

Comparison between NERC BAL-003-0a and Alberta BAL-003-AB-0a Frequency Response and Bias			
Section	NERC BAL-003-0a	Alberta BAL-003-AB-0a	Reason for difference
Purpose	This standard provides a consistent method for calculating the Frequency Bias component of ACE..	The purpose of this reliability standard is to provide a consistent method for calculating the <i>frequency bias</i> component of ACE.	Minor change to writing style.
Applicability	4.1. Balancing Authorities.	This <i>reliability standard</i> applies to the entities listed below: <ul style="list-style-type: none"> • <i>Independent system Operator (ISO)</i> 	Identified the responsible entities in Alberta.
Effective Date	October 23, 2007		Document format change - this section is deleted and the effective date will be displayed at the footer and in the Revision History section at the end of the document. Effective date will be identified when filed with the Commission.
Definitions		Italicized terms used in this reliability standard have the meanings as set out in Part 1 of the <u>ISO Rules</u> .	Added definitions section to the Alberta reliability standard.

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Requirements	<p>R1 Each Balancing Authority shall review its Frequency Bias Settings by January 1 of each year and recalculate its setting to reflect any change in the Frequency Response of the Balancing Authority Area.</p> <p>R1.1. The Balancing Authority may change its Frequency Bias Setting, and the method used to determine the setting, whenever any of the factors used to determine the current bias value change.</p> <p>R1.2. Each Balancing Authority shall report its Frequency Bias Setting, and method for determining that setting, to the NERC Operating Committee.</p>	<p>R1 The ISO must review its <i>frequency bias settings</i> by January 1 of each year and recalculate its setting to reflect any change in the <i>frequency response</i> of the AIES.</p> <p>R1.1. The ISO may change its <i>frequency bias setting</i>, and the method used to determine the setting, whenever any of the factors used to determine the current bias value change.</p> <p>R1.2. The ISO must report its <i>frequency bias setting</i>, and method for determining that setting, to the NERC Operating Committee.</p>	<p>Identified the responsible entity in Alberta and identified the system in Alberta.</p> <p>Replaced the passive term “shall” with “must”.</p>
	<p>R2 Each Balancing Authority shall establish and maintain a Frequency Bias Setting that is as close as practical to, or greater than, the Balancing Authority’s Frequency Response. Frequency Bias may be calculated several ways:</p> <p>R2.1. The Balancing Authority may use</p>	<p>R2 The ISO must establish and maintain a <i>frequency bias setting</i> that is as close as practical to, or greater than, the AIES’s <i>frequency response</i>. <i>Frequency bias</i> may be calculated several ways:</p> <p>R2.1. The ISO may use a fixed <i>frequency bias</i> value which is based on a fixed, straight-line function of <i>tie line</i></p>	<p>Identified the responsible entity in Alberta and identified the system in Alberta.</p> <p>Replaced the passive term “shall” with “must”.</p>

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	<p>a fixed Frequency Bias value which is based on a fixed, straight-line function of Tie Line deviation versus Frequency Deviation. The Balancing Authority shall determine the fixed value by observing and averaging the Frequency Response for several Disturbances during on-peak hours.</p> <p>R2.2. The Balancing Authority may use a variable (linear or non-linear) bias value, which is based on a variable function of Tie Line deviation to Frequency Deviation. The Balancing Authority shall determine the variable frequency bias value by analyzing Frequency Response as it varies with factors such as load, generation, governor characteristics, and frequency.</p>	<p>deviation versus <i>frequency deviation</i>. The ISO must determine the fixed value by observing and averaging the <i>frequency response</i> for several <i>disturbances</i>.</p> <p>R2.2. The ISO may use a variable (linear or non-linear) bias value, which is based on a variable function of <i>tie line</i> deviation or <i>tie line</i> trip event measurements to <i>frequency deviation</i>. The ISO must determine the variable frequency bias value by analyzing <i>frequency response</i> as it varies with factors such as load, generation, governor characteristics, and frequency.</p>	<p>Alberta Variance¹: The ISO considers disturbance events for all hours to determine the appropriate AIES Frequency Bias value.</p> <p>Alberta Variance²: AIES has weak interconnections with other BAs and would separate under some disturbance conditions. Therefore it is important for the ISO to consider tie line trip events in its analysis to determine the appropriate AIES Frequency Bias value.</p>
	<p>R3 Each Balancing Authority shall operate its Automatic Generation Control (AGC)</p>	<p>R3 The ISO must operate its <i>automatic generation control (AGC)</i> on <i>tie line</i></p>	<p>Identified the responsible entity in Alberta.</p>

