WECC

Electric Reliability and Security for the West

WECC Criterion

PRC-001-WECC-CRT-3

Introduction

1. **Title**: **Governor Droop Setting**
2. **Number**: PRC-001-WECC-CRT-3
3. **Purpose**: To facilitate primary frequency support in the Western Interconnection
4. **Applicability**:
   - **4.1. Functional Entities:**
     - **4.1.1.** Generator Owners
   - **4.2. Facilities Included**[1]
     - **4.2.1.** All generating units connected to the Bulk Electric System (BES) within the Western Interconnection, whether synchronously or asynchronously, having Governor function. This specifically includes, but is not limited to:
       - **4.2.1.1.** Inverter-based resources (IBR), such as those powered by:[2]
         - **4.2.1.1.1.** Solar
         - **4.2.1.1.2.** Battery energy storage system (BESS)
         - **4.2.1.1.3.** Wind
   - **4.3. Facilities Excluded**
     - **4.3.1.** Blackstart Resources during system restoration or islanded conditions are excluded from this document.
5. **Effective Date**: First day of the second quarter following WECC Board of Directors approval.

[1] This document applies to the governor setting on individual generators rather than as an effective droop for an individual unit, a Balancing Authority Area, or a group of generators.

[2] "IBRs are resources that are asynchronously connected to the grid using a power convertor. IBRs include solar and wind resources, as well as battery energy storage systems (BESS). In 2022, there were three IBR-related events. Two of the events involved BESS." Impacts of Changing Resources and Consumer Load, Inverter Based Resources, WECC State of the Interconnection, 2023, page 17.

Requirements and Measures

WR1. Each Generator Owner shall set the Frequency Response droop for each generating unit to greater than or equal to 3 percent but less than or equal to 5 percent.

WM1. Each Generator Owner will have evidence that it set the Frequency Response droop for each generating unit to the parameters specified in WR1. Evidence may include, but is not limited to, dated setting sheets, generator test reports, generator logs, pictures, or other documentation.

Version History

Version	Date	Action	Change Tracking
1	October 13, 2011	Operating Committee Approved	Initial version
1	December 1, 2011	WECC Board of Directors Approved	Developed as WECC-0070. Initial version
1	September 5, 2012	WECC Board of Directors changed "CRT" to "RBP"	Designation change
1.1	January 17, 2013	Errata	Where applicable, the term "criterion" was exchanged for the generic term "document." At Section 6: Background, a footnote was added to explain the change from Criterion to Regional Business Practice. The document was conformed to the RBP template.
1.1	June 25, 2014	WECC Board of Directors changed "RBP" to "CRT"	Designation change
1.2	January 28, 2016	Errata	Sentence structure in the Effective Date was added for clarity. The information from the Background Fn 1 was removed because it is included in the Version History Table. The title "PRC-001-WECC-RBP-1.1 Regional Business Practice" was removed from Figure 1 to bring the Figure current. "PRC-001-WECC-RBP-1.1" was removed from the Rationale FAQs section to bring the document current.
1.2	April 1, 2016	No Change	Converted to new template
2	November 15, 2017	WECC Standards Committee approved for Board action	This project was developed as WECC-0125. The Purpose statement was shortened by removing the prepositional phrase. Facilities 4.2.2 was added to incorporate new technologies. The Background section was moved to the Guidance section. WR1/WM1 was updated replacing "governor" with "Frequency Response." M1 was updated to reflect current drafting conventions. The "Equipment Installation" section was added to the Guidance section. A typographical error in the April 1, 2016 row was corrected from 2.1 to 1.2.
2	December 6, 2017	WECC Board of Directors approved	The proposed Effective Date for the project was "immediately upon approval by the WECC Board of Directors (Board)." The Effective Date is December 6, 2017.
2.1	June 18, 2019	Errata	Converted to newest template.
3	March 13, 2024	WECC Board of Directors approved	Developed as WECC-0150. The Facilities section was updated to include Inverter Based Resources.

Attachments

Not used.

Rationale

Equipment Installation

Nothing in this document mandates installation of equipment required to meet Frequency Response.

Nothing in this document mandates installation of governor droop equipment.

This document only addresses equipment already installed or that which may be installed in the future and meets the criteria stated in the Applicability/Facilities section.

What constitutes a unit's "ability to react or respond to a change in system frequency" as described in the NERC Glossary is purposely omitted from this document to allow other regulatory forums to make that determination.

Background

The WECC Minimum Operating Reliability Criteria (MORC 2000) contained the following droop-related requirement:

> "C. Frequency Response and Bias
>
> 2. Governors. To provide an equitable and coordinated system response to load/generation imbalances, governor droop shall be set at 5%. Governors shall not be operated with excessive deadbands [sic], and governors shall not be blocked unless required by regulatory mandates."

After reviewing the MORC in 2010, the WECC Operating Reliability Criteria Work Group (ORCWG) recommended the MORC could be retired so long as its content was preserved elsewhere. That review concluded that the above droop-related language was not preserved elsewhere and should be retained in a WECC Criterion (WECC-0070 and WECC-0125).

After reviewing professional publications, existing practices, manufacturer recommendations, and industry-provided comments, the WECC-0070 drafting team concluded that requiring a droop setting within a bandwidth (3%-5%) would provide greater reliability through greater response and flexibility than requiring that droop be set at a specific, unchanging point.

In reaching this position, both the WECC-0070 and the WECC-0125 drafting teams considered, among other things:

1) The difficulty to measure adherence;
2) Extrinsic factors impacting response, such as:
    a. Response to operating conditions, generator operating points, boiler/turbine conditions, ambient conditions, vintage/design of the unit, physical/regulatory/environmental constraints, ramp rates, Automatic Generation Control, and other control mechanisms,

3) The non-linear response of Governors; and

4) Testing limitations when attempting to replicate operating conditions, particularly for hydro units.

In December 2011, the WECC Board of Directors (Board) approved Version 1 of this WECC Criterion including a single requirement addressing the performance dead band.[3]

As part of the WECC-0150, Version 3 project, the question-and-answer section of this document was deleted. That section is available for review in earlier versions of this document.

Overview

This document does not create a performance Standard. Rather, it establishes the criteria for setting droop with the goal of facilitating primary frequency support.

This document is not intended to apply to regulation. Droop is a setting in the Governor; regulation reflects the measured response of the unit.

Requirement

WR1:

The 3-to-5% range provides a balance between frequency regulation and system stability. If the setting is too low, there could be system instability and negative damping of low frequency oscillations. If the setting is too high, larger frequency dips could result in under frequency load shedding.

Typically, the droop settings are at 5%. It is recommended that the droop setting for hydro units be maintained at 5% for stability reasons.

[3] Version 1, "WR1. Each Generator Owner shall set the governor droop for each generating unit to greater than or equal to 3 percent but less than or equal to 5 percent."