

## Standard Authorization Request Form

Title of Proposed Standard	Reliability-Based Control v2
Request Date	May 3, 2007
Revised	September 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>	<input checked="" type="checkbox"/> New Standard
Primary Contact     Doug Hils	<input checked="" type="checkbox"/> Revision to existing Standard
Telephone     513-287-2149 Fax             513-287-2380	<input checked="" type="checkbox"/> Withdrawal of existing Standard
E-mail            doug.hils@duke-energy.com	<input type="checkbox"/> 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 excessive Area Control Error (as determined by this standard) may be contributing to or causing action to be taken to correct an SOL/IROL problem.

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

D) To support timely transmission congestion relief by requiring corrective load/generation management by the Balancing Authority(ies) 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% 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 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% 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 test 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 test or the Reliability Coordinators of increased dragging on the system or transmission-related problems associated with the field test.

**Coincident behavior of Balancing Authorities:** BAL-007 discourages coincident "dragging" and associated Inadvertent Interchange by enforcing tighter and tighter limits on Balancing Authorities as the Interconnection frequency deviates further from 60 Hz. As the BAAL is based upon the Interconnection frequency, and Interconnection frequency is impacted by the ACE performance of the Balancing Authorities, BAL-007 discourages coincident behavior of multiple Balancing Authorities "dragging", as any associated drop in Interconnection frequency is also reflected in the BAAL becoming more restrictive as frequency gets worse. It is important to note that coincident behavior or lack of control diversity is occurring today and is clearly observable in the Eastern Interconnection during the time of occurrence of most of the 23 Frequency Trigger Limit (FTL) Low 5-minute alarms in 2006 and the six FTL Low 5-minute alarms during the first quarter of 2007, when Interconnection frequency dropped below 59.95 Hz in the Eastern Interconnection for five minutes or more.

**Real-time corrective action:** The Balancing Authority ACE Limit (BAAL) under BAL-007 provides a very clear and unquestionable indication to the Balancing Authority and its Reliability Coordinator, of when the Balancing Authority must take corrective action. Under the existing CPS1 and CPS2, there is not a real-time indication to the Balancing Authority that it must take corrective action within a defined timeframe when it is impacting the Interconnection frequency. BAL-008 further supports the Interconnection frequency by requiring the Reliability Coordinator to direct its Balancing Authorities to take corrective action when defined frequency limits are exceeded.

**Imbalanced operation due to generation loss:** Though the Disturbance Control Standard ("DCS") requires action upon the loss of a resource 80% or greater of the most severe single contingency, there are many significant losses that are not captured under DCS. For example, if a Balancing Authority has a most severe single contingency of 1500 MW, DCS compliance will not apply for any loss less than 1200 MWs. As CPS2 allows approximately 74 hours of operation to be unbounded in a 31-day month, there are many hours that losses less than 1200 MW could remain unbalanced for substantial periods of time. In addition, as the DCS recovery for a reportable event measures the response within the 15-minute DCS recovery period, it is possible for a Balancing Authority's ACE to again go negative after that time, with similar reliability implications. Under BAL-007, any loss of generation causing a Balancing Authority's ACE to exceed its BAAL will require corrective action. In addition to BAL-007, this SAR also proposes the development of parameters necessary to direct corrective action if such losses are determined to be the cause of IROL/SOL problems.

BAL-007 addresses both the concern of units less than 80% falling under the radar and no action being taken for long periods when Interconnection frequency is being impacted, or losses that are DCS events being unchecked after the 15-minute DCS recovery period, where ACE could deteriorate again impacting Interconnection frequency. Another concern that BAL-007 addresses has to do with ACE recovery to the lower of the pre-disturbance ACE or zero under DCS: a Balancing Authority, which might be dragging by a few hundred MWs prior to a generation loss, could lose a generating unit and under DCS be deemed compliant if it returned ACE to its pre-disturbance state, though it could still be impacting the Interconnection frequency. Under the BAL-007, any Balancing Authority with ACE exceeding its BAAL is required to take corrective action no matter if its imbalance is due to generation loss, load forecast error, Interchange Transaction curtailment or any other situation.