¹ Alberta Variance is a change from the US Reliability Standard that the AESO has determined is material.

² Alberta Variance is a change from the US Reliability Standard that the AESO has determined is material.

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	on Tie Line Frequency Bias, unless such operation is adverse to system or Interconnection reliability.	<i>frequency bias</i> , unless such operation is adverse to <i>AIES</i> or <i>WECC</i> reliability.	Replaced the passive term “shall” with “must”.
	<p>R4 Balancing Authorities that use Dynamic Scheduling or Pseudo-ties for jointly owned units shall reflect their respective share of the unit governor droop response in their respective Frequency Bias Setting.</p> <p>R4.1. Fixed schedules for Jointly Owned Units mandate that Balancing Authority (A) that contains the Jointly Owned Unit must incorporate the respective share of the unit governor droop response for any Balancing Authorities that have fixed schedules (B and C). See the diagram below.</p> <p>R4.2. The Balancing Authorities that have a fixed schedule (B and C) but do not contain the Jointly Owned Unit shall not include their share of the governor droop response in their Frequency Bias Setting.</p>		R4, R4.1 and R4.2 are not applicable in Alberta since Alberta currently does not use dynamic scheduling or pseudo-tie for jointly owned units.

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	<p><i>Jointly Owned Unit</i></p> <pre> graph TD A((A)) --- B((B)) A --- C((C)) </pre>		
	<p>R5 Balancing Authorities that serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of the Balancing Authority's estimated yearly peak demand per 0.1 Hz change.</p> <p>R5.1. Balancing Authorities that do not serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of its estimated maximum generation level in the coming year per 0.1 Hz change.</p>	<p>R4 The ISO must have a monthly average <i>frequency bias setting</i> that is at least 1% of the AIES's estimated yearly peak demand per 0.1 Hz change.</p>	<p>Renumbered R5 to R4.</p> <p>Identified the responsible entity in Alberta and identified the system in Alberta.</p> <p>Replaced the passive term "shall" with "must".</p> <p>R 5.1 is not applicable in Alberta.</p>

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	<p>R6 A Balancing Authority that is performing Overlap Regulation Service shall increase its Frequency Bias Setting to match the frequency response of the entire area being controlled. A Balancing Authority shall not change its Frequency Bias Setting when performing Supplemental Regulation Service</p>		<p>R6 is not applicable since Alberta does not have overlap regulation service.</p>

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Measures	M1 Each Balancing Authority shall perform Frequency Response surveys when called for by the Operating Committee to determine the Balancing Authority's response to Interconnection Frequency Deviations.	<p>The following <i>measures</i> correspond to the requirements identified in Section 4 of this <i>reliability standard</i>. For example, MR1 is the measure for R1.</p> <p>M1 Documentation exists to show that review was carried out according to R1.</p> <p>M1.2 Confirmation that <i>frequency bias setting</i> and methods have been submitted to <i>NERC</i> (<i>NERC</i> survey or e-mail submission is sufficient).</p>	Added measures.
		M2 The <i>frequency bias setting</i> is close to or greater than the <i>AIES's frequency response</i> . The <i>frequency response</i> data is available for events analysis.	
		M3 EMS records, which set <i>AGC</i> control modes of operation, are available to support R3.	
		M4 A monthly average <i>frequency bias setting</i> and estimated yearly peak demand is available to support R4.	

