**[Registered Entity Name]**

**NERC ID: [NCRXXXXX]**

**MOD-027-1 – Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions, R2**

**1st Quarter 2022 Self-Certification**

# Instructions

1. Populate the cover page by adding your entity’s name and NERC identification number.
2. Complete thetasks listed under **Assessment Guidance**.
3. Log into **Align** and complete your self-certification response.
4. Submit via the Secure Evidence Locker (SEL) with the reference ID in Align as part of the self-certification response:
	1. This completed Worksheet; and
	2. Specific evidence requested within this document. Please make sure to use unique file names for each evidence file submitted, and identify within your narratives which specific evidence files support each conclusion made. These references and the use of unique file names helps facilitate and expedite MRO’s review of the Self-Certification work that has been performed.
	3. Any internal control information related to the Reliability Standard and Requirement in scope with supporting documentation of design and implementation of the internal control(s). Internal control information may impact your Compliance Oversight Plan and future monitoring frequency and methods of applicable Standards.

# Scope

**MOD-027-1- Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions, R2**

***R2.*** *Each Generator Owner shall provide, for each applicable unit, a verified turbine/governor and load control or active power/frequency control model, including documentation and data (as specified in Part 2.1) to its Transmission Planner in accordance with the periodicity specified in MOD-027 Attachment 1. [Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

***2.1.*** *Each applicable unit’s model shall be verified by the Generator Owner using one or more models acceptable to the Transmission Planner. Verification for individual units rated less than 20 MVA (gross nameplate rating) in a generating plant (per Section 4.2.1.2, 4.2.2.2, or 4.2.3.2) may be performed using either individual unit or aggregate unit model(s) or both. Each verification shall include the following:*

***2.1.1.*** *Documentation comparing the applicable unit’s MW model response to the recorded MW response for either:*

* *A frequency excursion from a system disturbance that meets MOD-027 Attachment 1 Note 1 with the applicable unit on-line,*
* *A speed governor reference change with the applicable unit online, or*
* *A partial load rejection test,[[1]](#footnote-1)*

***2.1.2.*** *Type of governor and load control or active power control/frequency control[[2]](#footnote-2) equipment,*

***2.1.3.*** *A description of the turbine (e.g. for hydro turbine - Kaplan, Francis, or Pelton; for steam turbine - boiler type, normal fuel type, and turbine type; for gas turbine - the type and manufacturer; for variable energy plant - type and manufacturer),*

***2.1.4.*** *Model structure and data for turbine/governor and load control or active power/frequency control, and*

***2.1.5.*** *Representation of the real power response effects of outer loop controls (such as operator set point controls, and load control but excluding AGC control) that would override the governor response (including blocked or nonfunctioning governors or modes of operation that limit Frequency Response), if applicable.*

***M2.*** *The Generator Owner must have and provide dated evidence it verified each generator turbine/governor and load control or active power/frequency control model according to Part 2.1 for each applicable unit and a dated transmittal (e.g., electronic mail message, postal receipt, or confirmation of facsimile) as evidence it provided the model, documentation, and data to its Transmission Planner, in accordance with Requirement R2.*

# Purpose:

To verify that the turbine/governor and load control or active power/frequency control[[3]](#footnote-3) model and the model parameters, used in dynamic simulations that assess Bulk Electric System (BES) reliability, accurately represent generator unit real power response to system frequency variations.

# Applicability:

**4.1 Functional entities:**

**4.1.1** Generator Owner

**4.1.2** Transmission Planner

**4.2. Facilities:**

For the purpose of the requirements contained herein, Facilities that are directly connected to the Bulk Electric System (BES) will be collectively referred to as an “applicable unit” that meet the following:

**4.2.1** Generation in the Eastern or Quebec Interconnections with the following characteristics:

**4.2.1.1** Individual generating unit greater than 100 MVA (gross nameplate rating).

**4.2.1.2** Individual generating plant consisting of multiple generating units that are directly connected at a common BES bus with total generation greater than 100 MVA (gross aggregate nameplate rating).

**4.2.2** Generation in the Western Interconnection with the following characteristics:

**4.2.2.1** Individual generating unit greater than 75 MVA (gross nameplate rating).

**4.2.2.2** Individual generating plant consisting of multiple generating units that are directly connected at a common BES bus with total generation greater than 75 MVA (gross aggregate nameplate rating).

**4.2.3** Generation in the ERCOT Interconnection with the following characteristics:

**4.2.3.1** Individual generating unit greater than 50 MVA (gross nameplate rating).

**4.2.3.2** Individual generating plant consisting of multiple generating units that are directly connected at a common BES bus with total generation greater than 75 MVA (gross aggregate nameplate rating).

