

September 23, 2009



**VIA ELECTRONIC FILING**

Ms. Kimberly D. Bose  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, D.C. 20426

**Re: *North American Electric Reliability Corporation,*  
Docket No. RM09-\_\_-000**

Dear Ms. Bose:

The North American Electric Reliability Corporation (“NERC”) hereby submits this informational filing describing the background and status of a field trial (“Field Trial”) approved under NERC’s Reliability Standards Development Process. The purpose of the field trial is to examine the results of proposed revisions to certain NERC Resource and Demand Balancing Reliability Standards. NERC has exercised its discretion by waiving compliance with Requirement R2 of BAL-001-0 for entities participating in the Field Trial as discussed in the filing.

NERC’s informational filing consists the following:

- This transmittal letter;
- A table of contents for the filing;
- A narrative background and description of the Field Trial;
- Eastern Interconnection Proof-of-Concept Field Trial **Exhibit A**
  - Attachment A-1 — Field Trial Data Submittal Format
  - Attachment A-2 — Proposed Frequency Monitoring and Response Process for Reliability Coordinators in the Eastern Interconnection
  - Attachment A-3 — Field Trial Implementation Plan

Attachment A-4 — Applicable Dates for the Balancing Authorities under the Field Trial

Attachment A-5 — Monthly Review Procedure

Attachment A-6 — Sample Calculations and Available Tools for BAL-007 Performance Evaluation

Attachment A-7 — Field Test Waivers of CPS2 Compliance

- Reliability-Based Control Standard Authorization Request — **Exhibit B**
- Field Trial Performance Data — **Exhibit C**
- Project 2007-18 Schedule — **Exhibit D**
- Sample CPS1 and BAAL Curves and CPS2 L<sub>10</sub> for Median-Size Balancing Authority on Eastern Interconnection — **Exhibit E**

Please contact the undersigned if you have any questions.

Respectfully submitted,

*/s/ Rebecca J. Michael*

Rebecca J. Michael

*Assistant General Counsel for North  
American Electric Reliability Corporation*



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Field Trial was approved by NERC in June 2005. Because compliance with the CPS2 standards, in accordance with the Reliability Standard BAL-001-0, Requirement R2, interferes with an entity’s performance and therefore affects the data collected under the Field Trial, NERC waived compliance with CPS2 measures under Requirement R2 for the Balancing Authorities who participated in the proof-of-concept Field Trial for the duration of the Field Trial. The initial Field Trial began in July 2005 prior to NERC’s certification as the Electric Reliability Organization (“ERO”) and continues today. The Field Trial was implemented in steps, with additional Balancing Authorities added throughout the duration of the test. While all Field Trial participants currently operate in the Eastern Interconnection, discussions are underway to bring members of the Western Electricity Coordinating Council into the Field Trial in 2009. The Balancing Authorities currently participating in the Field Trial are shown in Table 1.

**Table 1.**<sup>1</sup>

Balancing Authority Participants in Initial Field Trial	Region	Start Date	Reliability Coordinator
American Electric Power (CSW)	SPP	September 1, 2005	SPP
Duke Energy Carolinas (DUK)	SERC	April 1, 2009	VACS
East Kentucky Power Cooperative (EKPC)	SERC	July 6, 2005	TVA
Entergy (EES)	SERC	July 6, 2005	ICTE
EON-US (LGEE)	SERC	April 1, 2008	TVA
Independent Electricity System Operator (IESO)	NPCC	March 1, 2008	IESO
Manitoba Hydro (MHEB)	MRO	July 6, 2005	MISO
Midwest Independent Transmission System Operator (MISO)	MRO; RFC;SERC	January 6, 2009	MISO
PJM Interconnection (PJM)	RFC	August 1, 2005	PJM
Santee Cooper (SC)	SERC	March 1, 2006	VACS
Southern Company (SOCO)	SERC	October 15, 2005	SOCO
Tennessee Valley Authority (TVA)	SERC	October 1, 2005	TVA

<sup>1</sup> Acronyms in the left column correspond to TSIN identifiers.

In September 2006, the standard drafting team sponsoring the Field Trial presented the initial test results to the NERC Operating Committee and discussed the intent to request the Standards Committee to ballot the draft Resource and Demand Balancing Reliability Standards. In the ensuing discussions, the Operating Committee expressed concerns related to allowing Balancing Authorities more time to correct ACE after the sudden, unanticipated loss of generation if the team carried through on its proposal to retire the DCS. The primary concern was in the potential increase in unscheduled interchange and line loading. The NERC Operating Committee endorsed the adoption of the standards that were to be balloted and took the position that the DCS should remain in effect and be eliminated only after a further satisfactory Field Trial.

In April 2007, the ballot of the Resource and Demand Balancing Reliability Standards failed because, in the opinion of some commenters, the standards did not address transmission loading that could occur while unbalanced operation was supporting the Interconnection frequency. Importantly, no transmission loading or other reliability-related issues attributable to the Field Trial had been identified by the Reliability Coordinators in the Eastern Interconnection.

Because a failed ballot concludes the drafting process, the standard drafting team drafted a new standard authorization request (“SAR”) in May 2007. The SAR addressed the transmission-related concerns identified in the ballot comments, retained the prior work on the frequency-related standards, and added purpose statements to address short-duration frequency deviations associated with ramping of on/off-peak schedules, and timely actions to provide congestion relief. The timing of this SAR immediately

following the conclusion of the failed ballot permitted the NERC Standards Committee to authorize the continuation and expansion of the Field Trial.

In June 2007, NERC reaffirmed its support of the Field Trial and continued the waiver of CPS2 for Field Trial participants. After the SAR drafting team completed the refinement of the request, in November 2007, the Standards Committee approved a Reliability-Based Control Standard Drafting Team (“RBCSDT”) and established NERC Project 2007-18 to continue the development of the standards. Additional Balancing Authorities were encouraged to participate in the Field Trial so that the impact of full operation under the draft standard could be further evaluated over a larger group of participants and to determine whether operation under the proposed Balancing Authority ACE limits affects transmission system loading.

## II. NOTICES AND COMMUNICATIONS

Notices and communications with respect to this filing may be addressed to the following:

Rick Sergel  
President and Chief Executive Officer  
David N. Cook\*  
Vice President and General Counsel  
North American Electric Reliability Corporation  
116-390 Village Boulevard  
Princeton, NJ 08540-5721  
(609) 452-8060  
(609) 452-9550 – facsimile  
david.cook@nerc.net

Rebecca J. Michael\*  
Assistant General Counsel  
Holly A. Hawkins\*  
Attorney  
North American Electric Reliability Corporation  
1120 G Street, N.W.  
Suite 990  
Washington, D.C. 20005-3801  
(202) 393-3998  
(202) 393-3955 – facsimile  
rebecca.michael@nerc.net  
holly.hawkins@nerc.net

\*Persons to be included on FERC’s service list are indicated with an asterisk. NERC requests waiver of FERC’s rules and regulations to permit the inclusion of more than two people on the service list.

## III. FIELD TRIAL DESCRIPTION

Under the Proof-of-Concept Field Trial (“Field Trial”), each participating Balancing Authority balances resources and demand, and takes corrective action as needed, so that its clock-minute ACE does not exceed its clock-minute Balancing Authority ACE Limit (“BAAL”) for more than thirty consecutive clock-minutes. To properly evaluate the effectiveness of the proposed approach through the Field Trial without impact from potentially harmful CPS2 compliance actions, participating Balancing Authorities have an exemption from compliance with CPS2, but are required to comply with all other approved Reliability Standards.

The associated Reliability Coordinators monitor the performance of each participating Balancing Authority and the actual frequency against sets of frequency

limits: frequency trigger limits, frequency abnormal limits, and frequency reliability limits. Based on the Interconnection's actual frequency deviation with respect to the frequency limits for the Interconnection, the Reliability Coordinator may direct some or all of its Balancing Authorities to take corrective actions to move frequency into an acceptable range as follows:

- If a frequency trigger limit ("FTL") is exceeded for more than 5 consecutive clock-minutes, each Reliability Coordinator with one or more Balancing Authorities operating outside the BAAL, may direct the Balancing Authority(ies) to return to within its BAALs to help bring frequency back to within the FTLs. If a frequency abnormal limit ("FAL") is exceeded, each Reliability Coordinator may direct any of its Balancing Authorities contributing to the frequency deviation, to take corrective action even if the Balancing Authority(ies) is not operating outside its BAALs.
- If a frequency reliability limit ("FRL") is exceeded, frequency relays should operate to partially address the condition while other actions are implemented including, but not limited to, directives to Balancing Authorities to take corrective ACE action in support of the Interconnection frequency.

By the tenth working day of each month, each participating Balancing Authority provides the standard drafting team with its clock-minute data for the prior operating month supporting its performance under the Field Trial. In addition, the Balancing Authority provides explanations to the standard drafting team when the participating Balancing Authority's ACE exceeds the BAAL for more than 20 consecutive clock-minutes or for the longest duration event above 10 consecutive clock-minutes if BAAL is not exceeded for more than 20 minutes.

A complete description of the current Field Trial for the Reliability-Based Control SAR is included in **Exhibit A** and its attachments. The Field Trial description outlines the specific steps each Balancing Authority must take to be included in the Field Trial. These steps include a requirement to provide special training for the Balancing

Authorities' system operators and a requirement to maintain the capability to operate in compliance with the CPS2 if requested to cease operation under the Field Trial.

Attachment A-1 describes the data submittal format for the field trial participants.

Attachment A-2 addresses the actions Reliability Coordinators are expected to take if operating problems attributable to the real-time ACE of a participating Balancing Authority do occur. Attachments A-3 and A-4 present the Field Trial implementation plan and a schedule for the Balancing Authorities that are participating in the Field Trial.

The standard drafting team collects information regarding Field Trial performance, based on clock-minute data. The Field Trial monthly review procedure is documented in Attachment A-5, while supporting training and tools for performance evaluation are presented in Attachment A-6. Also included therein is a discussion of the comparison of the area control error limits under the Field Trial and CPS1 performance still being retained, describing the differences in response expected for various frequency schedules.

Attachment A-7 contains the NERC correspondence documenting the waiver of compliance to CPS2 for Field Trial participants.

**Exhibit B** of this filing is the 2007 SAR, as revised November 7, 2007, for development of a Reliability-Based Control Standard to address certain identified shortcomings in CPS2.