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Compliance	None Specified		
Regional Differences	None Specified		.
Associated Document Appendix 1 Interpretation of Requirement 3	<p>Interpretation of Requirement 3 Request: <i>Does the WECC Automatic Time Error Control Procedure (WATEC) violate Requirement 3 of BAL-003-0?</i> Interpretation: Requirement 3 of BAL-003-0 — Frequency Response and Bias deals with Balancing Authorities using Tie-Line Frequency Bias as the normal mode of automatic generation control.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Tie-Line Frequency Bias is one of the three foundational control modes available in a Balancing Authority's energy management system. (The other two are flat-tie and flat-frequency.) Many Balancing Authorities layer other control objectives on top of their basic control mode, such as automatic inadvertent payback, CPS optimization, time control (in single BA Interconnections). <input type="checkbox"/> As long as Tie-Line Frequency Bias is the underlying control mode and CPS1 is measured 		This interpretation provides clarification to R3 which the AESO has deemed to be acceptable. This does not require changes to the requirement.



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	<p>and reported on the associated ACE equation, there is no violation of BAL-003-0 Requirement 3: $ACE = (NIA - NIS) - 10B (FA - FS) - IME$</p>		
<p>Appendix 2 Interpretation of Requirement R2, R2.2, R5, R5.1</p>	<p>Request: <i>ERCOT specifically requests clarification that a Balancing Authority is entitled to use a variable bias value as authorized by Requirement R2.2, even though Requirement 5 seems not to account for the possibility of variable bias settings.</i></p> <p>Interpretation: The consensus of the Resources Subcommittee is that BAL-003-0 — Frequency Response and Bias — Requirement R2 does not conflict with BAL-003-0 Requirement R5.</p> <p>BAL-003-0 — Frequency Response and Bias Requirement 2 requires a Balancing Authority to analyze its response to frequency excursions as a first step in determining its frequency bias setting. The Balancing Authority may then choose a fixed bias (constant through the year) per Requirement 2.1, or a variable bias (varies with load, specific generators, etc.) per Requirement 2.2.</p>		<p>This interpretation provides clarifications to how R2, R2.2, R5 and R5.1 do not conflict and that entities are to meet all these requirements separately.</p> <p>The AESO is supportive of this interpretation and deems that no changes are required to these requirements.</p>

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	<p>BAL-003-0 — Frequency Response and Bias Requirement 5 sets a minimum contribution for all Balancing Authorities toward stabilizing interconnection frequency. The 1% bias setting establishes a minimum level of automatic generation control action to help stabilize frequency following a disturbance. By setting a floor on bias, Requirement 5 also helps ensure a consistent measure of control performance among all Balancing Authorities within a multi-Balancing Authority interconnection. However, ERCOT is a single Balancing Authority interconnection. The bias settings ERCOT uses do produce, on average, the best level of automatic generation control action to meet control performance metrics. The bias value in a single Balancing Authority interconnection does not impact the measure of control performance.</p> <p>BAL-003-0 R2. Each Balancing Authority shall establish and maintain a Frequency Bias Setting that is as close as practical to, or greater than, the Balancing</p>		

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	<p>Authority's Frequency Response. Frequency Bias may be calculated several ways:</p> <p>R2.1. The Balancing Authority may use a fixed Frequency Bias value which is based on a fixed, straight-line function of Tie Line deviation versus Frequency Deviation. The Balancing Authority shall determine the fixed value by observing and averaging the Frequency Response for several Disturbances during on-peak hours.</p> <p>R2.2. The Balancing Authority may use a variable (linear or non-linear) bias value, which is based on a variable function of Tie Line deviation to Frequency Deviation. The Balancing Authority shall determine the variable frequency bias value by analyzing Frequency Response as it varies with factors such as load, generation, governor characteristics, and frequency.</p> <p>BAL-003-0</p> <p>R5. Balancing Authorities that serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of the Balancing Authority's estimated yearly peak demand per 0.1 Hz change.</p> <p>R5.1. Balancing Authorities that do not serve native load shall have a monthly average Frequency Bias Setting that is at least 1% of its estimated maximum generation level in</p>		



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	the coming year per 0.1 Hz change.		