

**Discussion of a Minimum Frequency Bias Setting Requirement
With a Variable Frequency Bias Setting in Interconnections
With a Single Balancing Authority**

Mike Potishnak

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Balancing Authorities (BAs) in Interconnections with more than one BA need to obey the rules set by the ERO to assure reliable operations, so that excessive Interconnection frequency hunting and/or oscillations, and in the extreme, instability, are avoided. Such BAs have a lesser direct responsibility – they need to compute their frequency bias setting by rules specified by the ERO to achieve these goals, and to implement them at a time directed by the ERO for proper coordination. The common rule set and coordination are needed, so that the mutual support provided through tie line bias operation achieves these goals. Improper performance and implementation by one BA in an Interconnection can potentially have an adverse affect on other BAs in the Interconnection, and on the whole Interconnection in the extreme.

To prevent AGC and other secondary control mechanisms from withdrawing frequency response assistance due to a contingency in another BA, the frequency bias setting and frequency deviation from schedule are included in the ACE equation of all BAs. This is the main concept underlying the use of tie-line bias control in interconnections with more than one Balancing Authority. Historically, it has been

common practice to have 1% of forecasted peak load serve as a floor value for frequency bias settings in Interconnections with more than one BA. It has been commonly thought that it is better to have an Interconnection to be “overbiased” for better frequency support. With overbiasing, the shortfall in actual frequency response will result in a more negative ACE, and the initial effect is that the BA will provide power later via AGC that it did not provide via generator governor and load response. (When the mismatch between frequency bias settings and actual frequency response become large, second order effects may cause frequency hunting, but this is not the subject herein.)

Interconnections having only one Balancing Authority do not use tie line bias control, and mutual assistance to/from other BAs is not provided. These BAs have sole responsibility for avoiding frequency oscillations, and, instability in the extreme. They have a continuous responsibility to estimate the size of a megawatt adjustment needed to restore frequency to schedule. The MW/frequency relationship can be a function of many factors, such as the number and kind of generators on line, the magnitude of the load, other network devices in service, frequency, etc. In short, these relationships can change over time, particularly with wind being a bigger player now and in the future.

When a BA in a single BA Interconnection experiences a generation contingency when the initial frequency is close to 60 Hz, the frequency response of load and faster acting generator governor response arrest the frequency at point C. Since the single BA Interconnection out of necessity must have substantial generator governor response, the point

B settling frequency will be moved substantially in the direction of 60 Hz. As flat frequency control is used instead of tie line bias control, the main purpose of the frequency bias setting is to convert the frequency deviation that remains after governor response is deployed fully into the best estimate of the additional megawatts needed to restore frequency to 60 Hz. If these megawatts are substantially overestimated due to the imposition of a minimum bias setting, the interconnection frequency will experience hunting and/or oscillations, and instability in the extreme. This conversion of a frequency deviation into a megawatt requirement is based on physics and is unrelated to a minimum frequency bias setting that may be useful and necessary for Interconnections with more than one BA.

The ERO cannot effectively determine the rule set for a single Balancing Authority Interconnection, and a minimum frequency bias setting is overly prescriptive and can impact reliability adversely. Basically, single Balancing Authority Interconnections have the following implicit requirement:

Balancing Authorities that are the sole Balancing Authority in their Interconnection shall maintain their frequency bias setting to assure reliable frequency, avoiding excessive oscillations and instability.