#### **IV. FIELD TRIAL RESULTS**

Approximately 67 percent of the load within the Eastern Interconnection is represented by the Balancing Authorities operating under the Field Trial, and for the duration of the Field Trial to date, no transmission loading or other reliability-related issues have been cited by the Reliability Coordinators as attributable to operations under

the Field Trial. Summaries of the test results are shown in the table in **Exhibit C**. Table 1 of the exhibit shows the maximum number of consecutive clock-minutes that ACE exceeded the high and low BAAL for each participating Balancing Authority under the Field Trial through June 2009, along with each of the 12 participating Balancing Authority's performance for the month of June 2009. The bottom row of the table shows that the maximum time that a BAAL was exceeded by any participant was 43 consecutive clock-minutes, through June 2009. At no time during the Field Trial has a Balancing Authority or Reliability Coordinator requested that the trial be suspended or special action be taken as a result of the BAAL being exceeded. Tables 2 and 3 of **Exhibit C** show the number of times that the duration of the high and low FTLs set for the Field Trial was exceeded for 1 minute or longer, up to 10 minutes. The month in which the FTL was exceeded is also shown. Field trial procedures propose that the Reliability Coordinators initiate action when the FTL is exceeded for more than 5 minutes, with additional actions to be taken as the limit is exceeded by 10 minutes. The tables show that the FTLs were rarely exceeded for more than 10 minutes.

## **V. FIELD TRIAL OVERSIGHT**

The RBCSDT is responsible for oversight of the Field Trial under the auspices of the NERC Standards Committee. The drafting team holds a conference call and WebEx session monthly to update the NERC Resources Subcommittee, Operating Reliability Subcommittee, and Reliability Coordinator Working Group on the performance of the Field Trial and to request feedback. The agenda includes discussion on whether there were any transmission loading or other reliability-related issues in the prior or current month regarded as attributable to operation under the Field Trial. Information is provided

regarding Interconnection frequency and individual Balancing Authority performance for the prior month, with charts of events including the longest-duration FTL and BAAL exceedance. If for any reason a participating Balancing Authority's ACE exceeded its BAAL for more than 30 consecutive clock-minutes in the prior month, the Balancing Authority's explanation of the event is discussed to determine if any provisions of the Field Trial need to be changed. The chair of the drafting team provides a copy of the explanation of the circumstances to the Balancing Authority's Regional Entity for those cases in which BAAL is exceeded for more than 30 consecutive clock-minutes. The Reliability Coordinators for the participating Balancing Authorities also monitor the performance under the Field Trial and provide information to support the monthly analysis as needed.

## **VI. PROJECT 2007-18 SCHEDULE**

**Exhibit D** shows the current schedule for Project 2007-18, including the steps taken since NERC's Standards Committee authorized the project. The Field Trial schedule has been extensively revised in recent months. The RBCSDT is working with the WECC Operating Committee to establish the parameters for a Field Trial in the Western Interconnection. It is anticipated that sufficient Balancing Authorities in the Western Interconnection will begin operating under the Field Trial in the first quarter of 2010. The Field Trial will continue for one year in the Western Interconnection to demonstrate satisfactory performance. The RBCSDT anticipates developing new standard requirements to address purpose statements B and C of the SAR by the end of 2009. Work on purpose statement D is deferred pending the results of purpose statement B, as these two items are potentially related. This will result in a revision to certain

parameters of the Field Trial in October of 2010. All Balancing Authorities under the Field Trial will continue to operate to the new requirements for six months. At this point, the RBCSDT will analyze the overall results of the field trial and prepare documentation for balloting of the proposed standard. The Field Trial may be extended through the ballot period to minimize operational changes for the participating Balancing Authorities if supported by the Standards Committee. Balloting for the proposed new standards is expected to be completed during the second half of 2011.

## **VII. WAIVER OF COMPLIANCE**

Compliance to CPS2 requires ACE to move within its  $L_{10}$  value without regard to whether this helps or hurts Interconnection frequency or transmission loading or other reliability-related problems. However, compliance with proposed BAL-007 always drives corrective action in a direction that supports the Interconnection frequency, and the BAAL becomes increasingly more restrictive than the corresponding CPS2  $L_{10}$  as Interconnection frequency deviates further from 60 Hz. Further, CPS2 does not prevent Balancing Authorities from “dragging” on the system because the CPS2  $L_{10}$  can be exceeded for up to ten percent of the ten-minute periods per month (approximately 74 hours in a 31-day month).

Although there are valid reasons supporting application of the 90 percent requirement for CPS2, it is very possible for a Balancing Authority to “drag” by hundreds of MW for long periods, irrespective of its impact to Interconnection frequency or transmission constraints, and still be compliant under CPS2 at the end of the month. Since the Field Trial began on July 6, 2005, in support of the initial standard development effort, and continues in support of the subsequent development effort, there have been no

reports from the Balancing Authorities under the Field Trial or the Reliability Coordinators of increased dragging on the system or transmission-related or other reliability-related problems associated with the Field Trial. To properly evaluate the impact of operating to the new BAAL and frequency limits during the Field Trial, the participating Balancing Authorities cannot also be operating to the CPS2 obligations. Because CPS2 compliance actions could possibly result in harmful frequency support, as discussed above and in **Exhibit E**, the RBCSDT, with the approval of NERC, requested that participating Balancing Authorities operate only to the BAAL and frequency limits so it could faithfully evaluate the merits of the proposed approach based on the Field Trial results. Attachment A-7 of Exhibit A documents the waivers NERC has granted for compliance with CPS2 for participants in the Field Trial.

## VIII. CONCLUSION

NERC submits this informational filing to advise FERC of the status and progress to date with respect to NERC waivers of compliance with Requirement R2 of BAL-001-0 for those entities participating in the Field Trial associated with the current standards Project 2007-18 — Reliability-based Control. Additional Field Trial experience is required to validate the concepts under contemplation by the drafting team. Additional Field Trials will also allow the industry to gain the experience with the proposed changes to ensure that the industry has sufficient knowledge of the changes to make an informed decision during the balloting process. No FERC action is requested at this time.

Respectfully submitted,

Rick Sergel  
President and Chief Executive Officer  
David N. Cook  
Vice President and General Counsel  
North American Electric Reliability Corporation  
116-390 Village Boulevard  
Princeton, NJ 08540-5721  
(609) 452-8060  
(609) 452-9550 – facsimile  
david.cook@nerc.net

/s/ Rebecca J. Michael  
Rebecca J. Michael  
Assistant General Counsel  
Holly A. Hawkins  
Attorney  
North American Electric Reliability  
Corporation  
1120 G Street, N.W.  
Suite 990  
Washington, D.C. 20005-3801  
(202) 393-3998  
(202) 393-3955 – facsimile  
rebecca.michael@nerc.net  
holly.hawkins@nerc.net

**CERTIFICATE OF SERVICE**

I hereby certify that I have served a copy of the foregoing document upon all parties listed on the official service list compiled by the Secretary in this proceeding.

Dated at Washington, D.C. this 23rd day of September, 2009.

*/s/ Holly A. Hawkins* \_\_\_\_\_  
Holly A. Hawkins

*Attorney for North American Electric  
Reliability Corporation*

## **Exhibit A**

# **Eastern Interconnection Proof-of-Concept Field Trial**

## Exhibit A — Eastern Interconnection Proof-of-Concept Field Trial

### Overview

The Reliability-based Control SAR includes the purpose statements:

A) To maintain Interconnection frequency within predefined frequency limits under all conditions (i.e., normal and abnormal), to manage frequency-related issues such as frequency oscillations, instability, and unplanned tripping of load, generation or transmission, that adversely impact the reliability of the Interconnection. (Work brought into this SAR from [Draft BAL-007 through BAL-011](#)).

B) To support corrective action by the BA when its excessive Area Control Error, as determined by this standard, may be contributing to or causing action to be taken to correct an SOL or IROL problem.

C) To prevent Interconnection frequency excursions of short-duration attributed to the ramping of Interchange Transactions.

D) To support timely congestion relief by requiring the Balancing Authority to employ corrective load/generation management within a defined timeframe when participating in transmission loading relief procedures.

E) To address the directives of FERC Order 693:

1. Add data retention requirements to all standards.
2. Require a continent-wide contingency reserve policy.
3. Modify BAL-003 — Frequency Response and Bias.
4. Require minimum Regulating Reserves for a Balancing Authority.

Small groups of Balancing Authorities were brought under the generation control criteria of the draft standard BAL-007 beginning in July 2005. Under the Proof-of-Concept Field Trial (“Field Trial”), each Balancing Authority balances resources and demand, and takes corrective action as needed, so that its clock-minute ACE does not exceed its clock-minute Balancing Authority ACE Limit (“BAAL”) for more than 30 consecutive clock-minutes. Below is a list of the Balancing Authorities currently under the Field Trial.

Balancing Authority Participants	2009 Bias	Region	Reliability Coordinator	Start Date
American Electric Power (CSW)	-102.3	SPP	SPP	September 1, 2005
Duke Energy Carolinas	-201	SERC	VACS	April 1, 2009
East Kentucky Power Cooperative (EKPC)	-37.9	SERC	TVA	July 6, 2005
Entergy (EES)	-223.3	SERC	ICTE	July 6, 2005
EON-US (LGEE)	-92	SERC	TVA	April 1, 2008
Independent Electricity System Operator (IESO)	-285	NPCC	IESO	March 1, 2008
Manitoba Hydro (MHEB)	-44.9	MRO	MISO	July 6, 2005

Midwest Independent Transmission System Operator (MISO)*	-1106	MRO, RFC, SERC	MISO	January 6, 2009
PJM Interconnection (PJM)	-1344	RFC	PJM	August 1, 2005
Santee Cooper (SC)	-79.6	SERC	VACS	March 1, 2006
Southern Company (SOCO)	-465	SERC	SOCO	October 15, 2005
Tennessee Valley Authority (TVA)	-319.2	SERC	TVA	October 1, 2005

\* Upon entry of the Midwest ISO into the Field Trial on January 6, 2009, the ALTE, ALTW, CIN, MECS, NIPS and WEC Balancing Authorities ceased operating under the Field Trial as their areas are now included within the MISO Balancing Authority Area. The six Balancing Authorities started operating under in the Field Trial between July and September of 2005.

Along with the Balancing Authorities listed above, the Reliability Coordinators of ICTE, MISO, SOCO, SPP, TVA and VACS have monitored the performance of the Balancing Authorities within their respective areas, and other systems have provided information to support the monthly analysis of the Field Trial. It is important to note that approximately 67 percent of the projected 2009 peak load within the Eastern Interconnection is represented by the Balancing Authorities operating under the Field Trial and, for the duration of the Field Trial to date, no transmission loading or other reliability-related issues have been cited by the Reliability Coordinators as being attributed to operations under the Field Trial.

Under the expansion of the Field Trial, new Balancing Authorities will be brought under the generation control criteria of the draft standard BAL-007, requiring the participating Balancing Authorities to operate and report performance under the provisions stated in the draft standard BAL-007 and this document including attachments. The Reliability-based Control Standard Drafting Team (RBCSDT) will contact the volunteer Balancing Authorities to coordinate the start of actual operation to the draft standard BAL-007 on the date approved by the RBCSDT.

