Standard Development Timeline

This section is maintained by the drafting team during the development of the standard and will be removed when the standard is adopted by the NERC Board of Trustees (Board).

Description of Current Draft

This is the additional draft of the proposed standard for a formal 28-day comment period with ballot.

Completed Actions	Date
Standards Committee approved Standard Authorization Request (SAR) for posting	May 15, 2024
SAR posted for comment	May 17 – June 24, 2024
26-day initial formal comment period with ballot	May 22 – June 16, 2025

Anticipated Actions	Date
28-day formal comment period with ballot	August 14 – September 10, 2025
10-day final ballot	September 2025
Board adoption	November 4, 2025

New or Modified Term(s) Used in NERC Reliability Standards

This section includes all new or modified terms used in the proposed standard that will be included in the *Glossary of Terms Used in NERC Reliability Standards* upon applicable regulatory approval. Terms used in the proposed standard that are already defined and are not being modified can be found in the *Glossary of Terms Used in NERC Reliability Standards*. The new or revised terms were previously approved by the ballot body and will be presented to the Board for adoption in August 2025:

Term(s):

Model Verification: The process of confirming that model structure and parameter values are representative of the equipment or facility design and settings by reviewing equipment or facility design and settings documentation.

Model Validation: The process of comparing simulation results with measurements to assess how closely a model's behavior matches the measured behavior.

A. Introduction

1. **Title:** Verification and Validation of Dynamic Models and Data ~~for Generator Excitation Control System or Plant Volt/Var Control Functions~~

2. **Number:** MOD-~~026-1~~026-2

~~3. **Purpose:** To verify that the generator excitation control system or plant volt/var control function[1] model (including the power system stabilizer model and the impedance compensator model) and the model parameters used in dynamic simulations accurately represent the generator excitation control system or plant volt/var control function behavior when assessing Bulk Electric System (BES) reliability.~~

3. **Purpose:** To verify and validate that the dynamic models and associated parameters used to assess Bulk Electric System (BES) reliability represent the in-service equipment of Bulk Power System (BPS) facilities including generating facilities, transmission connected dynamic reactive resources, and high-voltage direct current (HVDC) systems.

4. **Applicability:**

   4.1. Functional Entities:

   ~~4.1.1~~**4.1.1.** Generator Owner

   4.1.2. Transmission Owner

   4.1.3. Planning Coordinator

   ~~4.1.2~~**4.1.4.** 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 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**~~**4.2.1.** Individual synchronous generating unit ~~**greater than 100 MVA (gross nameplate rating).**~~meeting the criteria set by Inclusion I2 of the BES definition;

~~**4.2.1.2** Individual generating plant consisting of multiple generating units that are directly connected at a common BES bus with total~~

~~[1] Excitation control system or plant volt/var control function:~~

~~a. For individual synchronous machines, the generator excitation control system includes the generator, exciter, voltage regulator, impedance compensation and power system stabilizer.~~

~~b. For an aggregate generating plant, the volt/var control system includes the voltage regulator & reactive power control system controlling and coordinating plant voltage and associated reactive capable resources.~~

~~generation greater than 100 MVA (gross aggregate nameplate rating).~~

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

4.2.2. Synchronous generating plant/Facility meeting the criteria set by Inclusion I2 of the BES definition;

4.2.3. Dynamic reactive resources meeting the criteria set by Inclusion I5 of the BES definition with a gross (individual or aggregate) nameplate rating greater than 20 MVA including:

4.2.3.1. Synchronous condensers; and

4.2.3.2. Flexible alternating current transmission system (FACTS) devices.

4.2.4. High-voltage direct current (HVDC) systems including:

4.2.4.1. Line commutated converter (LCC); and

~~**4.2.2.1**~~**4.2.4.2.** ~~Individual generating unit greater than 75 MVA (gross nameplate rating~~Voltage source converter (VSC).

4.2.5. Bulk Electric System (BES) Inverter-Based Resources; and

4.2.6. Non-BES Inverter-Based Resources that either have, or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.

~~**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:~~

~~**4.2.3.2** Individual generating unit greater than 50 MVA (gross nameplate rating).~~

~~**4.2.3.3** 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).~~

~~**4.2.4** For all Interconnections:~~

- A technically justified[2] unit that meets NERC registry criteria but is not otherwise included in the above Applicability sections 4.2.1, 4.2.2, or 4.2.3 and is requested by the Transmission Planner.

5. Effective Date: See Implementation Plan for Project 2020-06 Verification of Models and Data for Generators.

5.1. For Requirements R1, and R3 through R6, the first day of the first calendar quarter beyond the date that this standard is approved by applicable regulatory authorities or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities. In those jurisdictions where regulatory approval is not required, the standard shall become effective on the first day of the first calendar quarter beyond the date this standard is approved by the NERC Board of Trustees, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities.

5.2. For Requirement R2, 30 percent of the entity's applicable unit gross MVA for each Interconnection on the first day of the first calendar quarter that is four years following applicable regulatory approval or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, or in those jurisdictions where no regulatory approval is required, on the first day of the first calendar quarter that is four years following NERC Board of Trustees adoption or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities.

5.3. For Requirement R2, 50 percent of the entity's applicable unit gross MVA for each Interconnection on first day of the first calendar quarter that is six years following applicable regulatory approval or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, or in those jurisdictions where no regulatory approval is required, on the first day of the first calendar quarter that is six years following NERC Board of Trustees adoption or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities.

5.4. For Requirement R2, 100 percent of the entity's applicable unit gross MVA for each Interconnection on the first day of the first calendar quarter that is 10 years following applicable regulatory approval or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, or in those jurisdictions where no regulatory approval is required, on the first day of the first calendar quarter that is 10 years following NERC Board of Trustees adoption or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities.

[2] Technical justification is achieved by the Transmission Planner demonstrating that the simulated unit or plant response does not match the measured unit or plant response.