**Endorsement of the NERC Operating Committee:** Recognizing the merits of the proposed Standards, the NERC Operating Committee endorsed the adoption of BAL-007 through BAL-011. The work addressing frequency support is nearing completion however addition research and interaction with the industry is needed to address the reliability concerns cited regarding transmission loading. This SAR would propose broadening the field test to additional participants in the Eastern Interconnection, a field test for the HO

Interconnection, and a field test in the WECC.

**Short-Duration Frequency Deviations:**

Over the course of the field test of the Balance Resources and Demand Standards, the predominant source of frequency excursions exceeding the Frequency Trigger Limit (FTL) of 59.95 Hz in the Eastern Interconnection was attributed to the inability of resources to adequately ramp to match the implementation of Interchange Transactions. Imbalance across such short-duration excursions attributed primarily to the ramping of on/off-peak schedules is not adequately addressed in the current CPS2 or the proposed BAAL. The largest deviations have brought the Interconnection frequency below the Frequency Abnormal Limit (as defined in the proposed standards) where the Interconnection is at greater risk of a coincident event causing under-frequency load shedding. The targeted research for the draft standards would support that such short-duration frequency swings on their own do not present undue reliability risk to the Interconnection, however the SAR developer believes further research is needed to determine if other factors need to be considered. As the frequency excursions are predictable, the critical infrastructure aspects of such excursions perhaps needs to be considered as the excursions could be exploited in timing the coincident loss of other resources.

Ramp compliance is a Balancing Authority issue that each Balancing Authority should address internally with its resource operators. The NAESB business practice of using 20-minute ramps could be considered in the Eastern Interconnection as it is already followed in the WECC. As movement to a different business practice may have implications to NERC Standards, the Standard Drafting Team has passed this comment along to the NERC Resources Subcommittee and Interchange Subcommittee for their consideration and, perhaps, further discussion with NAESB.

**Timely Transmission Congestion Relief:**

The implementation of Transmission Loading Relief procedures relies upon the assumption that resources will move to correct the imbalance caused by the curtailment of Interchange Transactions. The current balancing standards do not require immediate action by the Balancing Authority to balance its system upon loss of transactions under TLR, resulting in the necessary transmission loading relief not being achieved at times as needed under the TLR process. This standard would address that concern by providing a clear direction to the Balancing Authority, and perhaps to the resources associated with the curtailed Interchange Transactions, on what action is required within a defined timeframe to ensure TLR procedures are effective.

**Brief Description** (Provide a paragraph that describes the scope of this standard action.)

This project includes expanding on the work already done in developing the draft BAL-007 through BAL-011 by adding requirements to address the following concerns:

- To support corrective action by the BA when excessive Area Control Error (as determined by this standard) may be contributing to or causing action to be taken to correct an SOL/IROL problem To prevent Interconnection frequency excursions of short duration attributed to the ramping of on and off-peak Interchange Transactions
- To support timely transmission congestion relief by requiring corrective load/generation management by the Balancing Authority(ies) within a defined timeframe when participating in transmission loading relief procedures.
- To address the directives of FERC Order 693.

Additionally, the frequency model used to establish the frequency-based limits will be reviewed to see if additional enhancements are necessary.

**Detailed Description** (Provide a description of the proposed project with sufficient details for the standard drafting team to execute the SAR.)

The standard drafting team should include in its scope all areas discussed in the section on "Industry Need". This standard (or set of standards) should address the balancing requirements applicable to Balancing Authorities, and perhaps resources within the Balancing Authorities, when needed to support the reliable operation of the Bulk Electric System. The standards developed should provide clear indication to the Balancing Authority and its Reliability Coordinator when corrective action is required of the Balancing Authority, and also reinforce that the Reliability Coordinator should not have to interact with the Balancing Authority related to the Balancing Authority's performance unless it is impacting reliability beyond the bounds established in this standard.