### **Field Trial Preparation**

Prior to the RBCSDT approval to operate under the Field Trial, each Balancing Authority must do the following:

- 1) Provide the RBCSDT with the name, phone number, and e-mail address of:
  - a. the primary contact for the Field Trial,
  - b. the party responsible for monthly performance reporting,
  - c. the director, manager, supervisor over Balancing Authority operations,
  - d. the compliance contact for its RRO
- 2) Provide one month or more of historic clock-minute data using the data format and calculations described in Attachment A to confirm the Balancing Authority's capability to accurately calculate and report performance under the Field Trial,
- 3) Provide screen-shots of the operator interface that will be used to monitor real-time performance under the Field Trial,

- 4) Provide confirmation that operators have been trained on the operator interface and actions that may be needed while under the Field Trial so that the clock-minute ACE does not exceed the BAAL for more than 30 consecutive clock-minutes, and
- 5) Provide contact information for its Reliability Coordinator and confirmation that the Reliability Coordinator has been contacted with regard to operating under the Field Trial. (One or more members of the RBCSDT will coordinate a joint conference call with BA and RC to discuss the Field Trial and the timing for beginning operation under the Field Trial.)
- 6) Provide verification that the Balancing Authority will maintain the capability to operate in compliance with the CPS2 requirement in the case where the Balancing Authority has been requested to cease operation under the Field Trial.

### **Field Trial Requirements**

For the duration of the Field Trial, the participating Balancing Authorities shall continue to be responsible for compliance under the NERC Reliability Standards including:

- BAL-001 — Real Power Balancing Control Performance (CPS1)
- BAL-002 — Disturbance Control Performance (DCS)

Prior to a Balancing Authority beginning operation under the Field Trial, the Reliability-Based Control Standard Drafting Team Chair will provide documentation to the NERC Standards Committee, the NERC Vice President and Director of Standards, and the NERC Vice President and Director of Compliance, requesting that the Balancing Authority be added to the list of participating Balancing Authorities waived of compliance to NERC CPS2 while operating under the Field Trial. Attachment G contains documentation of the NERC CPS2 waivers granted to the participating Balancing Authorities under the Field Trial.

Any requests for the Balancing Authority to take corrective action from the Reliability Coordinator shall be documented by the Balancing Authority (including the duration of the Reliability Coordinator request) and provided to the RBCSDT within 24 hours of such event. Upon receipt of notification from the Balancing Authority, the Chair of the RBCSDT will contact the Reliability Coordinator to determine if a conference call is necessary. If so, the Chair will set up a call between the RBCSDT, the Balancing Authority, and its Reliability Coordinator to determine what actions are necessary to address the issues raised by the Reliability Coordinator.

Participating Balancing Authorities shall be fully responsible for operating and reporting their performance under the draft BAL-007. Each Balancing Authority shall provide its clock-minute data for the first two weeks' operations under the Field Trial in the CSV format provided in Attachment A for analysis and review by the RBCSDT (for further information see Attachment C – Implementation Plan to be followed by the RBCSDT). For each calendar month of the Field Trial, each Balancing Authority will provide its clock-minute data for the prior month's operations to the RBCSDT by the tenth working day of following month in the CSV format provided in Attachment A.

### **Responsibility to Follow Reliability Coordinator Directives**

Recognizing the authority that the Reliability Coordinator has under the NERC standards for directing corrective action, the Reliability Coordinator over each participating Balancing Authority will have unquestioned authority to direct the participating Balancing Authority to take corrective action if any Reliability Coordinator experiences a problem on its system that it believes may be attributed to operations under the Field Trial.

If any Reliability Coordinator experiences a problem on its system that it believes may be attributed to the real-time ACE of a participating Balancing Authority, where that Balancing Authority's ACE has exceeded the BAAL, the Reliability Coordinator over the participating Balancing Authority may direct the Balancing Authority to restore its ACE within BAAL compliance limits immediately. At its discretion or at the request of a Reliability Coordinator experiencing a problem on its system, the Reliability Coordinator over the participating Balancing Authority may also direct the participating Balancing Authority to restore ACE within safe limits until the system problem is addressed. The Reliability Coordinator will notify the Balancing Authority when it can resume operations under the Field Trial.

In addition to the information provided above, Attachment B proposes actions to be taken by the Reliability Coordinator in consideration of abnormal Interconnection frequency.

### **Field Trial Performance Reporting**

For analysis of Control Performance Measure and Balancing Authority ACE Limit performance under the Field Trial, clock-minute data will be provided in monthly files by the tenth working day following the operating month to the RBCSDT as described in Attachment A.

On a monthly basis, each Balancing Authority will review its performance for the prior month and identify any periods where the ACE exceeded the low BAAL ("BAAL<sub>Low</sub>") or the high BAAL ("BAAL<sub>High</sub>") for more than ten consecutive clock-minutes. To help the RBCSDT gain a better understanding of the circumstances that all Balancing Authorities may be faced while operating under BAL-007, each Balancing Authority will provide a brief explanation of the circumstances related to any periods where the duration of consecutive clock-minutes exceeded twenty minutes. In the event that no period exceeded twenty minutes in the prior month, but the longest duration exceeded ten minutes, the Balancing Authority will provide a brief explanation of the circumstances related to that event. The brief explanations provided above will be for RBCSDT use and should be provided by the tenth working day following the operating month. In the event that the Balancing Authority exceeds 30 consecutive clock-minutes in restoring its ACE within the BAAL, the RBCSDT will request the Balancing Authority to provide a detailed account of the associated event to the Chair of the RBCSDT so that it can be reviewed by the RBCSDT and provided to the Balancing Authority's RRO(s) for informational purposes only.

**Early Termination or Withdrawal from the Field Trial**

The RBCSDT may terminate the Field Trial participation of one or more Balancing Authorities based upon the performance under the Field Trial. Balancing Authorities participating in the Field Trial shall immediately cease operating under the proposed standard BAL-007 if so directed by the RBCSDT as described in this document. Among other items, the RBCSDT will consider actions taken by the Balancing Authority when the BAAL was exceeded, whether there were events lasting more than 30 consecutive clock minutes, and whether a reliability-related problem was attributed to its operation under the Field Trial.

Any Balancing Authority may withdraw from the Field Trial upon notification to the RBCSDT of the date when it will cease operating under the Field Trial and be held responsible for compliance under CPS2. Withdrawal must occur at the end of a calendar month, with CPS2 compliance beginning the first day of the following month. Upon notification, the RBCSDT will contact the Standards Committee, the NERC Vice President and Director of Standards, and the NERC Vice President and Director of Compliance, of the change in Field Trial participation.

## ATTACHMENT A-1 — Field Trial Data Submittal Format

For analysis of Control Performance Measure and Balancing Authority ACE Limit (“BAAL”) performance under the Field Trial, clock-minute data will be provided in monthly files under the following Comma-Separated-Variable (“CSV”) format:

BA, Date, Time, Time Zone, ACE, FreqError, FreqBias, ActFreq, SchedFreq, AQC, FQC, BAAL\_Low, MinCtLow, BAAL\_High, MinCtHigh, <EOL>

<u>Field Name</u>	<u>Description/Type</u>
BA	BA acronym in NERC Registry (up to 4 characters)
Date	Date format (MM/DD/YY),
Time	24-hour time format (hh:mm),
TimeZone	3-character time-zone abbreviation (EST, EDT, CST, CDT, etc.)
ACE (REAL)	Clock-minute average Area Control Error (MW) (minimum of 1 digit to right of decimal point)
FreqError <i>Frequency Error is (REAL) Frequency.</i>	Clock-minute average Frequency Error (Hz) <i>equal to Actual Frequency minus Scheduled  (minimum of four digits to right of decimal point)</i>
FreqBias Hz) (REAL)	Clock-minute average Frequency Bias (MW/0.1  (same precision as implemented in EMS)
ActFreq (REAL)	Clock-minute average Actual Frequency (Hz) (minimum of four digits to right of decimal point)
SchedFreq (REAL)	Clock-minute average Scheduled Frequency (Hz) (minimum of two digits to right of decimal point)
AQC* (INTEGER)	ACE Quality Code (0=valid data, 1=bad data)
FQC* (INTEGER)	Frequency Quality Code (0=valid data, 1=bad data)
BAAL_Low (REAL)	BAAL <sub>Low</sub> (MW) (minimum of 1 digit to right of decimal point)
MinCtLow	Count of the consecutive minutes of negative ACE <

(INTEGER) BAAL<sub>Low</sub> when Actual Frequency is < 60 Hz.

BAAL<sub>High</sub> (REAL) BAAL<sub>High</sub> (MW)  
(minimum of 1 digit to right of decimal point)

MinCtHigh (INTEGER) Count of the consecutive minutes of positive ACE > BAAL<sub>High</sub> when Actual Frequency > 60 Hz.

\*If no quality code is available, then write 0 for all records. Ideally, the user should have the capability to update the quality code for the ACE and Frequency with each sample to flag whether that sample represents good or bad data. If over 50 percent of the samples of ACE for a given period have bad data, then AQC for that period should be flagged as "bad" for the ACE represented. If less than 50 percent of the samples represent bad data, then AQC for the period should be flagged as "good" using only the good samples of ACE for that period. Likewise, if over 50 percent of the samples of frequency for a given period have bad data, then FQC for that period should be flagged as "bad" for the frequency represented. If less than 50 percent of the samples represent bad data, then FQC for that period should be flagged as "good" using only the good samples of frequency for that period.

**Example CSV records:**

BA03,11/21/2004,10:00,EST, -10.2,-0.0080,-90.0,59.9920,60.00,0,0,-281.3,0,0,0,0  
 BA03,11/21/2004,10:01,EST, -2.5,-0.0100,-85.0,59.9900,60.00,0,0,-212.5,0,0,0,0  
 BA03,11/21/2004,10:02,EST, 1.6,-0.0070,-80.0,59.9930,60.00,0,0,-285.7,0,0,0,0  
 BA03,11/21/2004,10:03,EST, -309.0,-0.0370,-80.0,59.9630,60.00,0,0, -54.1,1,0,0,0  
 BA03,11/21/2004,10:04,EST, -310.4,-0.0420,-80.0,59.9580,60.00,0,0, -47.6,2,0,0,0  
 BA03,11/21/2004,10:05,EST, -312.5,-0.0540,-80.0,59.9460,60.00,0,0, -37.0,3,0,0,0

Note that the fourth row of data represents the first clock-minute record where the ACE of -309.0 MW was outside the BAAL<sub>Low</sub> boundary of -54.1 MW. As ACE remained outside the calculated BAAL boundary for the next two clock-minutes, "MinCtLow" was incremented for each record.

Note that column headings are not to be provided in the monthly CSV files.

**Monthly File Naming Convention**

Data shall be provided to the RBCSDT on a monthly basis no later than the tenth working day of the month using the following naming convention:

**YYYYMM\_BANN**.CSV, where YYYY is the four-digit year, MM is the two-digit month (01-12), and NN is the number assigned to the participating BA by the RBCSDT. For example, August 2005 data for BA03 should be written to the file named "200508\_BA03.CSV" and provided to the RBCSDT.

