

## 2017 Metrics with Historical Data

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### Metrics

In support of the ERO Enterprise's goals, there are six reliability metrics to measure progress on reliability improvement. There is also one metric to measure NERC's efficiency and effectiveness. The metrics are designed such that the measures of success, thresholds, and targets are reviewed annually and adjusted for the next year as needed. The metrics are cumulative; in order to achieve target, threshold must be met.

1. Fewer, less severe events
2. No gaps in Reliability Standards and compliance monitoring
3. Resource deficiencies are foreseen
4. No unauthorized physical or cyber security access resulting in disruption to BES facilities
5. Reduced reliability risk from noncompliance
6. Reduced risks in targeted areas
7. NERC's efficiency and effectiveness

<i>Metric 1: Fewer, less severe events</i>			
Measure of success	Threshold	Target	Historic Data
Number and severity of BES events	1. No Category 4 or 5 events 2. The slope of the cumulative trend line in the composite daily “event Severity Risk Index” (eSRI) <sup>1</sup> for Category 1–3 events remains flat	1. No Category 3 events 2. The slope of the cumulative trend line in the composite daily eSRI for Category 1–3 events trends negative	<p><b><u>All Thresholds and Targets:</u></b></p> 2016: 2 Cat 3* 2015: 1 Cat 3* 2014: 1 Cat 3
<i>Metric 2: No gaps in Reliability Standards and compliance monitoring</i>			
Measure of success	Threshold	Target	Historical Data
Number of gaps in Reliability Standards and compliance monitoring	Conduct gap analyses for five events, which include any unstudied Category 3 or above events, with the remainder being select events that occurred prior to the third quarter of the current calendar year. <sup>2</sup> Develop action plans to address any identified gaps in Reliability Standards and compliance monitoring.	Based on the gap analyses conducted, zero gaps in Reliability Standards and compliance monitoring identified	<p><b><u>Threshold and Target:</u></b></p> No gaps identified to date

<sup>1</sup> Measured on a rolling 5 year basis, including days with zero events and excluding Category 4 and 5 events, events caused by weather, flooding, earthquake, and AESO islanding. Other events that are high impact and infrequent, such as acts of war, are also excluded from the eSRI.

<sup>2</sup> Those events of interest that occur in the fourth quarter of the current calendar year can be included in a future year gap analysis.

<i>Metric 3: Resource deficiencies are foreseen</i>			
Measure of success	Threshold	Target	Historical Data
Number of unanticipated resource deficiencies <sup>3</sup>	<p>No firm load outages over 300 MW due to resource or essential reliability services<sup>4</sup> deficiency, or common mode failure<sup>5</sup></p> <p>This excludes deficiencies or common mode failures identified as a risk in an assessment during the past 3 years and not reported as resolved.</p>	<p>No EEA-3 declarations for resource deficiencies</p> <p>This excludes (1) any deficiencies or common mode failures identified as a risk in an assessment during the past 3 years and not reported as resolved and (2) any deficiencies that do not lead to a load shedding event</p>	<p><b>Threshold:</b> No essential reliability services deficiencies resulting in a 300 MW or greater load shed observed to date</p> <p>See Figure 9 for additional historic information regarding deficiencies and common mode failures</p> <p><b>Target:</b> Number of declared EEA-3 issued: 2015: 1 2014: 4 2013: 6</p>
<i>Metric 4: No unauthorized physical or cyber security access resulting in disruption to BES facilities</i>			
Measure of success	Threshold	Target	Historical Data
Number of unauthorized physical or cyber security access events resulting in disruption to BES facilities	<ol style="list-style-type: none"> <li>1. No firm load loss due to BES cyber attack</li> <li>2. No firm load shed more than 100 MW due to physical attack</li> </ol>	<ol style="list-style-type: none"> <li>1. No disruption of the operations of the BES from cyber attack</li> <li>2. Flat or declining trend in physical security events affecting BES facilities over the most recent two year period reported under reported U.S.D.O.E. Emergency Incident and Disturbance Report Form QE-417 and NERC Reliability Standard EOP-004</li> </ol>	<p><b>Threshold 1:</b> Total number of cyber security events that resulted in load loss: 2015: 0 2016: 0</p> <p><b>Threshold 2:</b> No physical security events that resulted in 100 MW of firm load loss in 2015 and 2016</p> <p><b>Target 1:</b> No impact on BES operations from cyber events in 2015 or 2016</p>

<sup>3</sup> Resource deficiency is defined as an operating condition that requires operators to manually shed firm load to maintain system stability due to a lack of available resources.

<sup>4</sup> Essential reliability service deficiency is defined as an operating condition that results in either of the following: 1) manual load shed to ensure stability of the BPS (pre-contingency) in respect to maintaining adequate voltage and voltage support or ramping capability, or 2) automatic load shed due to a lack of voltage or frequency support.

<sup>5</sup> Common-mode failure is defined as a disruption of infrastructure that impacts electricity supply, excluding force majeure events, e.g. weather, flooding, earthquakes, acts of god, war, etc.

