The CAISO is Proposing to Update its Telemetry Requirement to Support Compliance with NERC's BAL-003 Standard

- CAISO <u>Tariff section 4.6.5.1</u> provides in part:

  – Participating Generators with governor controls that are synchronized to the CAISO Controlled Grid must respond immediately and automatically outside a deadband in proportion to frequency deviations through the action of a governor to help restore frequency to the scheduled value. Participating Generators shall set the governor droop for each Generating Unit with governor controls no higher than 4 percent droop for combustion turbines and 5 percent droop for other technology types; with a deadband no larger than +/- 0.036 Hz. Participating Generators will not inhibit the real power response of their Generating Units with governor controls by any means that would override the governor response except as necessary to address physical operational constraints for reasons that include ambient temperature limitations outages of mechanical equipment or regulatory considerations.

- CAISO current *pro forma* interconnection agreements require:

  – All large and small synchronous and non-synchronous resources to install, maintain, and operate equipment capable of providing primary frequency response as a condition of interconnection, including operating requirements of a maximum droop setting of 5 percent and deadband setting of ±0.036 Hz.

On January 16, 2014, FERC approved reliability standard BAL-003-1 "Frequency Response and Frequency Bias Setting," submitted by NERC

- NERC BAL-003-1.1 Reliability Standard require CAISO to have sufficient Frequency Response to maintain Interconnection Frequency within predefined bounds by arresting frequency deviations and supporting frequency until the frequency is restored to its scheduled value

- In order to facilitate primary frequency support in the Western Interconnection, WECC created PRC-001-WECC-CRT1.2 to require generating resources with a governor to have a droop setting within a specified range.

- The CAISO is updating telemetry requirements to support compliance with NERC's standard

Why is telemetry requirement needed ?

Due to a changing resource mix and fundamental shift in the operational characteristics of the power system with potential BA reliability implications, a NERC task force and the CAISO assessed the impacts and identified measures to monitor continued grid reliability and resiliency

Goals:

1) Calculate the primary frequency response for each generation resource and interconnection minimum frequency response, monitoring actual frequency response of the interconnection

2) Setting governor dead band and droop parameters, and providing primary frequency response performance requirements

3) Maintain and monitor sustained frequency response (20s to 52s) and avoid primary frequency response withdrawal at a plant level

Primary and Secondary Frequency Reponses

This figure illustrates a frequency deviation due to a loss of generation resource and the methodology for calculating frequency response. **The event starts at time t0. Value A is the average frequency from t-16 to t-2 seconds, Point C is the lowest frequency point observed in the first 12 seconds and Value B is the average from t+20 to t+52 seconds. Point C' occurs when the frequency after 52 seconds falls below either the Point C (12 seconds) or average Value B (20 – 52 seconds).**

The difference between Value A and Value B is the change in frequency used for calculating primary frequency response. Frequency response is calculated as the ratio of the megawatts lost when a resource trips and the frequency deviation. For convenience, frequency response is expressed in this report as an absolute value. A large absolute value of frequency response, measured in MW/0.1Hz, is better than a small value.
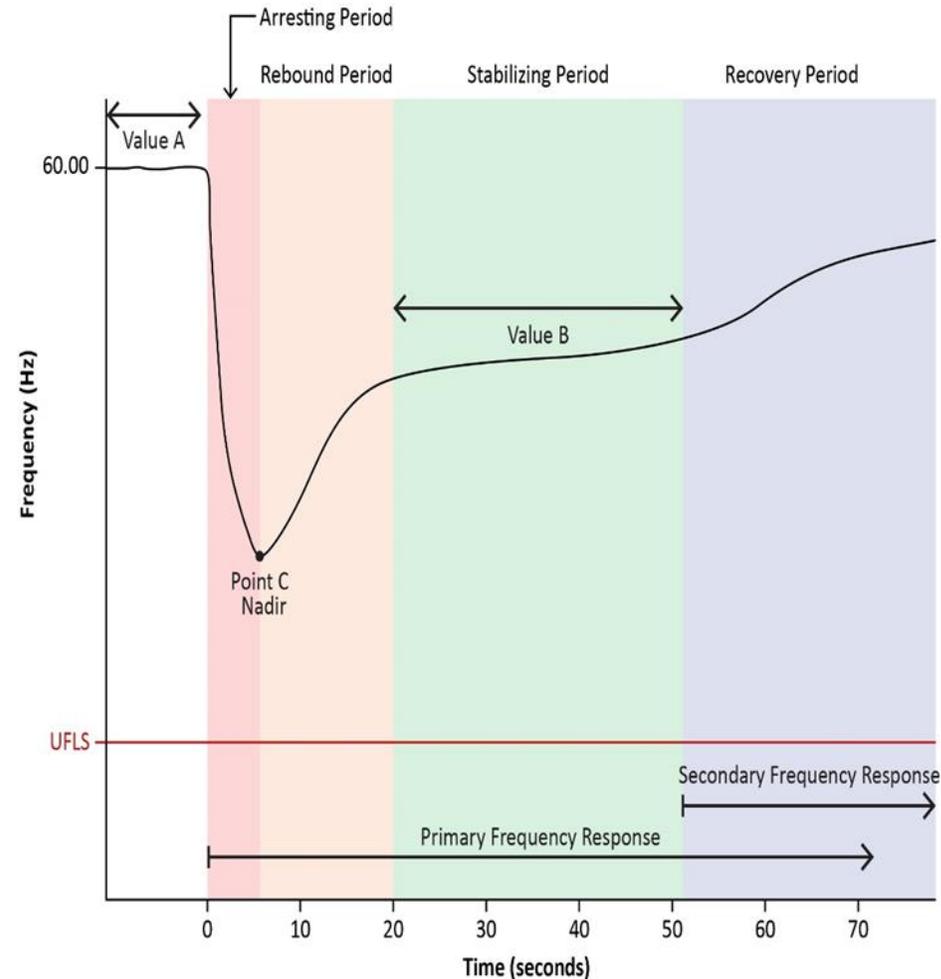
Request for additional telemetry data requirements