Once the data has been stored into the monthly CSV file, the user should then compress the file, typically 3-4 MB, into a "ZIP" file with the same naming convention (**YYYYMM\_BANN.ZIP**). Monthly data is to be provided via email no later than the tenth working day of the month to [doug.hils@duke-energy.com](mailto:doug.hils@duke-energy.com)

Questions should be directed to:

Doug Hils — Duke Energy

Midwest Control Area Operation  
513-287-2149  
[doug.hils@duke-energy.com](mailto:doug.hils@duke-energy.com)

### Calculation of Variables

The Balancing Authority ACE Limit (“BAAL”) should be calculated from the clock-minute averages of the data as follows:

$$\begin{aligned} \text{FTL}_{\text{Low}} &= 59.95 \text{ Hz} \\ \text{FTL}_{\text{High}} &= 60.05 \text{ Hz} \end{aligned}$$

Frequency Trigger Limits (“FTL”) for the Eastern Interconnection shown

$X$  = Actual Frequency – 60 Hz

(note: during time-error corrections, this variable is not equal to the Frequency Error which is always the sum of Actual Frequency minus Scheduled Frequency)

If  $X \leq 0$  then

$$\text{BAAL}_{\text{Low}} = (-10 * \text{Frequency Bias} * (\text{FTL}_{\text{Low}} - 60 \text{ Hz})^2) / (X - 0.000000001)$$

Else

$$\text{BAAL}_{\text{Low}} = 0.0$$

End If

If  $X > 0$  then

$$\text{BAAL}_{\text{High}} = (-10 * \text{Frequency Bias} * (\text{FTL}_{\text{High}} - 60 \text{ Hz})^2) / (X)$$

Else

$$\text{BAAL}_{\text{High}} = 0.0$$

End If

Needed to prevent division error when  $X = 0$  but will be insignificant in the calculation when  $X < 0$

The logic for the clock-minute counters (initialized at zero) would then use the logic:

If  $\text{BAAL}_{\text{Low}} < 0$  then

If  $\text{ACE} < \text{BAAL}_{\text{Low}}$  then

$$\text{MinCtLow} = \text{MinCtLow} + 1$$

Else

$$\text{MinCtLow} = 0$$

End If

$$\text{MinCtHigh} = 0$$

End If

If  $\text{BAAL}_{\text{High}} > 0$  then

If  $\text{ACE} > \text{BAAL}_{\text{High}}$  then

$$\text{MinCtHigh} = \text{MinCtHigh} + 1$$

Else

$$\text{MinCtHigh} = 0$$

End If

$$\text{MinCtLow} = 0$$

End If

# ATTACHMENT A-2 — Proposed Frequency Monitoring and Response Process for Reliability Coordinators in the Eastern Interconnection

## Introduction

This document outlines a proposed frequency monitoring and response process for the Eastern Interconnection.

## Short-Term Triggers (Reliability Coordinators (RC))

NOTE: If the frequency exceeds the FRL (Frequency Reliability Limit) or FAL (Frequency Abnormal Limit) High or Low then immediate action is required. The Frequency Trigger Limit (FTL) represents the initial frequency where the Reliability Coordinators should be directing corrective action if necessary.

Frequency	What	Actions
60.5	FRL High	1,4
60.2	FAL High	1,3
60.05 (if >10 minutes)	FTL High	1,2
60.05 (if >5 minutes)	FTL High	1
59.95 (if >5 minutes)	FTL Low	1
59.95 (if >10 minutes)	FTL Low	1,2
59.91	FAL Low	1,3
59.82	FRL Low	1,4

## Actions

1. Look for Bas (Balancing Authorities) within your area beyond BAAL (Balancing Authority ACE Limit). Direct correction and log in RCIS (Reliability Coordinator Information System) under Frequency section.
2. Direct BAs beyond BAAL to correct ACE (Area Control Error). Call Other RCs, communicate problem if known. Ask for cause if none reported. Log in RCIS under Frequency section. Notify Time Monitor of event and problem (if known). Time Monitor logs event and problem.
3. Direct all BAs with ACE hurting frequency to correct. Call other RCs, communicate problem if known. Ask for cause if none is reported. Log in RCIS under Frequency section. Notify Time Monitor of event and problem (if known). Time monitor logs event and problem.
4. Evaluate whether still interconnected. Direct emergency action. Call other RCs, communicate problem if known. Ask for cause if none is reported. Log in RCIS under Frequency section. Notify Time Monitor of event and problem (if known). Time monitor logs event and problem.

RCs should also log any other unusual frequency events and report to the Time Monitor.

The Time Monitor will notify the Resources Subcommittee for all events logged by Time Monitor.

Metric	What	Actions
+/- 0.031Hz	Hourly Average	Call Other RCs, communicate problem if known. Ask for cause if none reported. Log in RCIS under Frequency section. Notify Time Monitor of event and problem (if known). Time Monitor logs event and problem.
28 mHz	Changes in one-minute average frequency deviation	Call Other RCs, communicate problem if known. Ask for cause if none reported. Log in RCIS under Frequency section. Notify Time Monitor of event and problem (if known). Time Monitor logs event and problem.
28 mHz	Change over 10 seconds (future-in CERTS)	Scan for corresponding ACE changes to capture unit trips for frequency response benchmarking. Call Other RCs, communicate problem if known. Ask for cause if none reported. Log in RCIS under Frequency section. Notify Time Monitor of event and problem (if known). Time Monitor logs event and problem.

### Longer-Term Triggers and Benchmarks (Resources Subcommittee)

Metric	What	Actions
+/- 0.031Hz	Hourly Average	AIE Survey if no problem known. If problem known, survey entities involved to determine any lessons. Maintain record
20 mHz	Daily RMS1	Evaluate Day and determine need for survey. Maintain Record
16.8 mHz	Weekly RMS1	Evaluate Week and determine underlying cause. Maintain Record
28 mHz	Changes in one-minute average frequency deviation	If problem is known, maintain for excursion benchmarking. If problem is not known, ACE survey to determine problem.
28 mHz	Change over 10 seconds (future-in CERTS)	Scan for corresponding ACE changes to capture unit trips for frequency response benchmarking. If problem is not known, ACE survey to determine problem.

# **ATTACHMENT A-3 — Field Trial Implementation Plan**

## **Updated 03-03-2009**

### **Overview**

The additional of Balancing Authorities under the Field Trial will be coordinated by the RBCSDT in the following phases:

### **February 2008**

- 1) Early in February 2008 and prior to the Monthly Field Trial Review conference call, the Independent Electricity System Operator (IESO) will confirm that it is ready to commence operation under the Field Trial on March 1, 2008. The RBCSDT will verify that the IESO has met the requirements for participation in the Field Trial as described in this document and that the adjoining RCs are aware of the participation.
- 2) The RBCSDT will review January 2008 operation under the Field Trial at its monthly review of operations in the latter part of February 2008 and will gather input from the Resources Subcommittee, Operating Reliability Subcommittee and Reliability Coordinator Working Group to determine if there were any reliability issues attributed to the Field Trial that need to be considered by the RBCSDT.
- 3) During the conference call, the RBCSDT will ask for feedback from the Balancing Authorities and the Reliability Coordinators, including suggestions on how the Field Trial can be enhanced.
- 4) Based on the data and feedback provided back to the RBCSDT, among other items, the RBCSDT determined that no actions were needed with regard to the Field Trial.

### **Phase A:**

- 5) The IESO, representing a summer peak load of approximately 25,450 MW, will begin operating to the proposed BAL-007 standard on March 1, 2008.
- 6) The RBCSDT will review the first two weeks of operation under the Field Trial at its monthly review of operations in the latter part of March 2008 and will gather input from the Resources Subcommittee, Operating Reliability Subcommittee, and Reliability Coordinator Working Group to determine if there were any reliability issues attributed to the Field Trial that need to be considered by the RBCSDT.
- 7) During the conference call, the RBCSDT will ask for feedback from the Balancing Authorities and the Reliability Coordinators on the first two week's operations, including suggestions on how the Field Trial can be enhanced.
- 8) Based on the data and feedback provided back to the RBCSDT, among other items, the RBCSDT determined that no actions were needed with regard to the Field Trial.

### **Phase B:**

- 9) EON-US (LGEE), representing a summer peak load of approximately 7,230 MW, will begin operating to the proposed BAL-007 standard on April 1, 2008.

- 10) The RBCSDT will review the first two weeks of operation under the Field Trial at its monthly review of operations in the latter part of April 2008 and will gather input from the Resources Subcommittee, Operating Reliability Subcommittee and Reliability Coordinator Working Group to determine if there were any reliability issues attributed to the Field Trial that need to be considered by the RBCSDT.
- 11) During the conference call, the RBCSDT will ask for feedback from the Balancing Authorities and the Reliability Coordinators on the first two week's operations, including suggestions on how the Field Trial can be enhanced.
- 12) Based on the data and feedback provided back to the RBCSDT, among other items, the RBCSDT determined that no actions were needed with regard to the Field Trial.

**Phase C:**

- 13) Early in December 2008 and prior to the Monthly Field Trial Review conference call, the Midwest Independent Transmission System Operator (MISO) will confirm that it is ready to commence operation under the Field Trial on January 6, 2009. The RBCSDT will verify that the MISO has met the requirements for participation in the Field Trial as described in this document and that the adjoining RCs are aware of the participation.
- 14) At its monthly review of operations in the latter part of December 2008, the RBCSDT will gather input from the Resources Subcommittee, Operating Reliability Subcommittee, and Reliability Coordinator Working Group to determine if there were any reliability issues attributed to the Field Trial that need to be considered by the RBCSDT or other actions to be taken.
- 15) The Midwest ISO (MISO), representing a summer peak load of approximately 110,000 MW, will begin operating to the proposed standard BAL-007 on January 6, 2009. The MISO BA Area will include the areas of ALTE, ALTW, CIN, MECS, NIPS, and WEC, which represent a summer peak load of approximately 53,500 MW.
- 16) The RBCSDT will review the first two weeks of operation under the Field Trial at its monthly review of operations in the latter part of January 2009 and will gather input from the Resources Subcommittee, Operating Reliability Subcommittee, and Reliability Coordinator Working Group to determine if there were any reliability issues attributed to the Field Trial that need to be considered by the RBCSDT.
- 17) During the conference call, the RBCSDT will ask for feedback from the Balancing Authorities and the Reliability Coordinators on the first two week's operations, including suggestions on how the Field Trial can be enhanced.
- 18) Based on the data and feedback provided back to the RBCSDT, among other items, the RBCSDT determined that no actions were needed with regard to the Field Trial.

**Phase D:**

- 19) Early in March 2009 and prior to the Monthly Field Trial Review conference call, Duke Energy Carolinas (DUK) will confirm that it is ready to commence operation under the Field Trial on April 1, 2009. The RBCSDT will verify that DUK has met the requirements for participation in the Field Trial as described in this document and that the adjoining RCs are aware of the participation.

