysis

**S**: System
History of PRC-004

Two Factor Authentication Enabled  5/22/2015
As of today you can enable two factor authentication on your account, see

PERIODIC DATA SUBMITTAL

Form Name  Due Date
PRC-004/2 1a  1/20/2016

LINKS
- Public Site
- Public Compliance Site
- Wiki Site
- Compliance Support
# Inactive PRC-004 Standard

<table>
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<tr>
<th>PRC-004-0</th>
<th>Analysis and Reporting of Transmission Protection System Misoperations</th>
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<td>Analysis and Mitigation of Transmission and Generation Protection System Misoperations</td>
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<td>Protection System Misoperation Identification and Correction</td>
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<tr>
<td>PRC-004-5</td>
<td>Protection System Misoperation Identification and Correction</td>
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</tbody>
</table>
A. Introduction

1. Title: Protection System Misoperation Identification and Correction

2. Number: PRC-004-5(i)

3. Purpose: Identify and correct the causes of Misoperations of Protection Systems for Bulk Electric System (BES) Elements.

4. Applicability:

4.1. Functional Entities:

4.1.1 Transmission Owner

4.1.2 Generator Owner

4.1.3 Distribution Provider
Requirement 5

R5. Each Transmission Owner, Generator Owner, and Distribution Provider that owns the Protection System component(s) that caused the Misoperation shall, within 60 calendar days of first identifying a cause of the Misoperation:

- Develop a Corrective Action Plan (CAP) for the identified Protection System component(s), and an evaluation of the CAP’s applicability to the entity’s other Protection Systems including other locations; or

- Explain in a declaration why corrective actions are beyond the entity’s control or would not improve BES reliability, and that no further corrective actions will be taken.
The purpose of this Data Request

Develop meaningful metrics to assess Protection System performance

Identify trends in Protection System performance that negatively impact reliability

Identify remediation techniques to reduce the rate of occurrence and severity of Misoperations

Provide focused assistance to entities in need of guidance

Publicize lessons learned to the industry
Phase I - MIDAS Reporting Process

- Reporting Entities submit worksheets and receive status e-mails, but cannot see data in the MIDAS system (one-way interactions with MIDAS)

- NPCC SP-7 verify data submissions and communicates questions and/or changes to data
Notice: To prepare for deployment of the MIDAS Portal, the MIDAS Submission Page will be deactivated Thursday, October 12, 2017 at 6 am Eastern. Users will not be able to submit from Thursday, October 12, 2017 at 6 am Eastern through Monday, October 16, 2017 at 6 am Eastern.

* required fields

* Type NCR Number: 

* Resubmittal Only:  ○ Yes  ○ No

* Select Submission Quarter: Select ▼

* Select Submission Year: Select ▼

* Select Region (Lead Region if MRRE): Select ▼

* Submitter Name:

* Submitter Email Address:

* Key Code:

Select Misoperations File:  [Browse...]

Submit
**Operation Tab**

Protection System Misoperations:
[http://www.nerc.com/pa/RAPA/Pages/Misoperations.aspx](http://www.nerc.com/pa/RAPA/Pages/Misoperations.aspx)
Misoperation Tab

Protection System Misoperations:
http://www.nerc.com/pa/RAPA/Pages/Misoperations.aspx
Phase II - MIDAS Portal Reporting Process

- Reporting Entities submit worksheets, enter/edit information manually, review data in system, and creates/exports data and reports (two-way interactions through MIDAS Portal).

- NPCC SP-7 verifies data submissions and communicate questions and/or changes to the data. Phase II MIDAS provides more reports analyzing types of misoperations in the database.
**MIDAS Vs MIDAS Portal**

**Current Misoperations Reporting Process**
- Entity submits misoperations data through internet-based submission page.
- Region views records in MIDAS and exports data and reports.