B. Requirements and Measures

R1. Each Transmission Planner ~~shall provide the following requested information to the Generator Owner within 90 calendar days of receiving a written request~~ and its Planning Coordinator shall jointly develop dynamic model requirements for the purpose of Model Verification and Model Validation. The dynamic model requirements shall be made available to Generator Owner(s) and Transmission Owner(s) by the Transmission Planner and shall include at a minimum the following:
[Violation Risk Factor: Lower] [Time Horizon: ~~Operations~~Long-term Planning]

- ~~Instructions on how to obtain the list of excitation control system or plant volt/var control function models that are acceptable to the Transmission Planner for use in dynamic simulation,~~
- ~~Instructions on how to obtain the dynamic excitation control system or plant volt/var control function model library block diagrams and/or data sheets for models that are acceptable to the Transmission Planner, or~~
- ~~Model data for any of the Generator Owner's existing applicable unit specific excitation control system or plant volt/var control function contained in the Transmission Planner's dynamic database from the current (in-use) models, including generator MVA base.~~

1.1. Positive sequence dynamic model requirements, including requirements for the models and functions listed in Attachment 1;

1.1.1. Specification of which limiting and protective functions listed within Attachment 1, Table 1.1 are required to be represented in the model.

1.2. For the facilities listed in Applicability Sections 4.2.5 and 4.2.6 (Inverter-Based Resources), 4.2.3.2 (FACTS devices), 4.2.4.1 (LCC HVDC), and 4.2.4.2 (VSC HVDC):

1.2.1. Identification of which legacy[1] facilities require electromagnetic transient (EMT) model(s) under Requirement R3; and

1.2.2. Specification of acceptable EMT models, format, and level of detail.

1.3. Any additional requirements not listed under Requirement R1, Parts 1.1 and 1.2 used to assess the acceptability of submitted dynamic models and accompanying documentation. If no such additional requirements exist, the Transmission Planner shall document that none are applicable.

M1. Each Transmission Planner and Planning Coordinator must provide dated evidence such as document(s), webpage(s), or web portal(s) outlining the jointly developed dynamic model requirements. Each Transmission Planner shall have evidence demonstrating that the dynamic model requirements were made available to Generator Owner(s) and Transmission Owner(s) in accordance with Requirement R1.

[1] A legacy facility for the purpose of this standard is any facility with a commercial operation date prior to the effective date of MOD-026-2.

R2. Each Generator Owner or Transmission Owner shall provide to its Transmission Planner positive sequence dynamic model(s) with associated parameters, any information pertaining to changes to the model(s) or its parameters, and accompanying documentation in accordance with the periodicity requirements of Attachment 2. Each Generator Owner or Transmission Owner shall provide the following: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

2.1. Positive sequence dynamic model(s) representing the in-service equipment of the facility including, at a minimum, each of the applicable models and functions listed in Attachment 1 in accordance with the requirements developed in Requirement R1;

2.2. Documentation of Model Verification demonstrating that the configurable, site-specific parameters of the model(s) are representative of the design and settings of the in-service equipment of the facility;

2.2.1. For any parameters that cannot be verified, the Generator Owner or Transmission Owner shall provide a written statement to the Transmission Planner detailing any such parameters and reasons they cannot be verified.

2.3. Documentation of Model Validation comparing the behavior of the model(s) to the measured behavior during a staged test or system disturbance for:

2.3.1. A dynamic reactive power or voltage excursion event to perform Model Validation of generator, excitation control, reactive power control, and voltage control models, as applicable; and

2.3.2. A dynamic active power or frequency excursion event[2] to perform Model Validation of governor control, active power control, and frequency control models, as applicable.

~~**R2.**~~**M2.** Each Generator Owner ~~shall~~or Transmission Owner must provide dated evidence for each applicable ~~unit, a verified generator excitation control system or plant volt/var control function model, including documentation~~ facility that it provided positive sequence dynamic model(s) and accompanying documentation to its Transmission Planner in accordance with Requirement R2.

~~**R2.**~~**R3.** ~~and data (as specified in Part 2.1)~~ For facilities listed in Applicability Sections 4.2.3.2 (FACTS devices), 4.2.4 (HVDC), 4.2.5 (BES IBRs), and 4.2.6 (Non-BES IBRs), excluding legacy facilities where the original equipment manufacturer[3] no longer

[2] Model Validation frequency excursion criteria: "≥ 0.04 hertz deviation" (nadir point) from scheduled frequency for the Eastern Interconnection with the applicable facility operating in a frequency responsive mode. "≥ 0.08 hertz deviation" (nadir point) from scheduled frequency for the ERCOT and Western Interconnections with the applicable facility operating in a frequency responsive mode. "≥ 0.30 hertz deviation" (nadir point) from scheduled frequency for the Quebec Interconnection with the applicable unit operating in a frequency responsive mode.

[3] If the original equipment manufacturer that commissioned the facility was acquired, merged, or operating under a different name, the new company would be considered the original equipment manufacturer.

supports EMT model(s) for the facility and legacy facilities not identified by the Transmission Planner under Requirement R1, Part 1.2.1, each Generator Owner or Transmission Owner shall provide to its Transmission Planner EMT model(s) with associated parameters, any information pertaining to changes to the model(s) or its parameters, and accompanying documentation, in accordance with the periodicity ~~specified in MOD-026~~requirements of Attachment ~~1~~2. Each Generator Owner or Transmission Owner shall, provide the following: *[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 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:~~

3.1. A facility EMT model with associated parameters representing the applicable HVDC, FACTS device, IBR unit(s)[4], collector system, auxiliary control device(s),[5] power plant controller, generator step-up transformer(s), and main power transformer(s) that includes:

3.1.1. Enabled protective functions that directly trip the IBR unit(s) or facility;[6] and

3.1.2. Limiting functions that limit active/reactive output of the IBR unit(s) or facility.[7]

3.2. Documentation of Model Verification demonstrating that the configurable, site-specific parameters of the model(s) are representative of the design and settings of the in-service equipment of the facility;

3.2.1. For any parameters that cannot be verified, the Generator Owner or Transmission Owner shall provide a written statement to the Transmission Planner detailing why any such parameters and reasons they cannot be verified.

~~**2.1.1.**~~**3.3.** Documentation ~~demonstrating the applicable unit's model response matches the recorded response for a voltage excursion from either~~of Model

[4] For purposes of this standard, the phrase "IBR unit" refers to an individual device, or a grouping of multiple devices, that uses a power electronic interface(s), such as an inverter or converter, that is capable of exporting Real Power from a primary energy source or energy storage system, and that connects at a single point on the collector system.

[5] Only to include those auxiliary control devices that act on voltage and/or frequency.