- 20) The RBCSDT will review February 2009 operation under the Field Trial at its monthly review of operations in the latter part of March 2009 and will gather input from the Resources Subcommittee, Operating Reliability Subcommittee, and Reliability Coordinator Working Group to determine if there were any reliability issues attributed to the Field Trial that need to be considered by the RBCSDT.
- 21) Based on the data and feedback provided back to the RBCSDT, among other items, the RBCSDT will determine if any actions are needed with regards to the Field Trial.
- 22) On April 1, 2009, Duke Energy Carolinas (DUK), representing a summer peak load of approximately 20,040 MW, will begin operating to the proposed BAL-007 standard.
- 23) The RBCSDT will review the first two weeks of operation under the Field Trial at its monthly review of operations in the latter part of April 2009 and will gather input from the Resources Subcommittee, Operating Reliability Subcommittee, and Reliability Coordinator Working Group to determine if there were any reliability issues attributed to the Field Trial that need to be considered by the RBCSDT.
- 24) During the conference call, the RBCSDT will ask for feedback from the Balancing Authorities and the Reliability Coordinators, including suggestions on how the Field Trial can be enhanced.
- 25) Based on the data and feedback provided back to the RBCSDT, among other items, the RBCSDT determined that no actions were needed with regard to the Field Trial.

**Continued Operation:**

- 26) Other Balancing Authorities will be brought into the Field Trial at the beginning of a calendar month as the Balancing Authorities are trained and prepared to begin operating under the Field Trial of BAL-007 under the provisions and requirements of this Field Trial document and attachments.

Attachment D outlines the dates applicable to the participating Balancing Authorities under the Field Trial for 2009.

## **ATTACHMENT A-4 — Applicable Dates for the Balancing Authorities under the Field Trial**

**Updated 03-03-2009**

Note: All RBCSDT conference calls to review monthly operations are with the participating Balancing Authorities, their Reliability Coordinators, and members of the Resources Subcommittee, Operating Reliability Subcommittee, and Reliability Coordinator Working Group

### **January 6, 2009 — Field Trial begins for Midwest ISO (MISO)**

January 14, 2009 — Data for December 2009 provided by all Balancing Authorities

January 22, 2009 — Data for first 2 weeks of operations (January 6–19) provided by MISO

January 26, 2009 — Monthly Field Trial Review conference call

February 13, 2009 — Data for January 2009 provided by all Balancing Authorities

February 23, 2009 — Monthly Field Trial Review conference call

March 13, 2009 — Data for February 2009 provided by Balancing Authorities

March 23, 2009 — Monthly Field Trial Review conference call

April 1, 2009 — Field Trial begins for Duke Energy Carolinas (DUK)

April 14, 2009 — Data for March 2009 provided by Balancing Authorities

April 17, 2009 — Date for first 2 weeks of operation provided by DUK

April 20, 2009 — Monthly Field Trial Review conference call

May 14, 2009 — Data for April 2009 provided by all Balancing Authorities

May 26, 2009 — Monthly Field Trial Review conference call

June 12, 2009 — Data for May 2009 provided by all Balancing Authorities

June 22, 2009 — Monthly Field Trial Review conference call

July 14, 2009 — Data for June 2009 provided by all Balancing Authorities

July 20, 2009 — Monthly Field Trial Review conference call

August 14, 2009 — Data for July 2009 provided by all Balancing Authorities

August 24, 2009 — Monthly Field Trial Review conference call

September 14, 2009 — Data for August 2009 provided by all Balancing Authorities

September 21, 2009 — Monthly Field Trial Review conference call

October 14, 2009 — Data for September 2009 provided by all Balancing Authorities

October 26, 2009 — Monthly Field Trial Review conference call

November 13, 2009 — Data for October 2009 provided by all Balancing Authorities

November 23, 2009 — Monthly Field Trial Review conference call

December 14, 2009 — Data for November 2009 provided by all Balancing Authorities  
December 21, 2009 — Monthly Field Trial Review conference call

**NOTE: THIS ATTACHMENT WILL BE UPDATED AS NEW BALANCING  
AUTHORITIES ARE ADDED TO THE FIELD TRIAL.**

## ATTACHMENT A-5 — Monthly Review Procedure

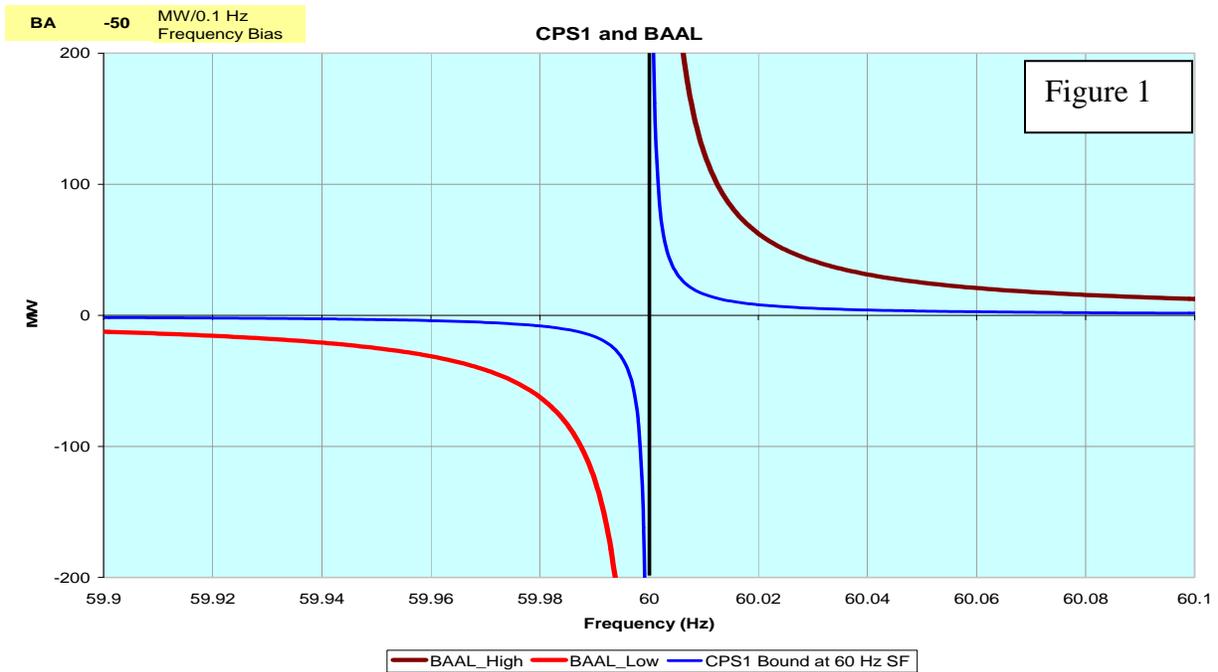
By the tenth working day of each month, the participating Balancing Authorities provide the clock-minute data for the prior operating month to the RBCSDT as described in Attachment A. The clock-minute data for each Balancing Authority will be imported into a database where all records will be converted to GMT and time-aligned based upon the clock-minute Actual Frequency data.

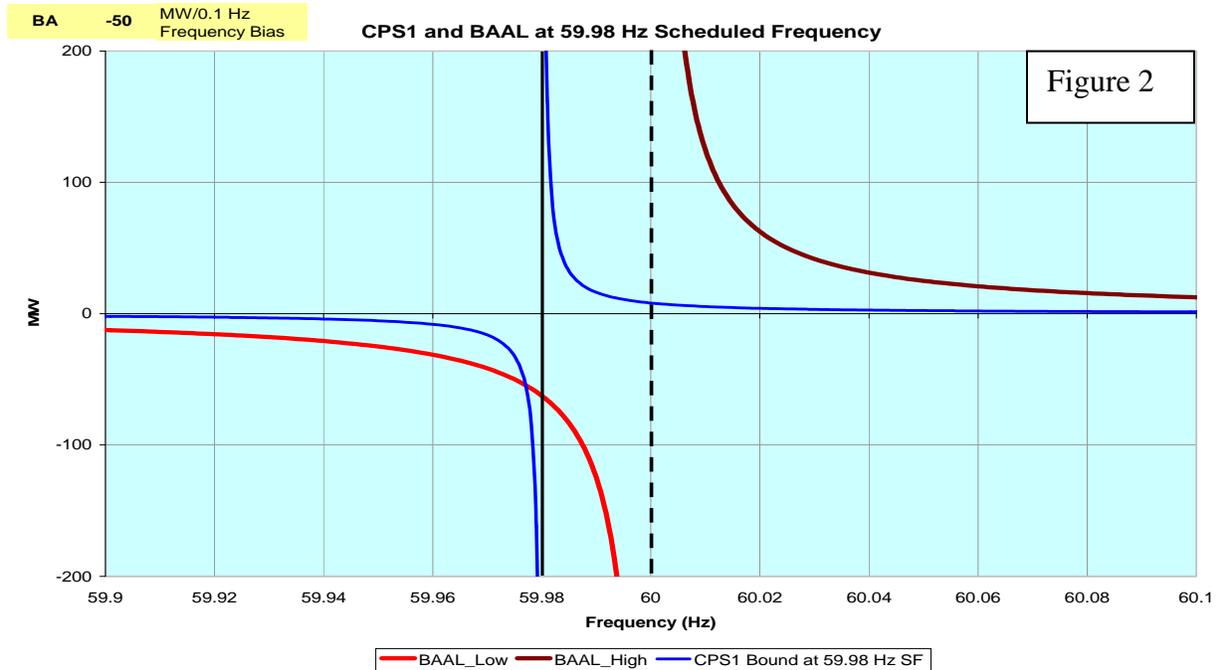
The queries shall provide the following:

- 1) All clock-minutes when  $FTL_{Low}$  was exceeded and
  - a. Scheduled Frequency = 59.98 Hz
  - b. Scheduled Frequency = 60.00 Hz
  - c. Scheduled Frequency = 60.02 Hz
- 2) All clock-minutes when  $FTL_{High}$  was exceeded and
  - a. Scheduled Frequency = 59.98 Hz
  - b. Scheduled Frequency = 60.00 Hz
  - c. Scheduled Frequency = 60.02 Hz
- 3) All clock-minutes where  $FTL_{Low}$  was exceeded, Scheduled Frequency = 59.98 Hz and Frequency Error was above -0.05 Hz.
- 4) All clock-minutes where  $FTL_{High}$  was exceeded, Scheduled Frequency = 60.05 Hz and Frequency Error was below 0.05 Hz.
- 5) The maximum number of clock-minutes that  $FTL_{Low}$  was exceeded for the month
- 6) The maximum number of clock-minutes that  $FTL_{High}$  was exceeded for the month
- 7) All clock-minutes where  $BAAL_{Low}$  was exceeded for each Balancing Authority
- 8) All clock-minutes where  $BAAL_{High}$  was exceeded for each Balancing Authority
- 9) The maximum number of clock-minutes that each Balancing Authority exceeded  $BAAL_{Low}$
- 10) The maximum number of clock-minutes that each Balancing Authority exceeded  $BAAL_{High}$
- 11) View of all Balancing Authorities for each clock-minute for comparison of
  - a. Actual Frequency
  - b. Scheduled Frequency
  - c. ACE
  - d. Minute Counts for  $BAAL_{Low}$  or  $BAAL_{High} > 0$
  - e. CPS1
  - f. ACPS1 (as described in Attachment F)

## ATTACHMENT A-6 — Sample Calculations and Available Tools for BAL-007 Performance Evaluation

CPS1 is a calculation for control performance that considers Balancing Authority operation at all times to Scheduled Frequency. During fast or slow time-error corrections, the CPS1 curves shift in a manner symmetric about the Scheduled Frequency, as illustrated in Figures 1 and 2.