**Continuance of work associated with BAL-007 through 011.** It is proposed that the work of the Balance Resources and Demand Standard Drafting Team for BAL-007 through BAL-011, including the targeted research, field test, and the reliability tools developed by CERTS for the Reliability Coordinators, be brought under the scope of this SAR. The standard drafting team would continue administration of the field test in the Eastern Interconnection and ERCOT, and coordinate the start of the field test of BAL-007 through 011 in the WECC and HQ Interconnections.

**WECC Frequency Limits and Transmission-Related Concerns.** Recognizing the concerns of the WECC, the standard drafting team would work with the WECC Operating Committee for implementing a field test similar to the manner in which it was administered in the Eastern Interconnection. The terms of the field test shall include:

The Reliability Coordinator over each participating Balancing Authority will have unquestioned authority to direct the participating Balancing Authority to cease operation under the Field Test, no matter of the Interconnection frequency, if any Reliability Coordinator experiences a problem on its system that it believes may be attributed to operations under the Field Test. Options available to the Reliability Coordinator include:

**BAAL Exceeded:** If any Reliability Coordinator experiences a problem on its system 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 shall 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 cease operation under the Field Test and restore ACE within safe limits until the system problem is addressed. The Reliability Coordinator will notify the Balancing Authority when it can restore operations again to the Field Test.

**BAAL Not Exceeded:** If any Reliability Coordinator experiences a problem on its system attributed to the real-time ACE of a participating Balancing Authority where that Balancing Authority's ACE has not exceeded the BAAL but is outside its associated CPS2 L<sub>10</sub> bound, the Reliability Coordinator over the participating Balancing Authority, at its discretion or at the request of the Reliability Coordinator experiencing a problem on its system, may direct the Balancing Authority to cease operation under the Field Test and restore ACE to within safe limits until the system problem is addressed. The Reliability Coordinator will notify the Balancing Authority when it can restore operations again to the Field Test.

As WECC may have other requirements that apply to prevention of under-frequency load shedding that may have to be addressed by this set of standards, it is suggested that the

standard drafting team work with the WECC members to gain consensus of what parameters should be considered in the development of the frequency limits for WECC, which may be more restrictive than those developed under the targeted research. It is suggested that the field test would be coordinated with the WECC Operating Committee and applicable NERC subcommittees including the Resources Subcommittee and Operating Reliability Subcommittee.

As certain transmission concerns raised primarily by WECC and NPCC members did not fall under the scope of draft BAL-007 through 011, the standards drafting team will work interactively with the industry to gain consensus on measures to support corrective action by the BA when excessive Area Control Error (as determined by this standard) may be contributing to or causing action to be taken to correct an SOL/IROL problem.

**Short-Duration Frequency Excursions Associated with Interchange Transaction Implementation.** The standards drafting team will work interactively with the industry to gain consensus on the measures necessary to prevent Interconnection frequency excursions of short-duration attributed to the ramping of on and off-peak Interchange Transactions. This standard should consider what requirements may be necessary at the resource level to minimize the need for the Balancing Authority to utilize other resources, such as Regulating and Operating Reserves, to correct ACE when resources associated with the Interchange Transactions being implemented do not match the required schedule ramp. Though the ramping of on and off-peak Interchange Transactions is noted as the primary concern in the proposal of this standard, the standard drafting team should work interactively with the industry to gain consensus on whether the two periods in the day should be the focus of the measures, or whether all time periods should be applicable under a more generic “ramping standard”.

**Balancing Requirements related to Transmission Loading Relief.** The implementation of transmission loading relief procedures relies upon the assumption that resources will move to correct the imbalance caused by the curtailment of Interchange Transactions. The existing balancing standards today do not require immediate action by the Balancing Authority to balance its system upon loss of transactions under TLR, resulting in the necessary transmission loading relief not being achieved at times as desired under the TLR process. This standard would address that concern by providing a clear direction to the Balancing Authority, and perhaps the resources associated with the curtailed Interchange Transactions, on what action is required within a defined timeframe to ensure TLR procedures are effective.