[6] Required protective functions are those that act directly on, or act on quantities derived from, voltage, frequency, and/or current. Examples of protections include DC reverse current, DC bus over-voltage and under-voltage, DC voltage unbalance, DC overcurrent, AC over-voltage and under-voltage protection (instantaneous and RMS), AC overcurrent, over-frequency and under-frequency protection, feeder (equivalent) AC over-voltage and under-voltage, feeder (equivalent) over-frequency and under-frequency, PLL (or equivalent) loss of synchronism, and phase jump tripping.

[7] Required limiting functions are those that act directly on, or act on quantities derived from, voltage, frequency, and/or current.

Validation comparing the behavior of the facility EMT model to the measured behavior during a staged test or ~~a measured~~ system disturbance~~,~~ for:

~~2.1.2. Manufacturer, model number (if available), and type of the excitation control system including, but not limited to static, AC brushless, DC rotating, and/or the plant volt/var control function (if installed),~~

~~2.1.3. Model structure and data including, but not limited to reactance, time constants, saturation factors, total rotational inertia, or equivalent data for the generator,~~

~~2.1.4. Model structure and data for the excitation control system, including the closed loop voltage regulator if a closed loop voltage regulator is installed or the model structure and data for the plant volt/var control function system,~~

~~2.1.5. Compensation settings (such as droop, line drop, differential compensation), if used, and~~

~~2.1.6. Model structure and data for power system stabilizer, if so equipped.~~

3.3.1. A dynamic reactive power or voltage excursion event to perform Model Validation of reactive power control and voltage control models, as applicable; and

3.3.2. A dynamic active power or frequency excursion event[8] to perform Model Validation of active power control and frequency control models, as applicable.

3.4. For IBR facilities, test[9] result(s) demonstrating a comparison of the IBR unit response and the IBR unit EMT model response for large signal disturbances. If test results are not obtainable, the Generator Owner shall document the reason; and

3.5. Documentation comparing the response of the facility positive sequence dynamic model provided in Requirement R2 to the response of the facility EMT model for large signal disturbances as defined by the Transmission Planner.

~~**R3.**~~**M3.** Each Generator Owner ~~shall provide a written response~~or Transmission Owner must provide dated evidence for each applicable facility that it provided EMT model(s) and accompanying documentation to its Transmission Planner ~~within 90 calendar days of receiving one of the following items for an applicable unit:~~in accordance with Requirement R3.

[8] Model Validation frequency excursion criteria: "≥ 0.04 hertz deviation" (nadir point) from scheduled frequency for the Eastern Interconnection with the applicable facility operating in a frequency responsive mode. "≥ 0.08 hertz deviation" (nadir point) from scheduled frequency for the ERCOT and Western Interconnections with the applicable facility operating in a frequency responsive mode. "≥ 0.30 hertz deviation" (nadir point) from scheduled frequency for the Quebec Interconnection with the applicable unit operating in a frequency responsive mode.

[9] A hardware specific test may include a factory type test, hardware in the loop test, or other manufacturer test to ensure the EMT model's large signal response emulates the supplied equipment to the extent possible.

R4. Each Generator Owner or Transmission Owner shall, within 180 calendar days after making a hardware, software, firmware, control mode, or setting change(s) to an applicable unit or facility that alters the dynamic response characteristic(s), provide its Transmission Planner with updated model(s) and accompanying documentation as described in Requirement R2, Parts 2.1 through 2.3 and, if applicable, Requirement R3, Parts 3.1 through 3.5. If mutually agreed upon with the Transmission Planner, model(s) and accompanying documentation may be provided according to a revised timeline. *[Violation Risk Factor: Medium] [Time Horizon: Operations Planning]*

- ~~Written notification from its Transmission Planner (in accordance with Requirement R6) that the excitation control system or plant volt/var control function model is not usable,~~
- ~~Written comments from its Transmission Planner identifying technical concerns with the verification documentation related to the excitation control system or plant volt/var control function model, or~~
- ~~Written comments and supporting evidence from its Transmission Planner indicating that the simulated excitation control system or plant volt/var control function model response did not match the recorded response to a transmission system event.~~

~~The written response shall contain either the technical basis for maintaining the current model, the model changes, or a plan to perform model verification[3] (in accordance with Requirement R2). *[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]*~~

~~R4.~~**M4.** Each Generator Owner ~~shall provide revised model data or plans to perform model verification[4]~~ (or Transmission Owner must provide dated evidence (e.g., email message, postal receipt, upload via web portal, etc.) that it provided its Transmission Planner with updated model(s) and accompanying documentation in accordance with Requirement ~~R2) for~~R4 for each change altering dynamic response characteristic(s) of an applicable unit ~~to its~~ or facility.

~~R3.~~**R5.** Each Transmission Planner shall, within ~~180~~90 calendar days ~~of making changes to the excitation control system or plant volt/var control function that alter the equipment response characteristic.[5]~~ after receiving model(s) and accompanying documentation provided by a Generator Owner or Transmission Owner, evaluate the model(s) and accompanying documentation to determine if it meets the dynamic

~~[3] If verification is performed, the 10-year period as outlined in MOD-026 Attachment 1 is reset.~~

~~[4] Ibid~~

~~[5] Exciter, voltage regulator, plant volt/var or power system stabilizer control replacement including software alterations that alter excitation control system equipment response, plant digital control system addition or replacement, plant digital control system software alterations that alter excitation control system equipment response, plant volt/var function equipment addition or replacement (such as static var systems, capacitor banks, individual unit excitation systems, etc), a change in the voltage control mode (such as going from power factor control to automatic voltage control, etc), exciter, voltage regulator, impedance compensator, or power system stabilizer settings change. Automatic changes in settings that occur due to changes in operating mode do not apply to Requirement R4.~~

model requirements developed under Requirement R1 and provide: *[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]*

- A written notification to the Generator Owner or Transmission Owner that the model(s) and accompanying documentation are acceptable, and a written notification, or the accepted model(s) and accompanying documentation, to its Planning Coordinator; or
- A written notification to the Generator Owner or Transmission Owner that the model(s) and accompanying documentation are not acceptable, along with an explanation and any supporting evidence demonstrating the issue(s).

M5. Each Transmission Planner must provide dated evidence that it reviewed provided model(s) and accompanying documentation in accordance with the dynamic model requirements developed in Requirement R1 and provided a written response notification in accordance with Requirement R5. Dated evidence may include date received, review date of provided model(s) and accompanying documentation, and dated response (e.g., email message, postal receipt, etc.).