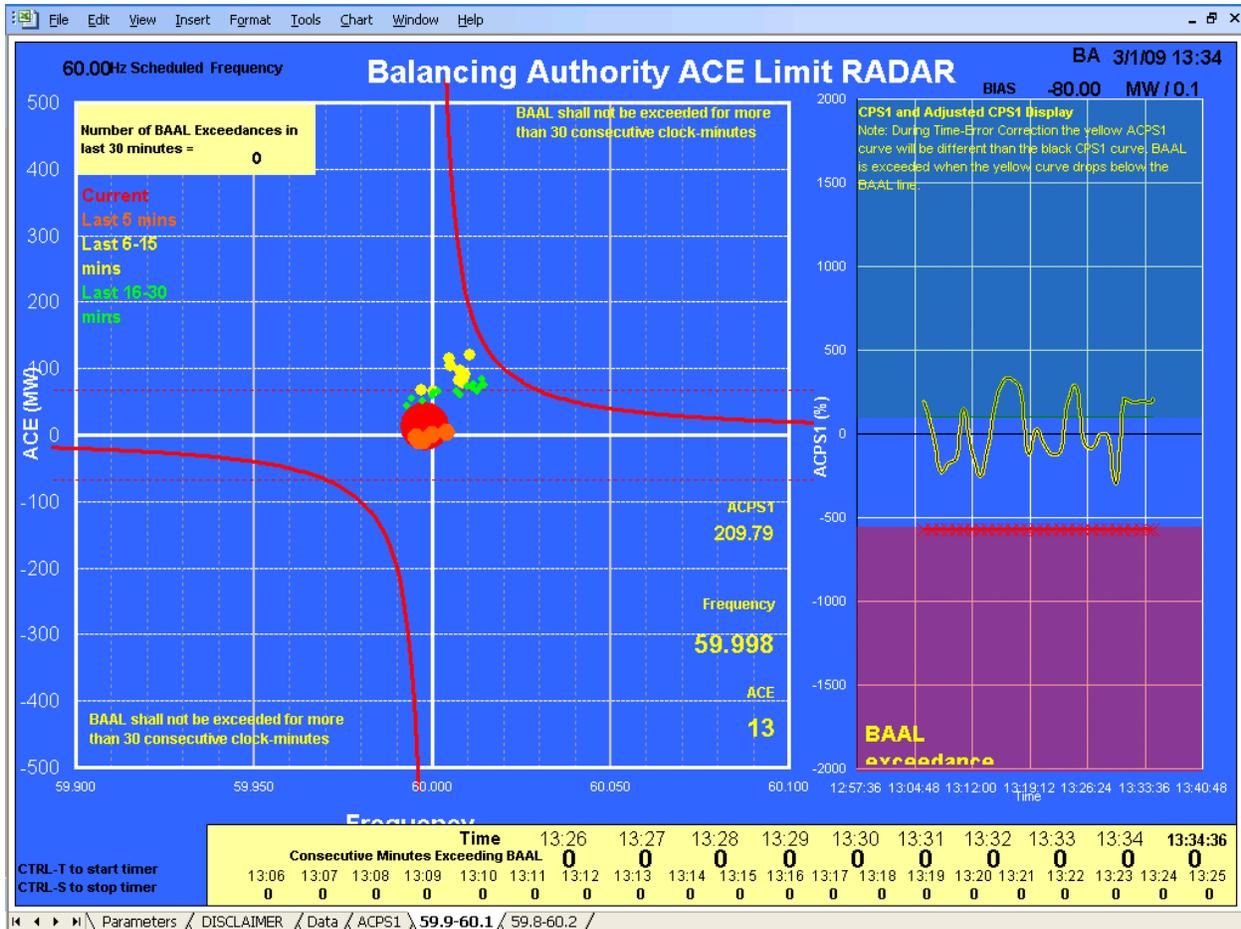
The Balancing Authority ACE Limit (“BAAL”) was developed “from the ground up”, considering the targeted research and development of Interconnection-specific Frequency Relay Limits, Frequency Abnormal Limits, and Frequency Trigger Limits. As the BAAL calculation is not a function of the Scheduled Frequency, its associated curves do not shift in a manner similar to CPS1, rather the limits remain symmetric about 60 Hz. as illustrated in Figures 1 and 2.

Though good performance in the long term under CPS1 is based upon control about the Scheduled Frequency, good performance in real-time under the BAAL is based also upon control in support of the Interconnection frequency and taking action to limit the duration of operating outside a variable bound that gets “tighter” as Actual Frequency deviates further from 60 Hz.

One type of display used to monitor when ACE exceeds the BAAL is provided below. The chart tracks the number of consecutive clock-minutes that ACE exceeds the BAAL along with displaying clock-minute ACE in relation to the clock-minute Actual Frequency.

NOTE: the text boxes for figure 3 and figure 4 are in the wrong place.

Figure 3



The screen above is from an Excel worksheet that brings in data from an OSI PI DataLink server (real-time and historic data) to display the last 30 clock-minutes of ACE where the color and size of the dots reflect the length of time passed. The Excel file is available on the NERC Reliability-Based Control website along with instructions for implementation with PI DataLink. As the duration of ACE exceeding the BAAL is a critical aspect of BAL-007, Balancing Authorities may prefer to trend a value as a function of time similar to other operator interfaces where time is displayed on the X or Y axis, as provided below.

In Eastern Interconnection, NERC CPS1 is calculated as follows:

$$CPS1 = (2 - (ACE * \text{Frequency Error}) / (-10 * \text{Frequency Bias} * 0.018 * 0.018)) * 100$$

Note: clock-minute average values must be used for all variables

In addition to calculating real-time performance under BAL-007 by comparing the clock-minute value of ACE to the calculated clock-minute value of the BAAL, the Balancing Authority can also monitor an adjusted version of the NERC CPS1 calculation that is not dependent upon Scheduled Frequency and referred to in this document as “ACPS1”. In the ACPS1 calculation below, Frequency Error is replaced with the term “(Actual Frequency – 60)”.

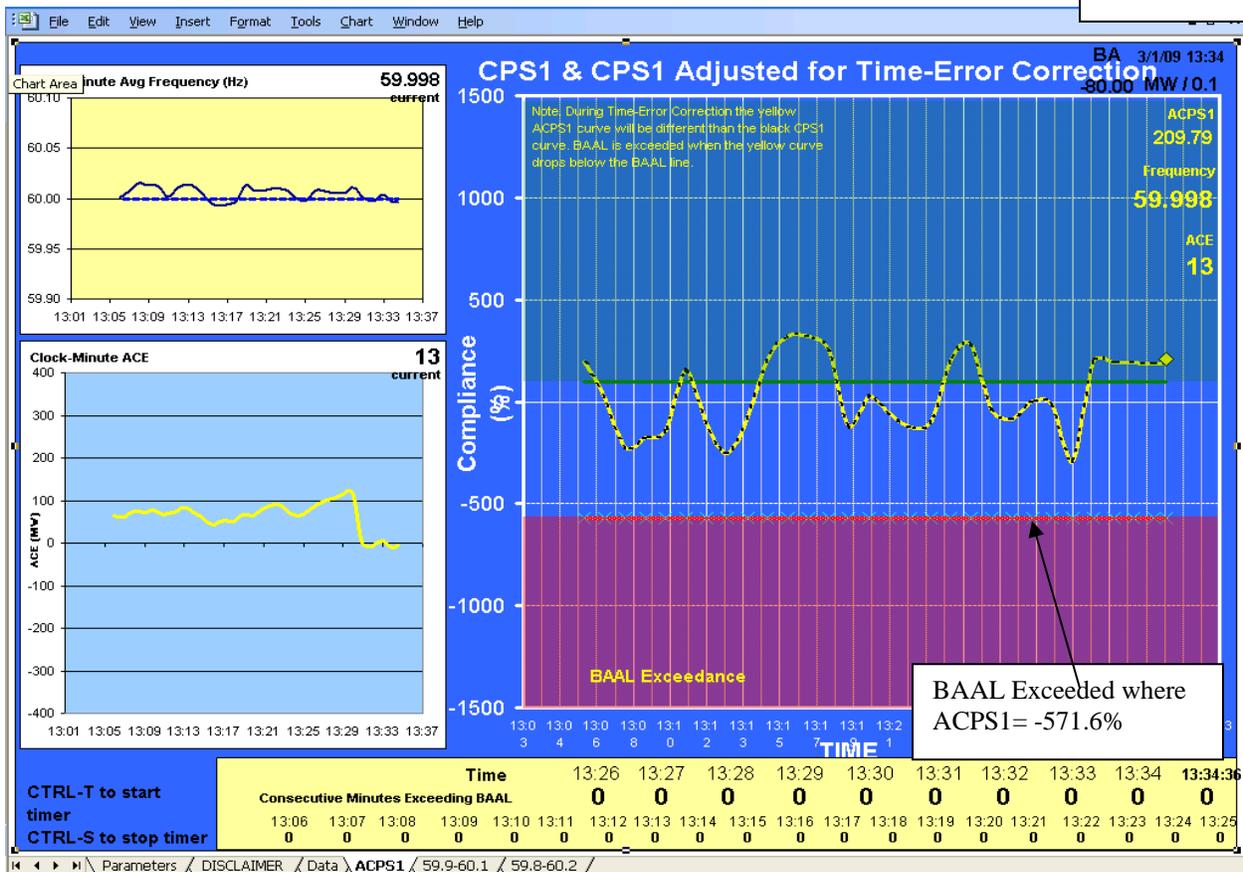
$$ACPS1 = (2 - (ACE * (\text{Actual Frequency} - 60)) / (-10 * \text{Frequency Bias} * 0.018 * 0.018)) * 100$$

Note: clock-minute average values must be used for all variables

Note: when Scheduled Frequency = 60 Hz, the calculations of CPS1 and ACPS1 are identical

The BAAL calculation provided in Attachment A shows that BAAL varies as a function of the Actual Frequency. By substituting BAAL for ACE in the ACPS1 calculation for a given value of Actual Frequency, one can determine that ACE exceeds the BAAL when ACPS1 is worse than approximately minus 571.6 percent for any Balancing Authority in the Eastern Interconnection. This information is useful in that the operator can monitor its performance against a bound that remains fixed with the value being monitored (ACPS1) being a function of ACE and Actual Frequency.

Figure 4



In the display above, the dotted line in the main chart to the right represents the CPS1 calculation and the yellow line represents the ACPS1 calculation. When Scheduled Frequency = 60 Hz, the values are identical; however, during times of fast or slow time-error correction, the curves will be different, requiring the operator to monitor operation to the long-term goal of averaging above 100 percent for CPS1, but also take action when the yellow line drops below -571.6 percent ACPS1 reflecting when the BAAL has been exceeded. The chart displayed can be selected from the same Excel worksheet as the prior display available on the NERC Reliability-Based Control website.