1) Droop setting in percent for existing and new resources
2) Governor blocking status(ON/OFF)
3) Governor or governor like dead band(mHz) settings
4) Operational unit ramp rate(MW/min) programmed in plant DCS

Note: *Existing telemetry scan rate is applicable for additional telemetry points*

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Governor droop or droop-like settings should be set between 3% to 5%

The definition of droop is the amount of speed (or frequency) change that is necessary to cause the main prime mover control mechanism to move from fully closed to fully open. A governor tuned with speed droop will open the control valve a specified amount for a given disturbance

1) Droop settings of 3%–4% depending on turbine type

2) Nuclear and others should set to 5%

3) The droop settings should not be less than 3% or
    greater than 5%

Source: PRC-001-WECC-CRT-1.2

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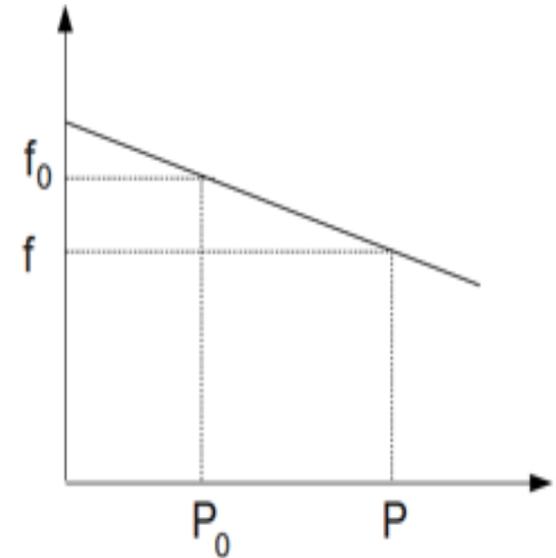
Governors blocking status is an additional requirement

Blocking the governor of a generator essentially bypasses the governing feedback mechanisms and maintains the generator at a fixed output level. Although this action may facilitate generator control for plant personnel, serious system problems may arise if too many generators are operating with blocked governors. These problems include:

a) System instability can occur since fewer units will be capable of reacting to system frequency deviations

b) Restoration of system frequency to normal frequency following a disturbance may take longer

c) Loading on interties can be further aggravated during system disturbances

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Governor or governor-like deadband

- Dead band may be used by some manufacturers and generation operators to reduce activity of controllers for normal power system frequency variations and may be large (about .05 Hz) to affect overall power system frequency control performance.

- Maximum dead band settings should not exceed ±36 mHz (59.964 Hz to 60.036 Hz)

- NERC Policy 1C, Guide 3 suggests "Governors should, as a minimum, be fully responsive to frequency deviations exceeding ± 36 mHz."

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Operation ramp rate should be observed by all resources

Ramp rate:

The CAISO is currently evaluating its control performance, which may require imposing ramp rates (MW/min) on all resources

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Team discussion and Q & A

Useful link:

Direct Telemetry BPM

https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Direct%20Telemetry

- For more follow up questions, please contact:
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Thank You

California ISO