**Misoperations Reporting Process for MIDAS Portal**
- Entity accesses misoperations data through MIDAS Portal for submission, manual entry/edit of data and creates/exports data or reports.
- Region views records in MIDAS and exports data and reports.
MIDAS Portal
Creating an Account

1. Navigate to NERC.com

2. In the upper right, click “Account Log-In/Register”

3. To the left, under “ERO Portal” click “Login”

4. In the upper right, click “Register”
User Permissions

Manage Permissions

Select permissions the user should have then click “Submit”

Manage User Permissions for: Jack Norris

- MIDAS Read-Only
- MIDAS Entity Admin
- MIDAS Reporter

Submit

Note: Read-Only only allows the user to view records and reports, it does not allow the user to create or modify records. Reporter allows the user to view, create, and edit records and reports. Entity Admin allows the user to view, create, and edit records and reports, as well as vet new users.
MIDAS Portal Menu

Under the “MIDAS Portal Menu” click “Bulk Submissions”

If the validation failed perform necessary corrections then resubmit the file. A file containing all related validation errors can be exported by clicking “Export to Excel”
Modify an Existing Misoperation Record

1. Click the dropdown arrow next to the Misoperation record
2. Click “Edit” from the dropdown selection options

Under the “MIDAS Portal Menu” click “Waivers (Opt-Outs)”
Enhancements to MIDAS

- Replacement of the current page used to submit
- Enhanced Security Scheme
  - Entity Admin, Reporter, and Observer levels for MIDAS Portal
- New portal for Entity for Manual Entry and Editing
- Revised Opt-Out (Waiver) Process
- Entities have access to data in the system
  - Submission Status and History
  - Reported Data
- Submission Validations
- Standardized Reports for Regions and Entities
Training Announcement
Misoperation Information Data Analysis
System Portal WebEx Training

Training Dates & Information:
Dial-in: 1-415-655-0002 US Toll

- **October 24, 2017 | 1:00 p.m. – 2:30 p.m. EDT**
  (17:00 – 18:30 UTC)
  Click here for: [Join WebEx Meeting](#)
  Access code: 734 097 984

- **November 9, 2017 | 1:00 p.m. - 2:30 p.m. EST**
  (18:00-19:30 UTC)
  Click here for: [Join WebEx Meeting](#)
  Access code: 734 097 984

- **November 20, 2017 | 1:00 p.m. - 2:30 p.m. EST**
  (18:00-19:30 UTC)
  Click here for: [Join WebEx Meeting](#)
  Access code: 734 097 984

- **November 28, 2017 | 1:00 p.m. - 2:30 p.m. EST**
  (18:00-19:30 UTC)
  Click here for: [Join WebEx Meeting](#)
  Access code: 734 097 984

The training will demonstrate how to use the functionality of the MIDAS portal that will be released in coming weeks.
System Protection Working Group (SP-7)

- Review the analysis of misoperations of protection systems on the bulk electric system including SPS
- Maintain a record of all reviewed misoperations
- Calculate statistic of protection system misoperations
- Work with the NPCC Event Analysis Team
- Share lessons learned with Members and industry from review of misoperations
- Recommend NPCC additions to the NERC reporting template
NPCC Protection System Misoperations by Cause

<table>
<thead>
<tr>
<th>Misoperation</th>
<th>Incorrect Setting/Logic/Design Errors</th>
<th>Relay Failures/Malfunctions</th>
<th>AC System</th>
<th>DC System</th>
<th>Unknown/Unexplainable</th>
<th>Communication Failures</th>
<th>As-left Personnel Error</th>
<th>Other/Explanable</th>
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</table>
Figure 4.6 Year-Over-Year Changes in Misoperation Rate by Region and NERC

From 2016 SOR Report:
• TO, GO, and DP
• PRC-004-5(i)
• Misoperation/Operation data reporting ➔ NERC Rules of Procedure, Section 1600. (“data request”).
• MIDAS Portal ➔ Submittal for 3rd Quarter 2017
• Submittal timeframe ➔ 60 Days after each quarter
Protection System Misoperations

Protection System Operations and Misoperations are reported by Transmission Owners, Generator Owners, and Distribution Providers via the Misoperation Information Data Analysis System (MIDAS) in the PRC-004 standard and the accompanying 1600 Data Request. Entities will report data on a quarterly basis. The first reporting period under the Data Request will be the quarter beginning on the first day of the first calendar quarter that is nine (9) months after the date that the Standard is approved.

“You must use Internet Explorer to open the file. Right click on the file and select “Save target as” to save the file.

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<td>6/18/2013 9:48 AM</td>
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</table>
MIDAS presentation - Spring 2016 Compliance Workshop (page 99):


rsahiholamal@npcc.org
212-205-7064

NERC MIDAS: midas@nerc.net