The standards drafting team will work interactively with the industry to gain consensus on the measures necessary to achieve the desired purpose of the standard. This standard should consider what requirements may be necessary at the resource level to minimize the need for the Balancing Authority to utilize other resources, such as Regulating and Operating Reserves, to correct ACE under such circumstances. The use of the words “Interchange Transactions” and “transmission loading relief procedures” are not meant to be restrictive in the scope of what the standard drafting team should consider toward achieving the desired outcome.

As the urgency for transmission relief needed and conditions related to availability of alternate resources vary, the standard drafting team should consider these and other factors in the determination, among others, of when this standard should be applicable, and whether ACE recovery response times should be dependent upon the conditions of the relief needed and resources assumed available. For example, other resources may be readily available for the PSE to implement and provide to the Balancing Authority upon the curtailment of energy on non-firm transmission, but emergency measures may have to be taken to procure alternate resources upon the curtailment of energy on firm transmission.

**FERC Order 693.** The Standard will 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 to BAL-003 – Frequency Response and Bias.
4. Require minimum Regulating Reserves for a Balancing Authority.

**Reliability Coordinator Requirements.** The Standard requires that the Reliability Coordinator monitor system frequency and Balancing Authority activities, and direct action when frequency limits are exceeded under BAL-008. Additional requirements may be placed upon the Reliability Coordinator based upon other measures developed under this Standard to address action necessary when excessive ACE of a Balancing Authority is impacting the transmission system and placing the interconnected electric system at risk.

**Measures under this Standard include:**

- Control Performance Measure 1 (CPM1) – CPM1 measures the Balancing Authority’s one-minute average Area Control Error with respect to Interconnection frequency. Compliance with CPM1 helps maintain Interconnection frequency on schedule. The basis for CPM1 will be reviewed by the Standard Drafting Team.
- Balancing Authority ACE Limit (BAAL) – BAAL measures the number of consecutive clock-minutes that the Balancing Authority’s ACE exceeds its BAAL, which is based upon the bias of the Balancing Authority, the Frequency Trigger Limit determined for the Interconnection, and the deviation of Actual Frequency from 60 Hz. BAAL requires that the Balancing Authority not exceed the BAAL for more than 30 consecutive clock-minutes, however the development of this Standard will determine the basis for the BAAL. Additionally, the frequency model used to establish the frequency-based limits will be reviewed to see if additional enhancements are necessary.

**Standards Authorization Request Form**

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**Reliability Functions**

<b>The Standard will Apply to the Following Functions</b> <i>(Check box for each one that applies.)</i>		
<input checked="" type="checkbox"/>	Reliability Coordinator	Responsible for the real-time operating reliability of its Reliability Coordinator Area in coordination with its neighboring Reliability Coordinator's wide area view.
<input checked="" type="checkbox"/>	Balancing Authority	Integrates resource plans ahead of time, and maintains load-interchange-resource balance within a Balancing Authority Area and supports Interconnection frequency in real time.
<input type="checkbox"/>	Interchange Coordinator	Ensures communication of interchange transactions for reliability evaluation purposes and coordinates implementation of valid and balanced interchange schedules between Balancing Authority Areas.
<input type="checkbox"/>	Planning Coordinator	Assesses the longer-term reliability of its Planning Coordinator Area.
<input type="checkbox"/>	Resource Planner	Develops a >one year plan for the resource adequacy of its specific loads within a Planning Coordinator area.
<input type="checkbox"/>	Transmission Planner	Develops a >one year plan for the reliability of the interconnected Bulk Electric System within its portion of the Planning Coordinator area.
<input type="checkbox"/>	Transmission Service Provider	Administers the transmission tariff and provides transmission services under applicable transmission service agreements (e.g., the pro forma tariff).
<input type="checkbox"/>	Transmission Owner	Owens and maintains transmission facilities.
<input type="checkbox"/>	Transmission Operator	Ensures the real-time operating reliability of the transmission assets within a Transmission Operator Area.
<input type="checkbox"/>	Distribution Provider	Delivers electrical energy to the End-use customer.
<input type="checkbox"/>	Generator Owner	Owens and maintains generation facilities.
<input checked="" type="checkbox"/>	Generator Operator	Operates generation unit(s) to provide real and reactive power.
<input checked="" type="checkbox"/>	Purchasing-Selling Entity	Purchases or sells energy, capacity, and necessary reliability-related services as required.
<input type="checkbox"/>	Market Operator	Interface point for reliability functions with commercial functions.
<input checked="" type="checkbox"/>	Load-Serving Entity	Secures energy and transmission service (and related reliability-related services) to serve the End-use Customer.