~~**R5.**~~**R6.** Each Generator Owner ~~shall provide a written response to its~~or Transmission ~~Planner~~Owner shall, within 90 calendar days ~~following receipt of a technically justified[6] unit~~after receiving a notification of unacceptability under Requirement R5 or within 180 calendar days after receiving a request from ~~the~~its Transmission Planner to perform a model review ~~of a unit or plant that includes~~due to identified model or accompanying documentation deficiencies, provide a response to its Transmission Planner. If mutually agreed upon with the Transmission Planner, the response to a request to perform a model review may be provided according to a revised timeline. The provided response shall include one of the following: *[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]*

- Updated model(s) and accompanying documentation as described in Requirement R2, Parts 2.1 through 2.3 and, if applicable, Requirement R3, Parts 3.1 through 3.5; or
- A technical justification and supporting evidence for maintaining the current model(s) and accompanying documentation.

M6. Each Generator Owner or Transmission Owner must provide dated evidence (e.g., email message, postal receipt, etc.) that it provided a response to its Transmission Planner in accordance with Requirement R6.

- ~~Details of plans to verify the model (in accordance with Requirement R2), or~~
- ~~Corrected model data including the source of revised model data such as discovery of manufacturer test values to replace generic model data or updating of data parameters based on an on-site review of the equipment.~~

~~[6] Technical justification is achieved by the Transmission Planner demonstrating that the simulated unit or plant response does not match the measured unit or plant response.~~

R6. Each Transmission Planner shall provide a written response to the Generator Owner within 90 calendar days of receiving the verified excitation control system or plant volt/var control function model information in accordance with Requirement R2 that the model is usable (meets the criteria specified in Parts 6.1 through 6.3) or is not usable.

6.1. The excitation control system or plant volt/var control function model initializes to compute modeling data without error,

6.2. A no-disturbance simulation results in negligible transients, and

6.3. For an otherwise stable simulation, a disturbance simulation results in the excitation control and plant volt/var control function model exhibiting positive damping.

R7. If the model is not usable, theEach Transmission Planner shall provide a technical description of why the model is not usablethe current (in-use) model(s) and accompanying documentation for an existing facility within 90 calendar days of receiving a written request for such data from the Generator Owner or Transmission Owner that owns the facility. *[Violation Risk Factor: Medium Lower] [Time Horizon: Operations Planning]*

C. Measures

M1.M7. TheEach Transmission Planner must have and provide the dated request for instructions or data, the transmitted instructions or data, and dated evidence of a written transmittal (e.g., electronic mailemail message, postal receipt, or confirmation of facsimile) as evidenceetc.) that it provided the request within 90 calendar dayscurrent (in-use) model(s) and accompanying documentation to the Generator Owner or Transmission Owner in accordance with Requirement R1R7.

~~**M2.** The Generator Owner must have and provide dated evidence it verified each generator excitation control system or plant volt/var control function 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.~~

~~**M3.** Evidence for Requirement R3 must include the Generator Owner's dated written response containing the information identified in Requirement R3 and dated evidence of transmittal (e.g., electronic mail message, postal receipt, or confirmation of facsimile) of the response.~~

~~**M4.** Evidence for Requirement R4 must include, for each of the Generator Owner's applicable units for which system changes specified in Requirement R4 were made, a dated revised model data or plans to perform a model verification and dated evidence (e.g., electronic mail message, postal receipt, or confirmation of facsimile) it provided the revised model and data or plans within 180 calendar days of making changes.~~

~~**M5.** Evidence for Requirement R5 must include the Generator Owner's dated written response containing the information identified in Requirement R5 and dated evidence (e.g., electronic mail message, postal receipt, or confirmation of facsimile) it provided a written response within 90 calendar days following receipt of a technically justified request.~~

~~**M6.** Evidence of Requirement R6 must include, for each model received, the dated response indicating the model was usable or not usable according to the criteria specified in Parts 6.1 through 6.3 and for a model that is not usable, a technical description; and dated evidence of transmittal (e.g., electronic mail message, postal receipt, or confirmation of facsimile) that the Generator Owner was notified within 90 calendar days of receipt of model information.~~

~~D.~~C. Compliance

1. Compliance Monitoring Process

~~6.1.~~1.1. Compliance Enforcement Authority

~~: "The Regional Entity shall serve as the~~ Compliance Enforcement Authority ~~unless the applicable entity is owned, operated, or controlled by~~" means NERC or the Regional Entity~~. In such cases the ERO or a Regional entity approved by FERC or other applicable governmental authority shall serve as the CEA~~ in their respective roles of monitoring and enforcing compliance with the NERC Reliability Standards.

~~**1.2. Data Retention**~~

1.2. Evidence Retention: The following evidence retention ~~periods~~period(s) identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance

Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full time period since the last audit.

The ~~Generator Owner and Transmission Planner shall each~~applicable entity shall keep data or evidence to show compliance as identified below unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation~~:~~.

- Requirements R1 through R7, and Measures M1 through M7, since the last audit, unless directed by its Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.
- ~~The Transmission Planner shall retain the information/data request and provided response evidence of Requirements R1 and R6, Measures M1 and M6 for three calendar years from the date the document was provided.~~
- ~~The Generator Owner shall retain the latest excitation control system or plant volt/var control function model verification evidence of Requirement R2, Measure M2.~~
- ~~The Generator Owner shall retain the information/data request and provided response evidence of Requirements R3 through R5, and Measures M3 through M5 for three calendar years from the date the document was provided.~~

If ~~a Generator Owner or Transmission Planner~~an applicable entity is found non-compliant, it shall keep information related to the non-compliance until mitigation is complete ~~or~~and approved, or for the time specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last audit records, and all requested and submitted subsequent audit records.

1.3. Compliance Monitoring and Enforcement Program: "Compliance Monitoring Enforcement Program" or "CMEP" means, depending on the context, (1) the NERC Compliance Monitoring and Enforcement Program (Appendix 4C to the NERC Rules of Procedure) or the Commission-approved program of a Regional Entity, as applicable, or (2) the program, department, or organization within NERC or a Regional Entity that is responsible for performing compliance monitoring and enforcement activities with respect to Registered Entities' compliance with Reliability Standards.