			<b>Target 2:</b> See Figures 1a and 1b																									
Metric 5: Reduced reliability risk from noncompliance																												
Measure of success	Threshold	Target	Historical Data																									
Number of severe violations and mitigation completion rates	1. The downward trend from 2011 for the compliance severity index <sup>6</sup> (excluding CIP version 5) is statistically significant	1. Compliance severity index trend is 50% or less of the 2011 index (excluding CIP version 5)	<b><u>Thresholds 1 and 2 and Targets 1 and 2:</u></b> See Figures 2 and 3  <b><u>Threshold 3 and Target 3:</u></b> Non-compliance self-identified: 2015: 84% 2014: 76% 2013: 73%  <b><u>Target 4:</u></b> No historical data on target 4—currently developing baseline  <b><u>Threshold 4 and Target 5:</u></b> Mitigation completion rates as of Q4 of 2015:																									
	2. CIP compliance severity index (for all CIP standards including version 5) stays at or below 65% of the 2011 index	2. CIP compliance severity index (for all CIP standards including version 5) stays at or below 55% of the 2011 index																										
	3. 75% of all noncompliance is self-identified	3. 80% of all noncompliance is self-identified																										
	4. Mitigation <sup>7</sup> completion rates are as follows:	4. Reduced repeat moderate and severe risk violations																										
		5. Mitigation completion rates are as follows:																										
<table><tr><th>Noncompliance discovery year</th><th>Threshold</th></tr><tr><td>2016</td><td>70%</td></tr><tr><td>2015</td><td>85%</td></tr><tr><td>2014 and older</td><td>99%</td></tr></table>	Noncompliance discovery year	Threshold	2016	70%	2015	85%	2014 and older	99%	<table><tr><th>Noncompliance discovery year</th><th>Target</th></tr><tr><td>2016</td><td>75%</td></tr><tr><td>2015</td><td>90%</td></tr><tr><td>2014 and older</td><td>100%</td></tr></table>	Noncompliance discovery year	Target	2016	75%	2015	90%	2014 and older	100%	<table><tr><th>Noncompliance discovery year</th><th>% Met</th></tr><tr><td>2014</td><td>80.39%</td></tr><tr><td>2013</td><td>93.52%</td></tr><tr><td>2012</td><td>97.26%</td></tr><tr><td>2011</td><td>99.66%</td></tr></table>	Noncompliance discovery year	% Met	2014	80.39%	2013	93.52%	2012	97.26%	2011	99.66%
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<sup>6</sup> The *Compliance Severity Risk Index* is calculated by multiplying an assigned weight for the risk determination of a noncompliance to an assigned weight of the discovery method of the noncompliance.

<sup>7</sup> Excludes mitigations involving federal entities and matters in litigation.

<i>Metric 6: Reduced risks in targeted areas</i>			
Measure of success	Threshold	Target	Historic Data
a. Events caused by generating unit forced outages due to cold weather	No firm load shed occurs from generating unit forced outages caused by cold weather	Using most extreme cold winter months, the Effective Forced Outage Rate (EFOR) decreases compared to a rolling previous 5 year benchmark average for each Regional Entity <sup>8</sup>	<p><b><u>Threshold:</u></b> Number of times firm load shed occurred as a result of generating unit forced outages from cold weather: 2014: 1 2011: 1</p> <p><b><u>Target:</u></b> See Figure 4</p>
b. Annual Misoperations rate of performance <sup>9</sup>	Annual Misoperation rate of performance is less than 9%	Annual Misoperation rate of performance is less than 8%	<p><b><u>Threshold and Target:</u></b></p> <ul style="list-style-type: none"> <li>See Figure 5 generally</li> <li>State of Reliability Report data: Q4–Q3: <p>Q4 2014 – Q3 2015: 9.4% Q4 2013 – Q3 2014: 10.4% Q4 2012 – Q3 2013: 10.1%</p> <p>Q3 – Q2:</p> <p>July 2014 – June 2015: 9.7% July 2013 – June 2014: 10.7%</p> </li> <li>Annual Misoperations Report data (Q1–Q4): <p>2015: 9.5% 2014: 9.8% 2013: 10.1%</p> </li> </ul>

<sup>8</sup> The sample will be based on the ten most extreme cold weather months between the months of December and March over the measurement period.

<sup>9</sup> Lines operated at 100 kV and above. The annual Misoperations rate of performance will be calculated based on data from June 2016 to June 2017.