**Standards Authorization Request Form**

**Reliability and Market Interface Principles**

<b>Applicable Reliability Principles</b> <i>(Check box for all that apply.)</i>	
<input checked="" type="checkbox"/>	1. Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
<input checked="" type="checkbox"/>	2. The frequency and voltage of interconnected bulk power systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
<input checked="" type="checkbox"/>	3. Information necessary for the planning and operation of interconnected bulk power systems shall be made available to those entities responsible for planning and operating the systems reliably.
<input type="checkbox"/>	4. Plans for emergency operation and system restoration of interconnected bulk power systems shall be developed, coordinated, maintained and implemented.
<input type="checkbox"/>	5. Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk power systems.
<input type="checkbox"/>	6. Personnel responsible for planning and operating interconnected bulk power systems shall be trained, qualified, and have the responsibility and authority to implement actions.
<input checked="" type="checkbox"/>	7. The security of the interconnected bulk power systems shall be assessed, monitored and maintained on a wide area basis.
<input type="checkbox"/>	8. Bulk power systems shall be protected from malicious physical or cyber attacks.
<b>Does the proposed Standard comply with all of the following Market Interface Principles?</b> <i>(Select 'yes' or 'no' from the drop-down box.)</i>	
1. A reliability standard shall not give any market participant an unfair competitive advantage. Yes	
2. A reliability standard shall neither mandate nor prohibit any specific market structure. Yes	
3. A reliability standard shall not preclude market solutions to achieving compliance with that standard. Yes	
4. A reliability standard shall not require the public disclosure of commercially sensitive information. All market participants shall have equal opportunity to access commercially non-sensitive information that is required for compliance with reliability standards. Yes	

**Related Standards**

<b>Standard No.</b>	<b>Explanation</b>
BAL-001-0	Real Power Balancing Control Performance - Retire when compliance with BAL-007-1 becomes effective
BAL-002-0	Disturbance Control Performance Standard - Modify based upon the development of this standard and the Frequency Response Standard
BAL-003-0	Frequency Response and Bias

**Standards Authorization Request Form**

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	- Retire when compliance with BAL-010-1 becomes effective
BAL-005-0	Automatic Generation Control - Modify compliance monitoring description 1.1.1
EOP-002-2	Capacity and Energy Emergencies - Modify R5 when BAL-007-1 through BAL-009-1 become effective
IRO-005-2	Reliability Coordination — Current Day Operations - Modify R4, 8, 9, 11 when BAL-007-1 through BAL-009-1 become effective

***Related SARs***

<b>SAR ID</b>	<b>Explanation</b>
Project 2007-12	Frequency Response SAR Work on Reliability-based Control SAR Project 2007-18 must consider the work on Frequency Response SAR Project 2007-12

***Regional Variances***

<b>Region</b>	<b>Explanation</b>
ERCOT	
FRCC	
MRO	
NPCC	
SERC	
RFC	
SPP	
WECC	