~~**1.3. Compliance Monitoring and Assessment Processes**~~

~~Compliance Audit~~

~~Self-Certification~~

~~Spot Checking~~

~~Compliance Investigation~~

~~Self-Reporting~~

~~Complaints~~

~~1.4. Additional Compliance Information~~

~~None~~

~~2.~~ Violation Severity Levels

~~R #~~	Violation Severity Levels			
~~R #~~	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1.	~~The Transmission Planner provided the instructions and data to the Generator Owner more than 90 calendar days but less than or equal to 120 calendar days of receiving a written request.~~N/A	The Transmission Planner ~~provided the instructions and data to the Generator Owner more than 120 calendar days but less than or equal to 150 calendar days of receiving a written request~~and Planning Coordinator jointly developed dynamic model requirements, but they failed to include one of the items in Requirement R1, Parts 1.1 through 1.3.	The Transmission Planner ~~provided the instructions and data to the Generator Owner more than 150 calendar days but less than or equal to 180 calendar days of receiving a written request~~and Planning Coordinator jointly developed dynamic model requirements, but they failed to include two of the items in Requirement R1, Parts 1.1 through 1.3.	The Transmission Planner and Planning Coordinator jointly developed dynamic model requirements, but they failed to include three of the items in Requirement R1, Parts 1.1 through 1.3. OR The Transmission Planner and Planning Coordinator failed to jointly develop dynamic model requirements. OR The Transmission Planner failed to ~~provide the instructions and data to the~~make dynamic model requirements available to Generator ~~Owner within 180 calendar days of receiving a written request~~Owners and Transmission Owners.
R2.	The ~~Generator Owner~~applicable entity provided ~~its verified~~positive sequence dynamic model(s), ~~including~~with associated	The ~~Generator Owner~~applicable entity provided ~~its verified~~positive sequence dynamic model(s), ~~including~~with associated	The ~~Generator Owner~~applicable entity provided ~~its verified~~positive sequence dynamic model(s), ~~including~~with associated	~~The Generator Owner provided its verified model(s), including documentation and data more than 270 calendar days late to its Transmission Planner in accordance with the~~

	parameters, and accompanying documentation ~~and data~~ to its Transmission Planner ~~after the timeframe specified in MOD-026~~in accordance with the periodicity requirements of Attachment ~~1~~2 with the exception of Row 2, but ~~less than or equal to~~within 90 calendar days ~~late;~~after the date required. OR ~~The Generator Owner provided the Transmission Planner verified models that omitted one of the six Parts identified in Requirement R2, Parts 2.1.1 through 2.1.6.~~The applicable entity provided dynamic model(s) that failed to include one of the applicable items in Attachment 1, Table 1.1 or Table 1.2.	parameters, and accompanying documentation ~~and data~~ to its Transmission Planner ~~more than 90 calendar days but less than or equal to~~between 91 and 180 calendar days ~~late as specified by~~after the date in accordance with the periodicity ~~timeframe in MOD-026~~requirements of Attachment ~~1~~2 with the exception of Row 2. OR ~~The Generator Owner provided the Transmission Planner verified models that omitted two of the six Parts identified in Requirement R2, Parts 2.1.1 through 2.1.6.~~The applicable entity provided dynamic model(s) that failed to include two of the applicable items in Attachment 1, Table 1.1 or Table 1.2.	parameters, and accompanying documentation ~~and data~~ to its Transmission Planner ~~more than 180 calendar days but less than or equal to~~between 181 and 270 calendar days ~~late as specified by~~after the date in accordance with the periodicity ~~timeframe in MOD-026~~requirements of Attachment ~~1~~2 with the exception of Row 2. OR ~~The Generator Owner provided the Transmission Planner verified models that omitted three of the six Parts identified in Requirement R2, Parts 2.1.1 through 2.1.6.~~The applicable entity provided dynamic model(s) that failed to include three of the applicable items in Attachment 1, Table 1.1 or Table 1.2.	~~periodicity specified in MOD-026 Attachment 1.~~ The applicable entity provided positive sequence dynamic model(s), with associated parameters, and accompanying documentation to its Transmission Planner more than 270 calendar days after the date in accordance with the periodicity requirements of Attachment 2 with the exception of Row 2 where the provision should occur no more than 90 calendar days after the date in Row 2. OR The ~~Generator Owner~~applicable entity failed to ~~use~~provide dynamic model(s) ~~acceptable to the Transmission Planner as specified in Requirement R2, Part 2.1.~~ or accompanying information.~~OR~~ ~~The Generator Owner provided the Transmission Planner verified model(s) but omitted four or more of the six parts identified in Requirement R2, Subparts 2.1.1 through 2.1.6.~~

R3.	The applicable entity provided EMT model(s) for its applicable facility with associated parameters and accompanying documentation to its Transmission Planner, in accordance with the requirements developed by its Transmission Planner and Planning Coordinator, after the date required but within 90 calendar days after the date required. OR ~~The Generator Owner provided a written response more than 90 calendar days but less than or equal to 120 calendar days of receiving written notice.~~The applicable entity provided EMT model(s) and accompanying documentation by the required date, but failed to include one of the items in Requirement R3, Parts 3.1 through 3.5.	The applicable entity provided EMT model(s) for its applicable facility with associated parameters and accompanying documentation to its Transmission Planner, in accordance with the requirements developed by its Transmission Planner and Planning Coordinator, between 91 and 180 calendar days after the date required. OR ~~The Generator Owner provided a written response more than 120 calendar days but less than or equal to 150 calendar days of receiving written notice.~~The applicable entity provided EMT model(s) and accompanying documentation by the required date, but failed to include two of the items in Requirement R3, Parts 3.1 through 3.5.	The applicable entity provided EMT model(s) for its applicable facility with associated parameters and accompanying documentation to its Transmission Planner, in accordance with the requirements developed by its Transmission Planner and Planning Coordinator, between 181 and 270 calendar days after the date required. OR ~~The Generator Owner provided a written response more than 150 calendar days but less than or equal to 180 calendar days of receiving written notice.~~The applicable entity provided EMT model(s) and accompanying documentation by the required date, but failed to include three of the items in Requirement R3, Parts 3.1 through 3.5.	The applicable entity provided EMT model(s) for its applicable facility with associated parameters and accompanying documentation to its Transmission Planner, in accordance with the requirements developed by its Transmission Planner and Planning Coordinator, more than 270 calendar days after the date required. OR The applicable entity provided EMT model(s) by the required date, but failed to include four of the items in Requirement R3, Parts 3.1 through 3.5. OR The ~~Generator Owner~~applicable entity failed to provide ~~a written response within 180 calendar days of receiving written notice.~~ EMT model(s) and accompanying documentation.~~OR~~ ~~The Generator Owner's written response failed to contain either the technical basis for maintaining the~~