## ATTACHMENT A-7



### NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL

Princeton Forrestal Village, 116-390 Village Boulevard, Princeton, New Jersey 08540-5731

June 20, 2005

Linda Campbell  
Chair of the Standards Authorization Committee

Dear Ms. Campbell,

#### **BALANCE RESOURCES AND DEMAND DRAFT STANDARD PHASE II FIELD TEST WAIVER OF CPS2 COMPLIANCE**

Several months ago the Compliance and Certification Managers Committee reviewed the Balance Resources and Demand Standard Drafting Team's request for approval of its proof-of-concept field test. The Compliance and Certification Managers Committee agreed to waive compliance to CPS-2 measures for entities who participate in the proof-of-concept field test for the duration of the field test with concurrence of the NERC Operating Committee. The proof-of-concept field test is being phased in, with entities beginning participation on different dates.

The following entities have volunteered and have been approved for participation in the Balance Resources and Demand proof-of-concept field test. For the duration of their participation in the field test, these entities will not be held accountable for compliance with CPS-2, found in Standard BAL-001, Real Power Balancing Control Performance.

- Alliant Energy
- Cinergy
- East Kentucky Power Cooperative
- Entergy
- Manitoba Hydro
- Northern Indiana Public Service Company
- PJM
- Central and Southwest
- FirstEnergy
- Michigan Electric Coordinated Systems
- Nebraska Public Power District
- Tennessee Valley Authority ESO
- Wisconsin Energy Corporation

The Chair of the Balance Resources and Demand Standard Drafting Team, Raymond Vice, will provide us with prompt notification of the initiation and termination of the field test as well as any changes to this list of approved participating Balancing Authorities. Mr. Vice will send notice of these changes to the applicable Regional Managers for use in their Compliance Enforcement Programs.

Sincerely,  
Dave Hilt  
NERC VP – Compliance

Copy to: Regional Managers

A New Jersey Nonprofit Corporation

Phone 609-452-8060 ■ Fax 609-452-9550 ■ URL [www.nerc.com](http://www.nerc.com)

May 22, 2007

**Regional Entity Management Group**

Sam R. Jones (ERCOT)	Timothy R. Gallagher (RFC)
Sarah Rogers (FRCC)	Gerry W. Cauley (SERC)
Daniel P. Skaar (MRO)	Charles H. Yeung (SPP)
Edward A. Schwerdt (NPCC)	Louis McCarren (WECC)

Dear Managers:

The purpose of this letter is to advise you that on May 10, 2007, the Standards Committee authorized a continuation and expansion of the field test for the draft Balance Resources and Demand standards (BAL-007 through BAL-011). The Standards Committee's extension of the field test is based on submission of a new standards authorization request that includes proposed standards BAL-007 through BAL-011, but also addresses the transmission-related concerns cited by many ballot pool members from the NPCC and WECC regions who voted against approval of these standards in the most recent ballot.

The balancing authorities currently participating in this field test have a waiver from compliance with standard BAL-001-0 – Real Power Balancing Control Performance, Requirement R2 (CPS2). This waiver will continue for these and any new field test participants as we move forward. I am highly encouraged that certain balancing authorities within WECC and NPCC have expressed an interest in participating in the continuing field test. Their participation will hopefully enhance the drafting team's ability to obtain overall industry consensus on the standards ultimately brought forth to ballot.

I will advise you as balancing authorities are added to or deleted from the field test, or if the field test is curtailed.

Sincerely,



GA:an

cc: Linda Campbell  
Larry D. Grimm  
Douglas E. Hils  
David W. Hilt

116-390 Village Boulevard, Princeton, New Jersey 08540-5721  
Phone: 609.452.8060 • Fax: 609.452.9550 • www.nerc.com

June 29, 2007

Mr. Gerry Adamski  
Director of Standards  
North American Electric Reliability Corporation  
116-390 Village Boulevard  
Princeton, New Jersey 08540

**Balance Resources and Demand Draft Standard Continuation Field Test and  
Waiver of CPS2 Compliance**

Dear Gerry:

The purpose of this letter is to confirm the extension of the CPS2 waiver for the entities participating in the continuing field test of the BAL standard currently under development.

The proof-of-concept field test is now expected to continue with the submission of a standard authorization request (SAR) to continue the development effort after the previous standard failed to achieve consensus in an earlier ballot. NERC compliance staff will direct the regional entities to waive compliance to CPS-2 measures for entities who participate in the proof-of-concept field test for the duration of the field test assuming continuing concurrence of the NERC Operating Committee.

To assure clarity with this field test, NERC compliance staff will need to be notified of all entities participating in the field test along with the duration of the field test. Such an end date can be either a specific date, or based on either the effective date of the standard or failure of the standard to continue approval. Please provide any notices of participants and effective date information to the attention of Ms. Cherie Broadrick.

Sincerely,

  
David W. Hilt

cc: Don Benjamin  
Cherie Broadrick  
Mike DeLaura  
Tim Kucey  
Regional Entity Compliance Managers  
Standards Committee  
Operating Committee

116-390 Village Boulevard, Princeton, New Jersey 08540-5721

Phone: 609.452.8060 • Fax: 609.452.9550 • www.nerc.com

## **Exhibit B**

### **Reliability-Based Control SAR**

## Exhibit B — Reliability-Based Control SAR

Title of Proposed Standard	Reliability-Based Control v3
Request Date Revised	May 3, 2007    September 7, 2007
Revised	November 7, 2007

<b>SAR Requester Information</b>	<b>SAR Type</b> ( <i>Check a box for each one that applies.</i> )
Name <b>Balance Resources and Demand Standard Drafting Team</b>	New Standard
Primary Contact Doug Hils	Revision to existing Standard
Telephone 513-287-2149 Fax 513-287-2380	Withdrawal of existing Standard
E-mail doug.hils@duke-energy.com	Urgent Action

**Purpose** (Describe what the standard action will achieve in support of bulk power system reliability.)

- A) To maintain Interconnection frequency within predefined frequency limits under all conditions (i.e., normal and abnormal), to manage frequency-related issues such as frequency oscillations, instability, and unplanned tripping of load, generation or transmission, that adversely impact the reliability of the Interconnection. (Work brought into this SAR from Draft BAL-007 though BAL-011)
- B) To support corrective action by the BA when its excessive Area Control Error, as determined by this standard, may be contributing to or causing action to be taken to correct an SOL or IROL problem.
- C) To prevent Interconnection frequency excursions of short-duration attributed to the ramping of Interchange Transactions.
- D) To support timely congestion relief by requiring the Balancing Authority to employ corrective load/generation management within a defined timeframe when participating in transmission loading relief procedures.
- E) To address the directives of FERC Order 693:
  - 1. Add data retention requirements to all standards.
  - 2. Require a continent-wide contingency reserve policy.
  - 3. Modify BAL-003 – Frequency Response and Bias.
  - 4. Require minimum Regulating Reserves for a Balancing Authority.

**Industry Need** (Provide a justification for the development or revision of the standard, including an assessment of the reliability and market interface impacts of implementing or not implementing the standard action.)

**Interconnection Frequency and Transmission Impacts:**

Under the existing approved balancing standards, it is possible for a Balancing Authority with excessive Area Control Error (“ACE”) to significantly impact the Interconnection

frequency and/or cause IROL/SOL violations on other systems and remain compliant to the Control Performance Standard 1 (CPS1) and Control Performance Standard (CPS2).

**Corrective action not always supporting reliability:** Compliance to CPS2 requires ACE to move within  $L_{10}$  when it is binding (90 percent of the ten-minute periods per month) without regard as to whether this helps or hurts frequency or transmission loading problems. It has been demonstrated that compliance with BAL-007 always drives corrective action in a direction that supports the Interconnection frequency, and the Balancing Authority ACE Limit (BAAL) becomes increasingly more restrictive than the corresponding CPS2  $L_{10}$  as Interconnection frequency deviates further from 60 Hz.

This standard would also determine what other bounds may be necessary to require proper action by the Balancing Authority when excessive ACE (as determined by this standard) is impacting transmission constraints; however the outcome must be a set of compliance elements that cannot conflict or require information that the Balancing Authority does not have access to. For example, a Balancing Authority may be dragging on the system and impacting the Interconnection frequency at the same time its inadvertent flows may be helping to relieve congestion. Such dynamics will have to be considered in the development of this standard; however the resulting standard cannot assume that the Balancing Authority has access to transmission-related information.

**Impact of imbalanced operations on transmission system:**

Though not included in the scope of the original SAR for the balancing standards, the comments primarily provided by WECC and NPCC in the April 26, 2007 ballot of BAL-007 through 011 indicated that transmission-related problems transmission loading or reliability-related due to imbalanced operations should also be considered in the standards development. It is true that replacing CPS2 with the BAAL would not be sufficient to address such transmission concerns, as BAAL is unbounded during periods when ACE is supporting the Interconnection frequency. Though there are other standards in place today to address actions to be taken if imbalanced operation impacts transmission, there is not a balancing standard in place today that would require a Balancing Authority to immediately take corrective action within a defined timeframe if excessive ACE is causing an IROL or SOL exceedance on another system that may develop into a violation. As CPS2 is also unbounded for up to ten percent of the ten-minute periods per month, the SAR developer believes the conditions exist today where excessive ACE can cause or contribute to an IROL or SOL exceedance.

**Reliability problems associated with “dragging”:**

CPS2 does not prevent Balancing Authorities from “dragging” on the system, as the CPS2  $L_{10}$  can be exceeded for up to ten percent of the ten-minute periods per month (approximately 74 hours in a 31-day month).

Though there are valid reasons supporting why the 90 percent requirement for CPS2 is applicable, it is very possible for a Balancing Authority to “drag” by hundreds of MW for long periods, no matter of its impact to Interconnection frequency or transmission constraints, and still be compliant under CPS2 at the end of the month. Since the beginning of the Field Trial on July 6, 2005 of BAL-007 through 011, and as of the date of this SAR revision, there have been no

reports from the Balancing Authorities under the Field Trial or the Reliability Coordinators of increased dragging on the system or transmission-related problems associated with the Field Trial.

## **Exhibit C**

### **Field Trial Performance Data**

## Exhibit C — Field Trial Performance Data

**Table 1.**

MinCtLow = Count of consecutive clock-minutes BAAL\_Low was exceeded

MinCtHigh = Count of consecutive clock-minutes BAAL\_High was exceeded

	JULY '05 – MARCH '09 Performance under BAL-007		MARCH 2009 Performance under BAL-007	
	Max MinCtLow	Max MinCtHigh	Max MinCtLow	Max MinCtHigh
BA01	10	12	5	12
BA02	7	12	6	6
BA03	14	15	14	6
BA04	26	16	4	8
BA05	19	18	10	10
BA06	17	20	13	12
BA07	16	22	6	9
BA08	15	23	5	5
BA09	20	24	8	24
BA10	28	26	12	10
BA11	27	40	14	11
BA12	28	43	7	10

## Exhibit C – Table 2

This table lists the number of times that the duration of the FTL<sub>LOW</sub> exceedence was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column.