**Metric 6: Reduced risks in targeted areas (continued)**

Measure of success	Threshold	Target	Historic Data
c. Number of automatic AC transmission outages caused by human error	1. No events with load loss greater than 300 MW caused by human error	<p>1. Number of transmission line outages per circuit caused by human error is declining by 5% and outage impacts<sup>10</sup> are declining</p> <p>2. Declining number of events from transmission line outage caused by human error resulting in firm load loss based on a rolling 5-year average</p>	<p><b>Threshold 1:</b> Number of events with load loss greater than 300 MW caused by human error: 2015: 0 2014: 1 2013: 1 2012: 1</p> <p><b>Target 1:</b> See Figure 6</p> <p><b>Target 2:</b> Number of events with load loss where root cause is human error: 2015: 4 2014: 4 2013: 5 2012: 2</p>

<sup>10</sup> Lines operated at 200 kV and above

**Metric 6: Reduced risks in targeted areas (continued)**

Measure of success	Threshold	Target	Historic Data
d. Number of transmission outages due to AC substation equipment failures	1. No events with load loss greater than 300 MW caused by AC substation equipment failures	1. Number of transmission line outages per circuit caused by AC substation equipment failures declines by 5% and outages are declining  2. Reduce the number of events from AC substation equipment failures resulting in firm load loss based on a rolling 5-year average	<p><b>Threshold 1:</b> Number of events with load loss greater than 300 MW due to equipment failure: 2015: 2 2014: 0 2013: 0 2012: 1</p> <p><b>Target 1:</b> See Figure 7</p> <p><b>Target 2:</b></p> <ul style="list-style-type: none"> <li>• See Figure 8</li> <li>• Number of events with transmission loss, failed equipment, and load loss: 2016: 3 (692) 2015: 3 (1,478 MW) 2014: 6 (263 MW) 2013: 8 (422 MW) 2012: 12 (1,524 MW)</li> </ul>
e. Number of transmission line <sup>11</sup> outages due to vegetation	No transmission line outages due to FAC-003 violations	No more than 15 Sustained Outages caused by vegetation (e.g., blow-ins, fall-ins) that are not violations of FAC-003	<p><b>Threshold:</b> FAC violations: 2013: 0 2014: 0 2015: 3</p> <p><b>Target:</b> Non FAC violations: 2013: 15 2014: 19 2015: 20</p>

<sup>11</sup> Lines operated at 200 kV and above

**Metric 7: NERC's efficiency and effectiveness**

Measure of success	Threshold	Target	Historical Data
a. Execution of business plan and budget (BP&B)	NERC will be at or under budget for expenses and fixed assets exclusive of the authorized use of operating reserves	NERC will be at or under budget for expenses and fixed assets inclusive of the authorized use of operating reserves with the exception of authorized reserve expenditures resulting from a FERC directive which was not in existence at the time the final 2017 BP&B was provided to the Board for approval	See Figure 10
b. Implementation of ERO Enterprise technology solutions		<ol style="list-style-type: none"> <li>1. Complete ERO Enterprise IT projects for Entity Registration, Enterprise Reporting Phase 4 (data for event analysis, misoperations, or TADS), and NERC's public-facing website on time, on budget, and with expected functionality</li> <li>2. Develop a method to measure and track the cost benefit of ERO Enterprise IT projects</li> </ol>	<p><b>Target 1:</b> ERO Enterprise projects for 2015 (sub-metric J) and 2016 (sub-metric E) met this target</p> <p><b>Target 2:</b> No historical data</p>
c. Implementation of the Regional Entity oversight plans and NERC adherence to the Rules of Procedure		<ol style="list-style-type: none"> <li>1. Implement the recommendations and schedule from audit findings identified in 2016 by the Compliance and Certification Committee and NERC's internal audit department</li> <li>2. No significant new noncompliance findings in NERC's implementation of the Regional Entity oversight plans or adherence to the Rules of Procedure</li> </ol>	<p><b>Target 1:</b> No historical data</p> <p><b>Target 2:</b> Information is on file with NERC Internal Audit and the Enterprise-wide Risk Committee</p>
d. Implementation of action plans in response to ERO Enterprise Effectiveness Survey results		Implement the 2017 milestones identified in the action plans as accepted by the Board of Trustees in 2016	No historical data



## Appendix

Figure 1a:

2015

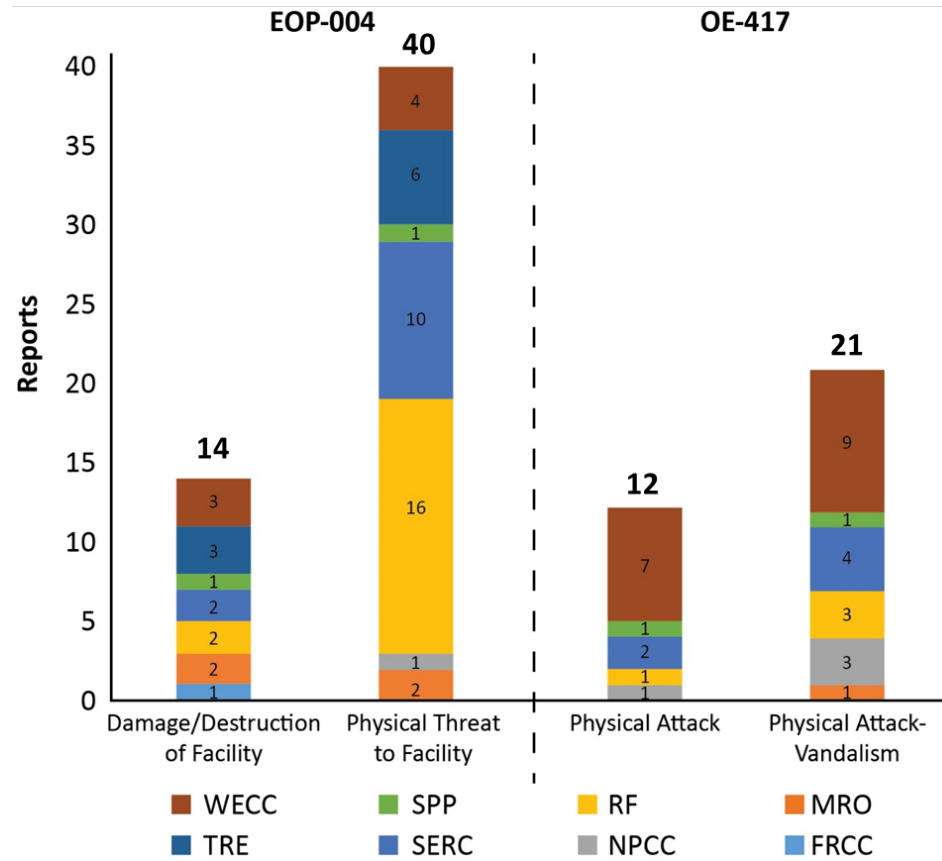


Figure 1b:

2016