# Assessment Guidance

**MOD-027-1- Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions, R2**

1. Populate Tab 1 of file **MOD-027\_R2\_Testing\_Workbook Q1 2022.xlsx** with all applicable units as defined in Section 4.2 of the standard. If you do not own applicable units or this requirement is not applicable to you, skip to step 6.
2. Select a random sample from the population identified in Tab 1, using the following sampling logic (a random sample may be selected using statistical functions available in Microsoft Excel, through use of RAT-STATS <https://oig.hhs.gov/compliance/rat-stats/index.asp>, or other statistical tool). Use the sample result to populate Tab 2.
	1. Select eight of your applicable units if your total population is nine or greater;
	2. If eight or fewer total applicable units exist in the population, select the entire population.

Fill in Table 1 with the evidence of the sampling process used, including:

Evidence of the sampling process or tool utilized to create the sample (e.g. what are your samples and how are they created).

|  |
| --- |
| **Table 1: Sampling of Tab 1** |
| **File Contents** | **File Name / Page(s)** |
| **Statistical Function Output** |  |
| **Comments** |  |

1. For each sampled applicable unit in Tab 2, please provide:
	1. Documentation, model and data that shows you verified the generator turbine/governor and load control or active power/frequency control model according to Part 2.1. Provide the file names in Tab 2 and upload these files via the SEL.
	2. Dated evidence to show that you provided model, data and documentation to your Transmission Planner. Provide the file names in Tab 2 and upload these files via the SEL.
2. In Table 2 below, please respond “yes” or “no” to the question “Have you completed Requirement R2 of MOD-027-1 for at least 50 percent of your applicable unit gross MVA per Interconnection by 7/1/2020?”

|  |
| --- |
| **Table 2: Have you completed Requirement R2 of MOD-027-1 for at least 50 percent of your applicable unit gross MVA per Interconnection by 7/1/2020?** |
| **Response (Yes/No)** |  |
| **Comments** |  |

1. Please describe and provide internal controls your organization has developed for MOD-027-1 R2. If undocumented, provide a narrative of your MOD-027-1 program. Also provide sample implementation of the internal controls.

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| --- |
| **Table 3: Internal controls for MOD-027-1 R2** |
| **File(s) Contents** | **File Name / Page(s)** |
| **Internal Control Documents** |  |
| **Response** |  |

1. Does the evidence provided meet all elements of the requirement listed?

☐ Yes, respond “Compliant” for R2 to the Self-Certification in Align. Upload supporting documentation to the SEL.

☐ No, respond “Non-Compliant” for R2 to the Self-Certification in Align. Include comments supporting the “Non-Compliant” response. Upload supporting documentation to the SEL.

☐ Do not own, respond “Do Not Own” for R2 to the Self-Certification in Align. Include comments supporting the “Do Not Own” response. Upload supporting documentation to the SEL.

☐ Do not meet the applicability requirements of the full standard, respond “Not-Applicable” for R2 to the Self-Certification in Align. Include comments supporting the “Not-Applicable” response. Upload supporting documentation to the SEL. This response should not be used if the circumstance within the standard or requirement language did not happen. This response should only be used if the requirement or standard is not applicable at all to the entity (such as not registered for the function).

# Document Submittals

MRO requires copies of the following be submitted with the self-certification response to the SEL:

1. This completed worksheet;
2. All files as detailed in Tables 1, and 3; and
3. Completed *MOD-027\_R2\_Testing\_Workbook Q1 2022.xlsx* and the associated evidence files

Please make sure to use unique file names for each evidence file submitted, and identify within your responses to the steps above which specific evidence files support each conclusion made. These references and the use of unique file names helps facilitate and expedite MRO’s review of the Self-Certification work that has been performed.

All other data related to the registered entity’s analysis and self-certification response are to be retained for at least 180 days after the submission date. MRO staff may request submission of additional information at a later date to verify accuracy of self-certification submittals.

1. Differences between the control mode tested and the final simulation model must be identified, particularly when analyzing load rejection data. Most controls change gains or have a set point runback which takes effect when the breaker opens. Load or set point controls will also not be in effect once the breaker opens. Some method of accounting for these differences must be presented if the final model is not validated from on-line data under the normal operating conditions under which the model is expected to apply. [↑](#footnote-ref-1)
2. Turbine/governor and load control or active power/frequency control:

a. Turbine/governor and load control applies to conventional synchronous generation.

b. Active power/frequency control applies to inverter connected generators (often found at variable energy plants). [↑](#footnote-ref-2)
3. Turbine/governor and load control or active power/frequency control:

a. Turbine/governor and load control applies to conventional synchronous generation.

b. Active power/frequency control applies to inverter connected generators (often found at variable energy plants). [↑](#footnote-ref-3)