Reliability Standards Analysis and Assessment

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Reliability Standards Analysis and Assessment

Background:

- NERC Resources Subcommittee and Frequency Working Group are responsible for reliability standards development and monitoring performance
- NERC has requested CERTS support for research and analysis
- Research activity related to standards development and testing is continuing
- Current activities include
  - Frequency Event Detection and Reporting
  - Frequency Control Performance Report
  - Performance assessment of the new Balancing Authority Ace Limit (BAAL) standard
  - Analysis function is planned to be transitioned to NERC Staff
Reliability Standards Analysis and Assessment

Objective:

Perform analysis to assess grid performance and standards development

- Perform grid reliability metrics analysis using data collected in CERTS applications as requested by the Resources Subcommittee

- Analyze collected data to assess reliability performance at different levels – Interconnection, Reliability Coordinator, Balancing Authority

- Perform analysis, testing, and monitoring of current and proposed reliability standards

Analysis Presented to and Used by NERC Resources Subcommittee and RS-Frequency Working Group
Reliability Standards Analysis and Assessment

Tasks:

- Monthly frequency response event collection and analysis
- Monthly frequency device check
- Provide quarterly frequency control performance report and time error correction report for all four interconnections
Frequency Response Event Collection and Analysis

Background
- FERC Order No. 693 directed the ERO to define the number of Frequency Response surveys that were conducted each year and to define a necessary amount of Frequency Response.
- The RS initiated the Standards Authorization Request (SAR) for BAL-003 to put a measurement process in place so the adequacy of Frequency Response and the underlying issues can be objectively analyzed to enable informed decisions.

Accomplishment
- Worked closely with the NERC RS-FWG to define methodologies, test thresholds and formalize collection process in order to capture all significant frequency events for all four interconnections.
- Submitted frequency events monthly report to the NERC RS-FWG. These monthly summary reports are posted at the NERC RS website under “Candidate Frequency Events”.
- Captured over 1500 events since 2012 for all four interconnections. Around 500 events are used for Reliability Standard BAL-003-1 and around 500 events are used for Measure-4.
- Collected events data are used for FRS Form 1, Standard BAL-003-1, NERC Frequency Response Annual Analysis Report and State of Reliability Report.
2015 Frequency Event Counts and Frequency Response

– Event Type:
  ▪ Detected Event: detected by predefined thresholds
  ▪ Additional NERC SA Reported Event: reported by NERC S/A because they did not meet the significant event threshold criteria highlighted in pink
  ▪ Additional Low Event:
    • EI and the ERCOT: with Point C method highlighted in yellow
    • Quebec: Additional low events detected by lower threshold highlighted in grey
  ▪ Candidate Event= Detected Event+ Additional NERC SA Reported Event+ Additional Low Event
  ▪ Measure-4 Event: Selected by FWG from Candidate Event
  ▪ BAL-003 Event: Selected by FWG from Candidate Event
<table>
<thead>
<tr>
<th>2015 Event Type</th>
<th>Detected Event Count</th>
<th>Additional NERC SA Reported Event Count</th>
<th>Additional Low Event Count</th>
<th>Total Event Count</th>
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</thead>
<tbody>
<tr>
<td><strong>Eastern</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Candidates Events</td>
<td>140</td>
<td>73</td>
<td>32</td>
<td>245</td>
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<tr>
<td>M4 Events</td>
<td>36</td>
<td>0</td>
<td>0</td>
<td>36</td>
</tr>
<tr>
<td>BAL3 Events</td>
<td>30</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td><strong>Western</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Candidates Events</td>
<td>46</td>
<td>10</td>
<td>0</td>
<td>56</td>
</tr>
<tr>
<td>M4 Events</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>BAL3 Events</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>25</td>
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<tr>
<td><strong>ERCOT</strong></td>
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<tr>
<td>Candidates Events</td>
<td>55</td>
<td>9</td>
<td>10</td>
<td>74</td>
</tr>
<tr>
<td>M4 Events</td>
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<td>0</td>
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<td>34</td>
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<td>BAL3 Events</td>
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<td>2</td>
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<td>37</td>
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<tr>
<td><strong>Quebec</strong></td>
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<td></td>
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<tr>
<td>Candidates Events</td>
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<td>2</td>
<td>7</td>
<td>52</td>
</tr>
<tr>
<td>M4 Events</td>
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</tr>
<tr>
<td>BAL3 Events</td>
<td>28</td>
<td>0</td>
<td>1</td>
<td>29</td>
</tr>
</tbody>
</table>

- Eastern and Western: None pink and yellow event are selected for M-4 and BAL-003
- ERCOT: Two pink events are selected for BAL-003
- Quebec: One grey event is selected for M-4 and BAL-003
CERTS-EPG and NERC Work Transition Status

- Target: Last report (June report) will be provide on July
- NERC staff performed parallel work since December 2015
- NERC and CERTS-EPG events detection mismatch analysis
  - Almost all the events not found in CERTS-EPG list are small events which are lower than the detection threshold 36mHz
  - NERC event list missed 8 significant events selected by frequency working group


<table>
<thead>
<tr>
<th></th>
<th>Total Event</th>
<th>CERTS-EPG Missing</th>
<th>NERC Missing</th>
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<tbody>
<tr>
<td>Detected Events</td>
<td>107</td>
<td>11</td>
<td>41</td>
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<tr>
<td>FWG Selected Significant Events</td>
<td>22</td>
<td>0</td>
<td>8</td>
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Quarterly Frequency Performance Control Report

- On an quarterly basis, EPG uses the 1-minute NERC frequency data to prepare frequency control performance report for submittal to the NERC Resources Subcommittee for their review
  - Monthly CPS1, CSP2,
  - Yearly frequency deviation profile
  - Last 6 years frequency histogram
  - Hourly average of frequency deviation
  - Daily performance for RMS1, RMS10 and RMS60 of frequency deviation
  - Yearly RMS1 and RMS10 Profile of frequency deviation
  - Daily RMS1 of frequency deviation
  - Daily average of frequency deviation
  - Quarterly Time Error Report

- Last funded report presented on RS January meeting
RS has obligation to review the frequency control performance trend.
New Standard BAAL (Balancing Authority ACE Limit)

- New standard BAAL to replace current CPS2 in July 2016
- WECC CPS2 has been decreasing since 22 WECC BAs participated in field trial with CPS2 waiver on March 2010
- NERC RS needs CERTS-EPG help to monitor frequency control performance
- CERTS-EPG helped NERC BAAL standard drafting group since 2005
Next Steps

- Continue to produce and deliver monthly frequency response event report to NERC-RS and the industry as CERTS-EPG has done during the last 4 years until NERC is really ready

- Support the NERC Resource Subcommittee (RS) for the implementation of New Standard BAAL and monitor the BA performance
Q & A