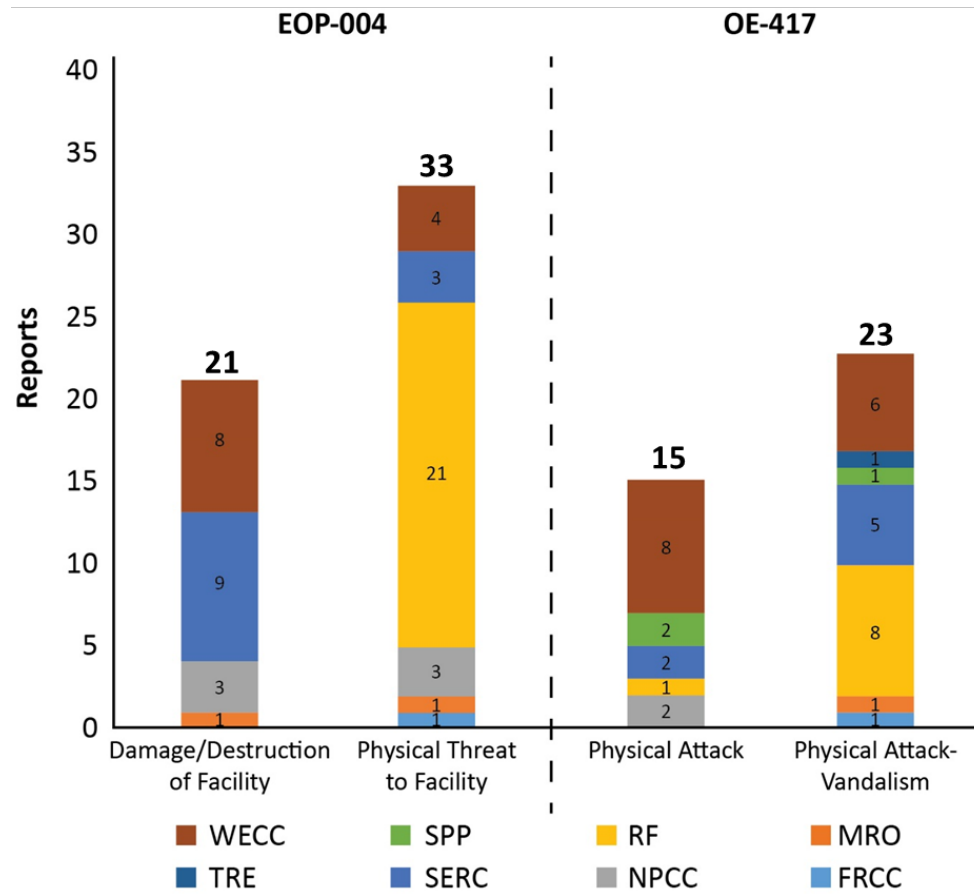
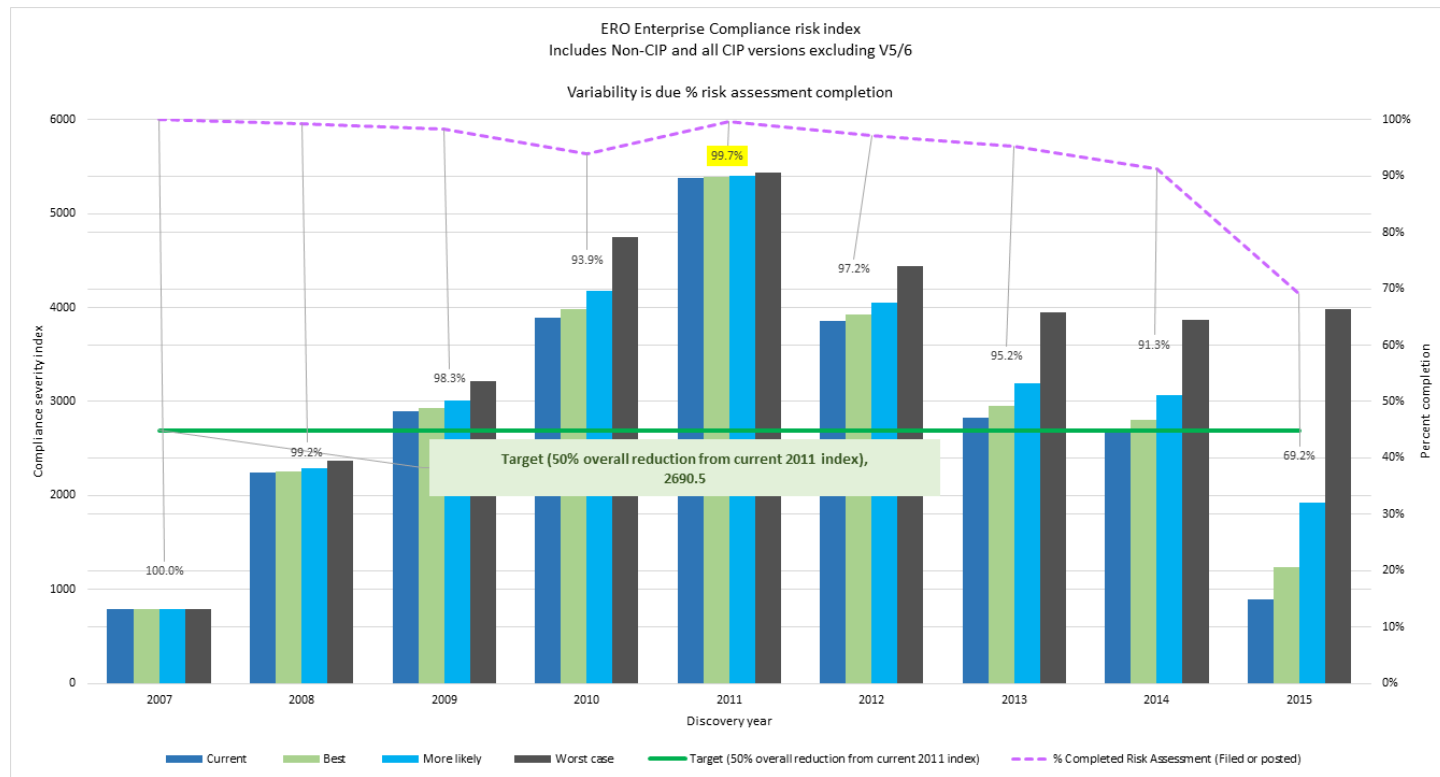