				~~current model, or a list of future model changes, or a plan to perform another model verification.~~
R4.	The ~~Generator Owner provided revised model data or plans to perform model verification more than 180 calendar days but less than or equal to~~applicable entity provided updated model(s) and accompanying documentation to its Transmission Planner between 181 and 210 calendar days ~~of making changes to the excitation control system or plant volt/var control function that altered the equipment~~(or within 30 calendar days after the timeline mutually agreed to by the Transmission Planner) after making a change that alters the dynamic response characteristic(s).	The ~~Generator Owner provided revised model data or plans to perform model verification more than 210 calendar days but less than or equal to~~applicable entity provided updated model(s) and accompanying documentation between 211 and 240 calendar days ~~of making changes to the excitation control system or plant volt/var control function that altered the equipment~~(or between 31 and 60 calendar days after the timeline mutually agreed to by the Transmission Planner) after making a change that alters the dynamic response characteristic(s).	The ~~Generator Owner provided revised model data or plans to perform model verification more than 240 calendar days but less than or equal to~~applicable entity provided updated model(s) and accompanying documentation between 241 and 270 calendar days ~~of making changes to the excitation control system or plant volt/var control function that altered the equipment~~(or between 61 and 90 calendar days after the timeline mutually agreed to by the Transmission Planner) after making a change that alters the dynamic response characteristic(s).	The applicable entity provided updated model(s) and accompanying documentation more than 270 calendar days (or more than 90 calendar days after the timeline mutually agreed to by the Transmission Planner) after making a change that alters the dynamic response characteristic(s). OR ~~The Generator Owner failed to provide revised model data or failed to provide plans to perform model verification within 270 calendar days of making changes to the excitation control system or plant volt/var control function that altered the equipment response characteristic.~~The applicable entity failed to identify, provide updated model(s) and accompanying documentation after making a change that alters the dynamic response characteristic(s).

R5.	The ~~Generator Owner~~Transmission Planner reviewed the submitted model(s) and accompanying documentation for adherence to the dynamic model requirements developed in Requirement R1, but provided a written response ~~more than 90 calendar days but less than or equal~~to the submitter between 91 to 120 calendar days ~~to the Transmission Planner following receipt of a technically justified request to perform a model review of an applicable unit~~after receiving the submission.	The ~~Generator Owner~~Transmission Planner reviewed the submitted model(s) and accompanying documentation for adherence to the dynamic model requirements developed in Requirement R1, but provided a written response ~~more than 120 calendar days but less than or equal~~to the submitter between 121 to 150 calendar days ~~to the Transmission Planner following receipt of a technically justified request to perform a model review of an applicable unit~~after receiving the submission.	~~The Generator Owner provided a written response more than 150 calendar days but less than or equal to 180 calendar days to the Transmission Planner following receipt of a technically justified request to perform a model review of an applicable unit.~~ The Transmission Planner reviewed the submitted model(s) and accompanying documentation for adherence to the dynamic model requirements developed in Requirement R1, but provided a written response to the submitter between 151 to 180 calendar days after receiving the submission.	~~The Generator Owner failed to provide a written response to the Transmission Planner within 180 calendar days following receipt of a technically justified request to perform a model review of an applicable unit.~~ The Transmission Planner reviewed the submitted model(s) and accompanying documentation for adherence to the dynamic model requirements developed in Requirement R1, but provided a written response to the submitter more than 180 calendar days after receiving the submission. OR The Transmission Planner reviewed the submitted model(s) and accompanying documentation for adherence to the dynamic model requirements developed in Requirement R1, and provided a response indicating that the model was unacceptable, but did not include an explanation and supporting evidence. OR

				~~The Generator Owner's written response failed to include one of the sub-bullets of Requirement R5.~~The Transmission Planner failed to review the submitted model(s) and accompanying documentation for adherence to the dynamic model requirements developed in Requirement R1, and failed to provide a response to the submitter.
R6.	The ~~Transmission Planner~~applicable entity provided a ~~written~~ response to the ~~Generator Owner indicating whether the model is usable or not usable; including a technical description if the model is not usable, more than 90 calendar days but less than or equal~~Transmission Planner after receiving a notification of unacceptability under Requirement R5, but did so between 91 to 120 calendar days ~~of~~after receiving ~~verified model information;~~a notification of unacceptability. OR The ~~Transmission Planner~~applicable entity provided a ~~written~~ response to the ~~Generator Owner within 90~~	The ~~Transmission Planner~~applicable entity provided a ~~written~~ response to the ~~Generator Owner indicating whether the model is usable or not usable; including a technical description if the model is not usable, more than 120 calendar days but less than or equal~~Transmission Planner after receiving a notification of unacceptability under Requirement R5, but did so between 121 to 150 calendar days ~~of~~after receiving ~~the verified model information;~~a notification of unacceptability. OR ~~The Transmission Planner's written response omitted confirmation for one of the specified model criteria listed~~	The ~~Transmission Planner~~applicable entity provided a ~~written~~ response to the ~~Generator Owner indicating whether the model is usable or not usable; including a technical description if the model is not usable, more than 150 calendar days but less than or equal~~Transmission Planner after receiving a notification of unacceptability under Requirement R5, but did so between 151 to 180 calendar days ~~of~~after receiving ~~the verified model information;~~a notification of unacceptability. OR ~~The Transmission Planner's written response omitted confirmation for two of the specified model criteria listed~~	The ~~Transmission Planner~~applicable entity failed to provide a ~~written~~ response to the ~~Generator Owner within 180 calendar days of receiving the verified model information;~~Transmission Planner after receiving a notification of unacceptability under Requirement R5 or a request to perform a model review. OR ~~The Transmission Planner's written response omitted confirmation for all specified model criteria listed in Requirement R6, Parts 6.1 through 6.3;~~ The applicable entity provided a response to the Transmission Planner after receiving a