(\*The 15-minute duration in March 2007 was for the Monday morning after the change to the new Daylight Saving Time.)

Clock-Minutes of Actual Frequency <= FTL <sub>Low</sub> (59.95 Hz)												
Year	Month	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
2005	7	32	14	7	3	2						5
2005	8	56	36	20	12	8	2	1	1	1	1	10
2005	9	33	20	9	4	2	1	1	1			8
2005	10	43	21	12	5	2	2	1	1	1	1	11
2005	11	58	26	14	5	4	1					6
2005	12	41	18	5	4	2	2	1				7
2006	1	43	20	7	2	2	1					6
2006	2	39	17	4	2	1	1					6
2006	3	50	23	4	2							4
2006	4	58	30	10	5	2						5
2006	5	54	30	15	10	4	4	1	1			8
2006	6	41	22	11	4	1						5
2006	7	34	18	9	4	2	1	1	1	1		9
2006	8	49	26	15	8	3						5
2006	9	39	21	11	4	3	1					6
2006	10	51	26	9	6	2	1					6
2006	11	47	22	10	8	4						5
2006	12	34	14	3	1							4
2007	1	44	21	10	7	3	2	1				7
2007	2	33	13	2								3
2007	3	76	39	18	10	3	2	2	1	1	1	15
2007	4	45	18	7	4	3						5
2007	5	64	32	10	7	3						5
2007	6	47	24	12	6	2	1					6
2007	7	33	19	8	4	2	1					6
2007	8	31	16	9	3	2	1					6
2007	9	41	27	12	6	4	2	2	1			8
2007	10	73	25	15	8	1						5
2007	11	60	23	10	2							4
2007	12	38	13	4	2	1	1					6
2008	1	34	21	11	4	2	1	1	1			8
2008	2	46	27	8	4	1	1	1	1			8
2008	3	55	27	10	7	2	1					6
2008	4	60	28	11	4	3						5
2008	5	63	31	9	3							4
2008	6	34	16	6	4	1						5
2008	7	29	17	9	1	1	1	1				7
2008	8	35	18	5	1	1						5
2008	9	39	20	9	1							4
2008	10	38	18	8	3	1						5
2008	11	13	5	2	1	1						5
2008	12	35	11	3	1							4
2009	1	16	7	3	2							4
2009	2	18	10	5	1							4
2009	3	23	10	4	2	2						5
2009	4	37	14	5	2	1						5
2009	5	31	9	2	1							4
2009	6	28	19	8	2	1						5
SUM		2021	982	410	192	85	31	14	9	4	3	

### Exhibit C — Table 3

This chart lists the number of times that the duration of the FTL<sub>HIGH</sub> exceedence was greater than or equal to 1 minute, 2 minutes, 3 minutes and so on, with the maximum duration for the month noted in the right column.

Clock-Minutes of Actual Frequency >= FTL_High (60.05 Hz)												
Year	Month	>=1 Min	>=2 Min	>=3 Min	>=4 Min	>=5 Min	>=6 Min	>=7 Min	>=8 Min	>=9 Min	>=10 Min	Max_Duration
2005	7	11	4	1								3
2005	8	21	7	4	2	1						5
2005	9	21	9	3	2	2	1	1				7
2005	10	23	6	2	1	1						5
2005	11	22	7	4	1	1	1	1				7
2005	12	19	6	2								3
2006	1	27	15	11	6	2						5
2006	2	24	10	7	5							4
2006	3	33	12	4	2	1	1	1	1			8
2006	4	46	22	3	1	1	1	1	1			8
2006	5	39	20	9	4	1						5
2006	6	24	10	7	4	4	3	3	2	1	1	10
2006	7	29	11	8	2							4
2006	8	26	13	10	5	1	1	1	1			8
2006	9	33	14	4	2							4
2006	10	28	14	4	3	2	1	1	1			8
2006	11	22	11	4								3
2006	12	29	12	7	3	2	1					6
2007	1	31	14	5	2	1	1	1				7
2007	2	21	13	4	1							4
2007	3	38	21	10	4	2	1	1	1			8
2007	4	31	15	8	4							4
2007	5	49	20	11	7	4	4	1				7
2007	6	25	14	7	2	1	1	1				7
2007	7	20	12	8	2							4
2007	8	32	14	7	3	2						5
2007	9	16	6	4	2	1						5
2007	10	36	16	4	1	1						5
2007	11	24	7	5	2	1						5
2007	12	38	16	7	2							4
2008	1	24	16	8	1							4
2008	2	24	11	6	3	3	2	1	1			8
2008	3	34	6									2
2008	4	33	12	8	3	3	1					6
2008	5	20	10	6	4	1						5
2008	6	19	10	3	2	1						5
2008	7	12	4	1								3
2008	8	17	6	3	1	1	1					6
2008	9	21	11	6	5	3	3	3	3	2	1	11
2008	10	19	7	1								3
2008	11	9	2	1	1							4
2008	12	8	2	1								3
2009	1	9	6	4								3
2009	2	11	3	1	1	1	1					6
2009	3	11	4	3	2	1	1	1	1	1		9
2009	4	20	6	1								3
2009	5	15	4	2	2	1	1	1	1			8
2009	6	16	8	1								3
SUM		1160	499	230	100	47	27	19	13	4	2	

## **Exhibit D**

### **Project 2007-18 Schedule**

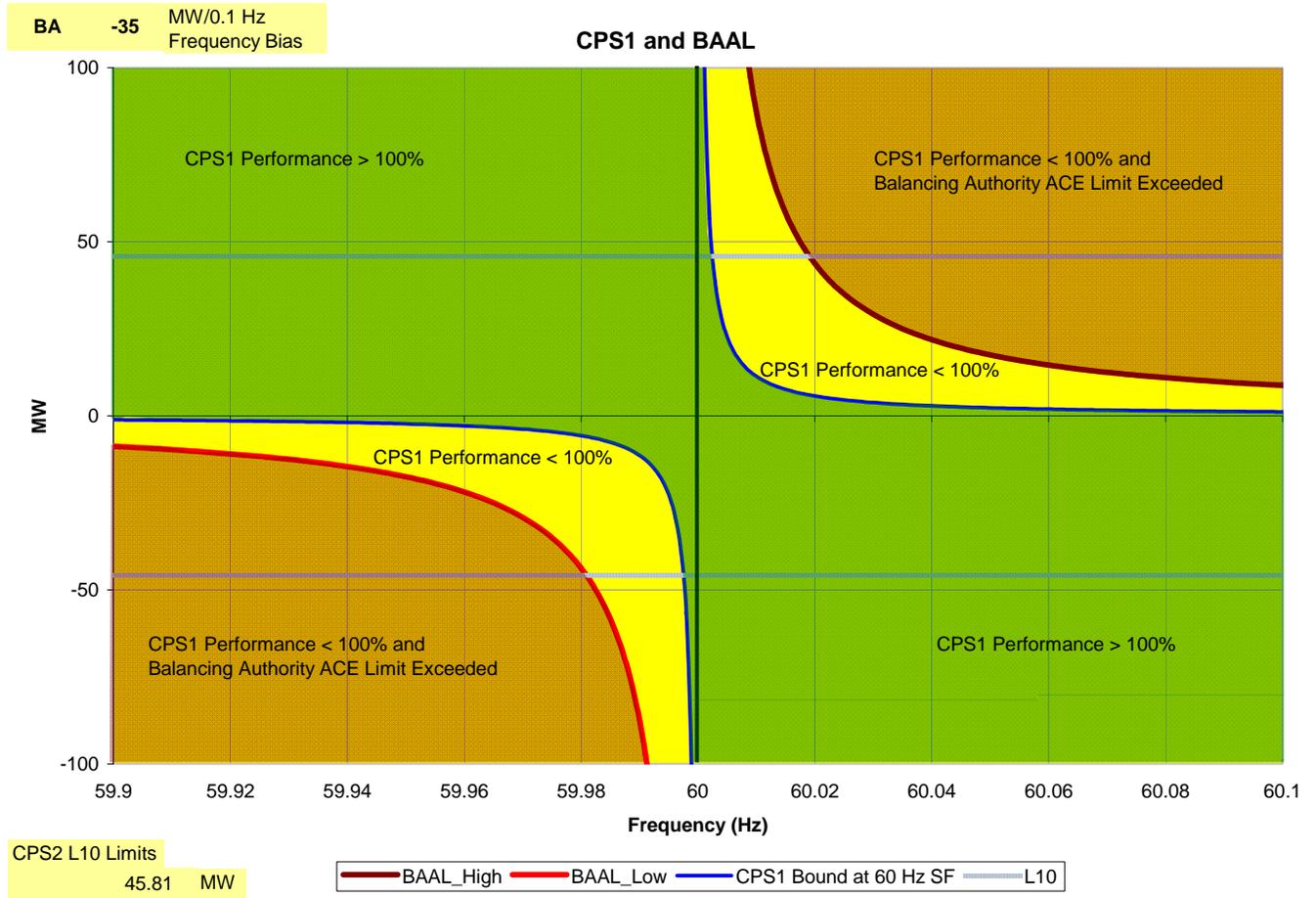


## **Exhibit E**

**Sample CPS1 and BAAL Curves and CPS2 L<sub>10</sub> for  
Median-Size  
Balancing Authority on Eastern Interconnection.**

## Exhibit E

### Sample CPS1 and BAAL Curves and CPS2 L<sub>10</sub> for Median-Size Balancing Authority on Eastern Interconnection.



This chart illustrates the concept of ACE supporting the Interconnection frequency within the criteria set under the BAL-001 Requirement R1 (CPS1) and the Balancing Authority ACE Limit (BAAL) under the draft standard BAL-007 currently under the proof-of-concept Field Trial in the Eastern Interconnection.

For the duration of the Field Trial, BAL-001 Requirement R2 (CPS2) has been waived in order to fully test and accurately capture the impact of operation under the draft BAAL under BAL-007, as adoption of the standard if balloted and approved would include elimination of Requirement R2 (CPS2) under BAL-001. As illustrated in the chart, CPS2 requires ACE to move within CPS2 L<sub>10</sub> when it is binding (90 percent of the ten-minute periods per month) without regard as to whether this helps or hurts frequency, which conflicts with the concepts behind CPS1 and the draft BAAL. The chart illustrates how the BAAL provides a real-time measure that gets “tighter” than the CPS2 L<sub>10</sub> limits as frequency deviates further away from 60 Hz. Under the Field Trial, the Balancing Authority ACE Limit should not be exceeded for more than 30 consecutive clock-minutes.

For Frequency Trigger Limits set at 59.95 Hz and 60.05 Hz under the Field Trial and Scheduled Frequency = 60 Hz, a BAAL exceedence is equivalent to a clock-minute CPS1 of -571.6 percent for every Balancing Authority in the Eastern Interconnection.