Figure 2:



**Figure 3:**

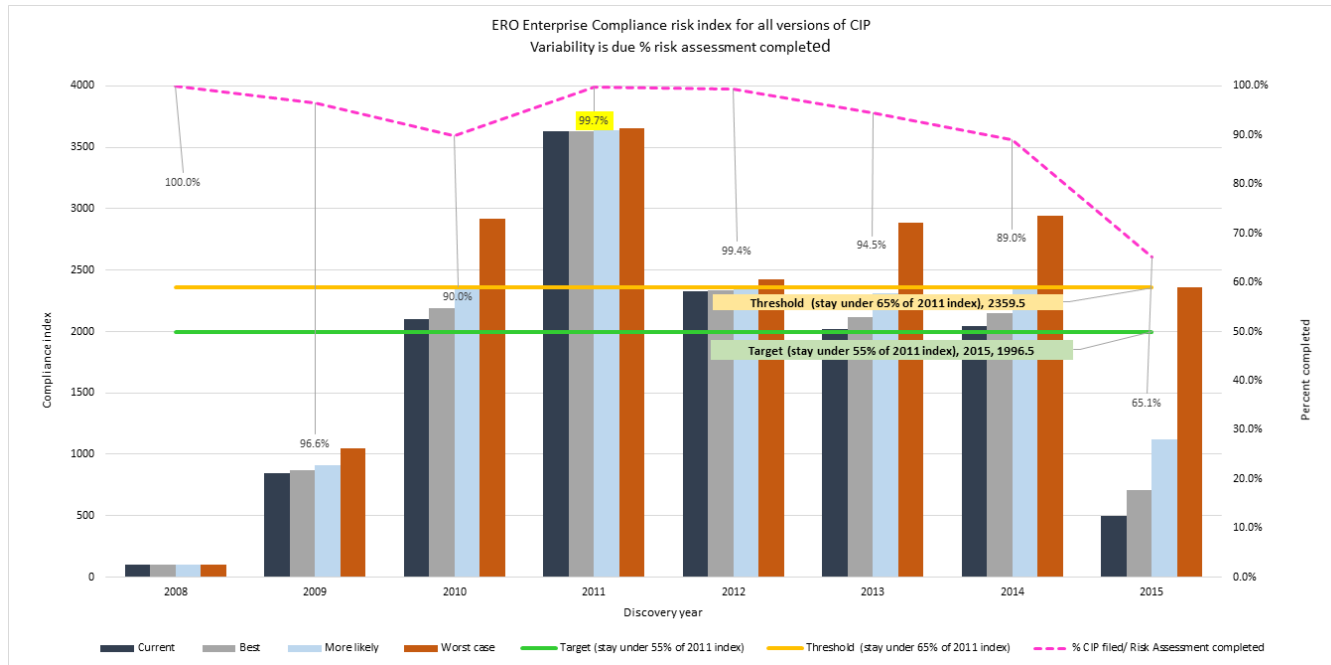


Figure 4:

## Monthly Capacity Weighted EFORd 2009-2014

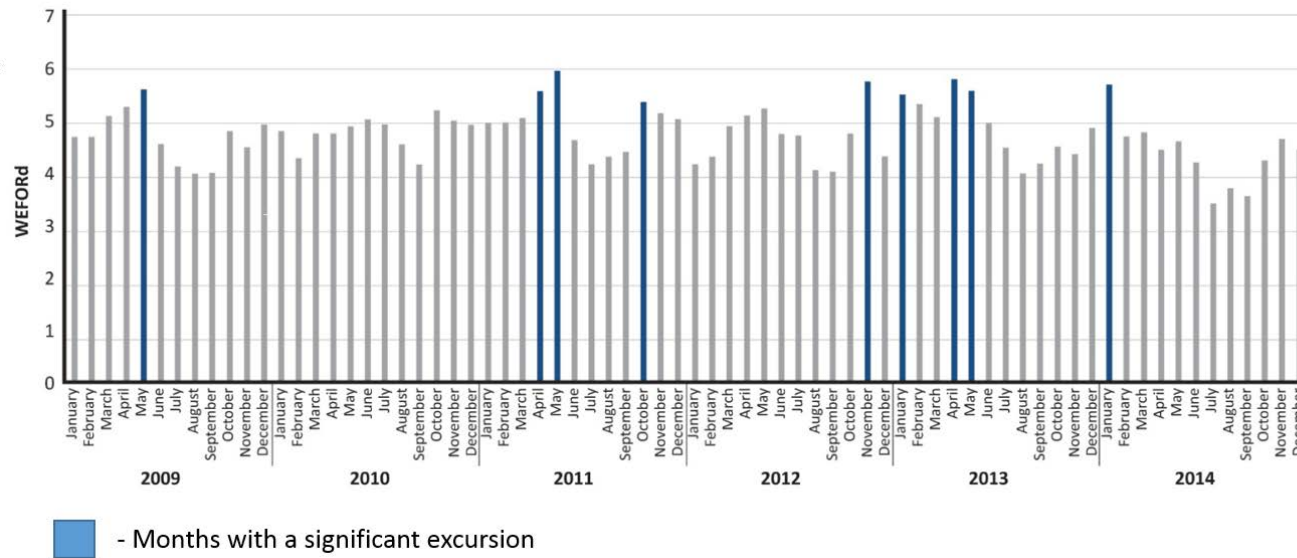
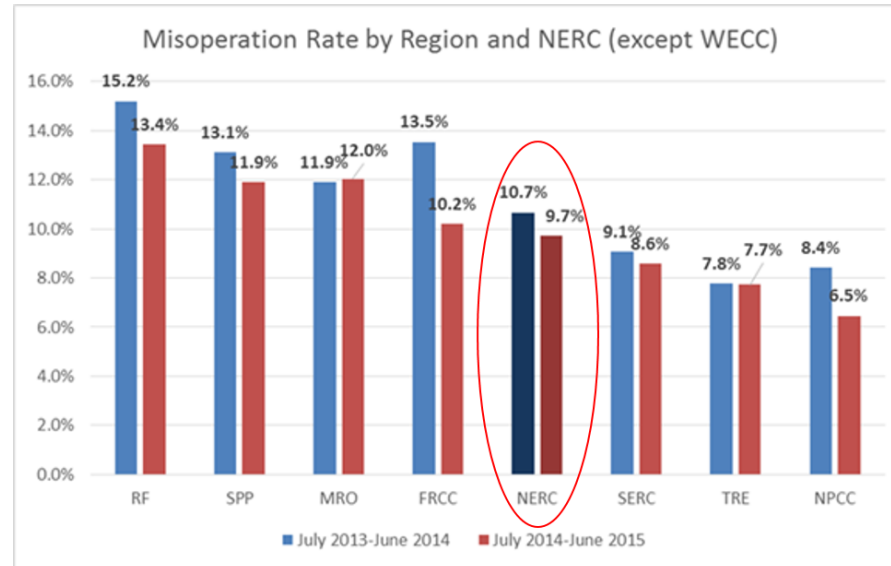


Figure 5:



Method SOR:

Q4 2013 - Q3 2014 : 10.4%  
Q4 2014 – Q3 2015 : 9.4%

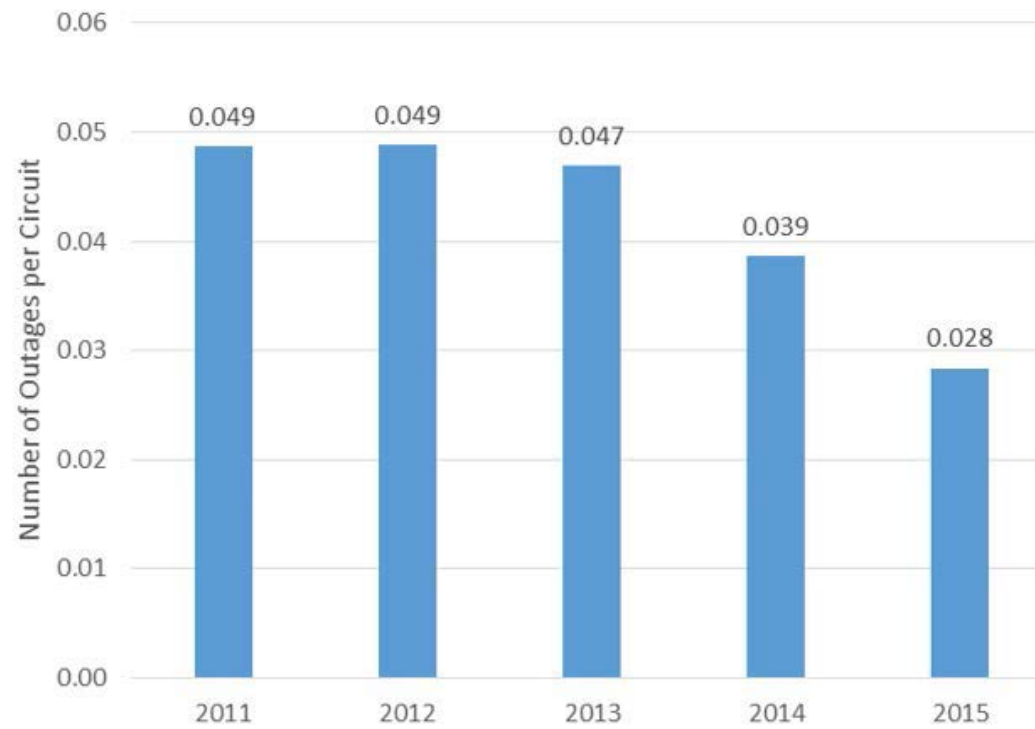
Method Annual Misoperations Report:

2013 : 10.1%  
2014 : 9.8%  
2015: 9.5%

Method using Q3-Q2:

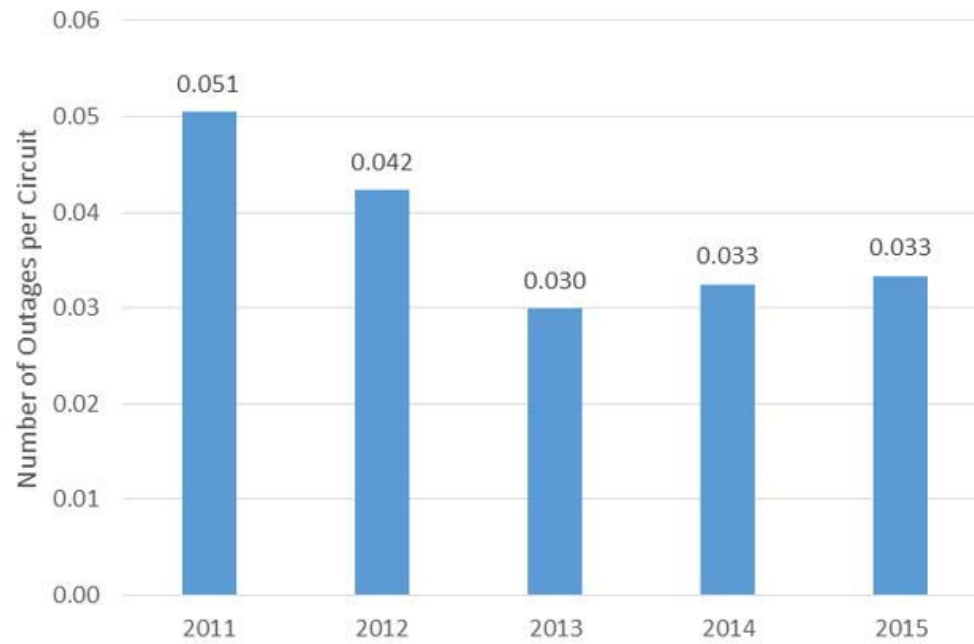
July 2013 – June 2014 : 10.7%  
July 2014 – June 2015 : 9.7%

**Figure 6:**



Automatic AC Circuit Outages Initiated by Human Error

**Figure 7:**



Automatic AC Circuit Outages Initiated by Failed AC Substation Equipment



Figure 8:

Qualified Events with Transmission Loss, Failed Equipment, and Firm Load Loss

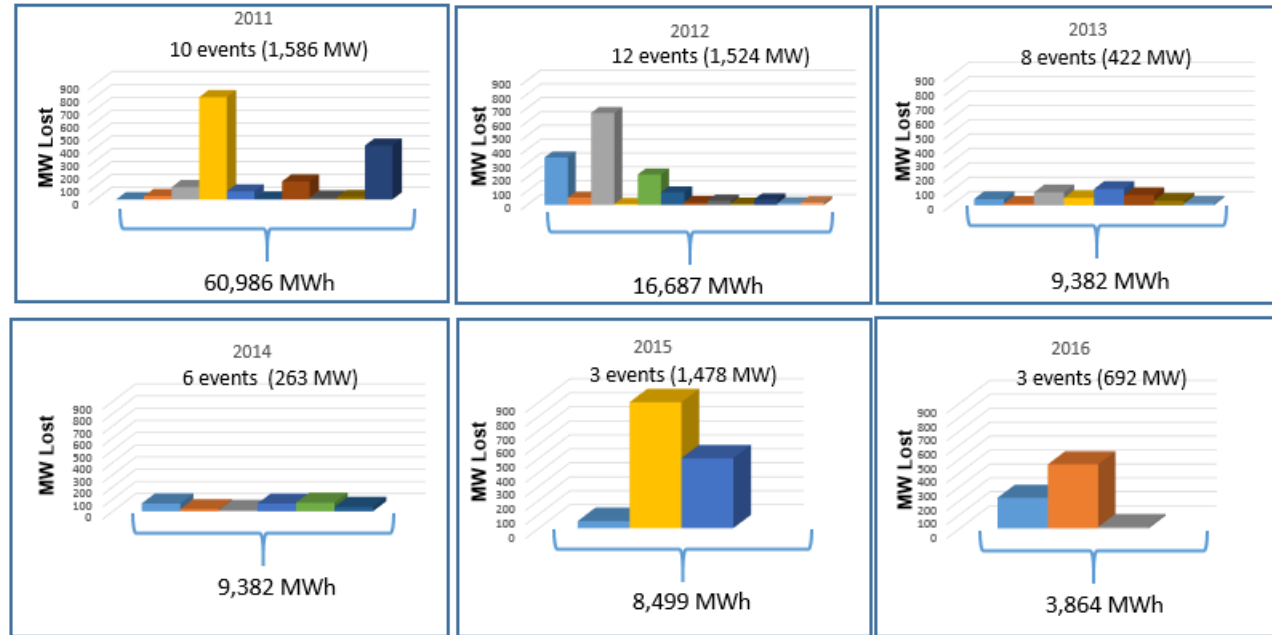


Figure 9:

Date	Time	RC	BA	Region	Deficient MW	Duration	Load Shed MW
9/20/2015	13:05	Peak	CISO	WECC	150 MW	2hr 56 min	150 MW
12/4/2014	15:05	HQT	HQT	NPCC	796 MW	3hr 05 min	796 MW
8/22/2014	14:00	FRCC	HST	FRCC	15 MW	2 hr	0.0
8/21/2014	14:12	FRCC	HST	FRCC	15 MW	3 hr 51 min	0.0
1/7/2014	7:41	VACAR So	PJM	SERC	300 MW	3 hr 20 min	300 MW
9/2/2013	15:31	Peak	LDWP	WECC	0 MW	4 min	0.0
8/29/2013	11:38	Peak	CFE	WECC	500 MW	3 hr 27 min	100 MW
8/5/2013	22:45	SPP	BRAZ	SPP	24 MW	1 hr 30 min	0.0
7/2/2013	16:22	AESO	AESO	WECC	200 MW	1 hr 1 min	0.0
6/17/2013	16:16	FRCC	TEC	FRCC	100 MW	1 hr 44 min	0.0
4/1/2013	17:40	SPP	BRAZ	SPP	50 MW	9 hr 6 min	0.0

**Figure 10:**

***NERC Budget vs Actual Variance***  
***Expenditures With and Without Reserves***  
***\$(000)s***

<b>Budget Year</b>		<b>Actual</b>	<b>Budget</b>	<b>Over (Under)</b>	<b>Threshold Met</b>	<b>Target Met</b>
<b>2011</b>	Excluding reserves	45,436	48,726	(3,290)	YES	
	Including reserves	51,331	48,726	2,605		NO
<b>2012</b>	Excluding reserves	49,788	53,112	(3,324)	YES	
	Including reserves	51,200	53,112	(1,912)		YES
<b>2013</b>	Excluding reserves	53,373	54,293	(920)	YES	
	Including reserves	54,709	54,293	416		NO
<b>2014</b>	Excluding reserves	52,279	56,390	(4,111)	YES	
	Including reserves	53,140	56,390	(3,250)		YES
<b>2015</b>	Excluding reserves	57,598	57,299	299	NO	
	Including reserves	59,071	57,299	1,772		NO