	~~calendar days indicating that the model is not usable; but did not include a technical description.~~ Transmission Planner after receiving a request to perform a model review, but did so between 181 to 210 calendar days (or within 30 calendar days after the timeline mutually agreed to by the Transmission Planner) after receiving a request to perform a model review.	~~in Requirement R6, Parts 6.1 through 6.3;~~ ~~OR~~ The ~~Transmission Planner~~applicable entity provided a ~~written~~ response to the ~~Generator Owner indicating that the~~Transmission Planner after receiving a request to perform a model ~~is not usable~~review, but did ~~not include a technical description and provided the response more than 90~~so between 211 to 240 calendar days ~~but less than or equal to 120~~(or between 31 and 60 calendar days ~~of~~after the timeline mutually agreed to by the Transmission Planner) after receiving ~~verified~~a request to perform a model ~~information~~review.	~~in Requirement R6, Parts 6.1 through 6.3;~~ ~~OR~~ The ~~Transmission Planner~~applicable entity provided a ~~written~~ response to the ~~Generator Owner indicating that the~~Transmission Planner after receiving a request to perform a model ~~is not usable~~review, but did ~~not include a technical description and provided the response more than 120~~so between 241 to 270 calendar days ~~but less than or equal to 150~~(or between 61 and 90 calendar days ~~of~~after the timeline mutually agreed to by the Transmission Planner) after receiving ~~verified~~a request to perform a model ~~information~~review.	notification of unacceptability under Requirement R5, but did so more than 180 calendar days after receiving a notification of unacceptability. OR The ~~Transmission Planner~~applicable entity provided a ~~written~~ response to the ~~Generator Owner indicating that the~~Transmission Planner after receiving a request to perform a model ~~is not usable~~review, but did ~~not include a technical description and provided the response~~so more than ~~150~~270 calendar days (or more than 90 calendar days after the timeline mutually agreed to by the Transmission Planner) after receiving ~~verified~~a request to perform a model ~~information~~review. OR The applicable entity provided a response to the Transmission Planner after receiving a notification or unacceptability or a request to perform a model review, but its response failed to contain one of the

				two options for responses described in Requirement R6.
R7	The Transmission Planner provided the current (in-use) model(s) and accompanying documentation to the Generator Owner or Transmission Owner, but did so between 91 and 120 calendar days after receiving a request.	The Transmission Planner provided the current (in-use) model(s) and accompanying documentation to the Generator Owner or Transmission Owner, but did so between 121 and 150 calendar days after receiving a request.	The Transmission Planner provided the current (in-use) model(s) and accompanying documentation to the Generator Owner or Transmission Owner, but did so between 151 and 180 calendar days after receiving a request.	The Transmission Planner provided the current (in-use) model(s) and accompanying documentation to the Generator Owner or Transmission Owner, but did so more than 180 calendar days after receiving a request. OR The Transmission Planner failed to provide the current (in-use) model(s) and accompanying documentation to the Generator Owner or Transmission Owner after receiving a request.

D. Regional Variances

None.

E. Associated Documents

- Project 2020-06 Verification of Models and Data for Generators Implementation Plan
- Project 2020-06 MOD-026-2 Technical Rationale
- Project 2020-06 VSL VRFs Justification Document
- Project 2020-06 Mapping Document

Version History

~~E. Regional Variances~~

~~None.~~

~~F. Associated Documents~~

~~None.~~

~~Version History~~

Version	Date	Action	Change Tracking
1	February 7, 2013	Adopted by NERC Board of Trustees	New
1	March 20, 2014	FERC Order issued approving MOD~~-026-1.~~ 026-1. (Order becomes effective for R1, R3, R4, R5, and R6 on 7/1/14. R2 becomes effective on 7/1/18.)	
1	May 7, 2014	NERC Board of Trustees adopted revisions to VSLs in Requirement R6.	Revisions
1	November 26, 2014	FERC issued a letter order approved ~~revisions~~ revision to VSLs in Requirement R6.	
2	TBD	Adopted by NERC Board of Trustees	FERC Order No. 901 Revisions by Project 2020-06.

G. References

The following documents contain technical information beyond the scope of this Standard on excitation control system functionality, modeling, and testing.

1. IEEE 421.1 Definitions for Excitation Systems for Synchronous Machines
2. IEEE 421.2 Guide for Identification, Testing, and Evaluation of the Dynamic Performance of Excitation Control Systems
3. IEEE 421.5 IEEE Recommended Practice for Excitation System Models for Power System Stability Studies
4. K. Clark, R.A. Walling, N.W. Miller, "Solar Photovoltaic (PV) Plant Models in PSLF," IEEE/PES General Meeting, Detroit, MI, July 2011
5. M. Asmine, J. Brochu, J. Fortmann, R. Gagnon, Y. Kazachkov, C.-E. Langlois, C. Larose, E. Muljadi, J. MacDowell, P. Pourbeik, S. A. Seman, and K. Wiens, "Model Validation for Wind Turbine Generator Models", IEEE Transactions on Power System, Volume 26, Issue 3, August 2011
6. A. Ellis, E. Muljadi, J. Sanchez-Gasca, Y. Kazachkov, "Generic Models for Simulation of Wind Power Plants in Bulk System Planning Studies," IEEE PES General Meeting 2011, Detroit, MI, July 24-28
7. N.W. Miller, J. J. Sanchez-Gasca, K. Clark, J.M. MacDowell, "Dynamic Modeling of GE Wind Plants for Stability Simulations," IEEE PES General Meeting 2011, Detroit, MI, July 24-28
8. A. Ellis, Y. Kazachkov, E. Muljadi, P. Pourbeik, J.J. Sanchez-Gasca, Working Group Joint Report – WECC Working Group on Dynamic Performance of Wind Power Generation & IEEE Working Group on Dynamic Performance of Wind Power Generation, "Description and Technical Specifications for Generic WTG Models – A Status Report," Proc. IEEE PES 2011 Power Systems Conference and Exposition (PSCE), March 2011, Phoenix, AZ
9. K. Clark, N.W. Miller, R.A. Walling, "Modeling of GE Solar Photovoltaic (PV) Plants for Grid Studies," version 1.1, April 2010
10. K. Clark, N.W. Miller, J. J. Sanchez-Gasca, "Modeling of GE Wind Turbine-Generators for Grid Studies," version 4.5, April 16, 2010, Available from GE Energy
11. R.J. Piwko, N.W. Miller, J.M. MacDowell, "Field Testing & Model Validation of Wind Plants," in Proc. IEEE PES General Meeting, Pittsburg, PA, July 2008
12. N. Miller, K. Clark, J. MacDowell and W. Barton, "Experience with Field and Factory Testing for Model Validation of GE Wind Plants," in Proc. Eur. Wind Energy Conf. Exhib., Brussels, Belgium, March/April 2008
13. IEEE Task Force on Generator Model Validation Testing of the Power System Stability Subcommittee, "Guidelines for Generator Stability Model Validation Testing," IEEE PES General Meeting 2007, paper 07GM1307

14. W.W. Price and J. J. Sanchez-Gasca, "Simplified Wind Turbine Generator Aerodynamic Models for Transient Stability Studies," in PROC IEEE PES 2006 Power Systems Conf. Expo. (PSCE), Atlanta, GA, October 1, 2006, p. 986-992

15. J.J. Sanchez-Gasca, R.J. Piwko, N. W. Miller, W. W. Price, "On the Integration of Wind Power Plants in Large Power Systems," Proc. X Symposium of Specialists in Electric and Expansion Planning (SEPOPE), Florianopolis, Brazil, May 2006

16. N. W. Miller, J. J. Sanchez-Gasca, W. W. Price, R. W. Delmerico, "Dynamic Modeling of GE 1.5 and 3.6 MW Wind Turbine-Generators for Stability Simulations," Proc. IEEE Power Engineering Society General Meeting, Toronto, Ontario, July 2003

17. P. Pourbeik, C. Pink and R. Bisbee, "Power Plant Model Validation for Achieving Reliability Standard Requirements Based on Recorded On-Line Disturbance Data", Proceedings of the IEEE PSCE, March, 2011

Attachment 1:

Table 1.1 Applicability: Facility Sections 4.2.1 or 4.2.2 Synchronous Condenser Identified in Facility Section 4.2.3.1			
Generator Model	**Excitation Control**	**Governor Control**	**Additional Limiting and Protective Functions**
1. Manufacturer, model number (if available), and type of generator/synchronous condenser; 2. Models representing the generator/synchronous condenser.	1. Manufacturer, model number (if available), and type of excitation system hardware and control; 2. Model(s) representing the excitation system including voltage regulator, impedance compensation (such as droop, line drop, differential compensation), power system stabilizer, and outer-loop controls which impact dynamic volt/volt-ampere reactive (VAR) performance.	1. Manufacturer, model number (if available), and type of prime mover, governor, and control; 2. Model(s) representing the prime mover, governor control system, and any other controls which impact the dynamic active real power or frequency performance due to a system disturbance (e.g., load controller), but excluding Automatic Generation Control.	If required by its Transmission Planner under Requirement R1, Part 1.1.1, Generator Owner(s) or Transmission Owner(s) shall submit: 1. Model(s) representing enabled excitation limiters; 2. Model(s) representing enabled AC over- voltage, AC under-voltage, enabled over-frequency, under-frequency, over-speed, under-speed, Volts per Hertz protective functions, out of step protection that trip the excitation system, the prime mover, or generator/synchronous condenser either directly or via lockout or auxiliary tripping relays.

Table 1.2 Applicability: Facility Sections 4.2.5 and 4.2.6 FACTS Devices Identified in Facility Section 4.2.3.2 HVDC Systems Identified in Facility Section 4.2.4			
The facility	**Volt/VAR Control**	**Frequency/ Power Control[10]**	**Additional Limiting and Protective Functions**
1. Manufacturer 2. Model Number 3. Software/Firmware versions for applicable facility's a. IBR unit(s) b. FACTS device(s) c. VSC HVDC d. LCC HVDC e. Power plant controller(s)	1. Model(s) representing associated reactive power/voltage control as applicable for the specific facility or equipment. a. In the case of IBR, the model shall include: i. IBR unit(s) electronic control ii. The facility's power plant control iii. Supplemental reactive power devices and their control b. Other equipment which impacts facility voltage and reactive power dynamic response.	1. Model(s) representing the associated active power/frequency control including the specific facility or equipment. a. In the case of the IBR, the model shall include: i. IBR unit(s) electronic control ii. The facility's power plant control b. Other equipment which impacts facility active power or grid frequency dynamic response.	1. Model(s) representing enabled limiting functions, which limit active or reactive output of the IBR unit or facility. Limiting functions include active or reactive power limiting, active or reactive current limiting, or other limiting functions as may be involved in active or reactive power prioritization, ramping, disturbance ride-through and post-disturbance recovery behaviors. 2. Model(s) representing enabled protection functions that directly trip IBR unit(s) or facility, to include AC over-voltage and under-voltage protection, and over-frequency

[10] Not applicable for FACTS Devices identified in Facility Section 4.2.3.2

			and under-frequency protection.

Attachment 2: Periodicity

MOD-~~026-~~026-2 Attachment ~~1~~2 ~~Excitation Control System or Plant Volt/Var Function Model Verification~~ Periodicity		
Row Number	**~~Verification~~Triggering Condition**	**Required Action**
1	Establishing the initial verification date for an applicable ~~unit~~facility. (Applies to Requirement R2 and Requirement R3)	For Requirement R2, transmit the model(s) and accompanying documentation meeting Requirement R2, Parts 2.1 through 2.3 to its Transmission Planner in accordance with the date(s) of the Implementation Plan. ~~Transmit the verified model, documentation and data to the Transmission Planner on or before the Effective Date.~~ ~~Row 4 applies when calculating generation fleet compliance during the 10-year implementation period.~~ ~~See Section A5 for Effective Dates.~~For Requirement R3, transmit the model(s) and accompanying documentation meeting Requirement R3, Parts 3.1 through 3.5 to its Transmission Planner in accordance with the date of the Implementation Plan or within 365 calendar days after the Transmission Planner identifies the facility as an applicable facility in accordance with Requirement R1, Part 1.2.1, whichever is later.
2	Initial verification for a newly commissioned facility. (Applies to Requirement R2 and Requirement R3)	Transmit the model(s) and accompanying documentation meeting Requirement R2, Parts 2.1 through 2.3 and, if applicable, Requirement R3, Parts 3.1 through 3.5 to its Transmission Planner within 365 calendar days after the commercial operation date.

MOD-026-026-2 Attachment 12 Excitation Control System or Plant Volt/Var Function Model Verification Periodicity		
Row Number	**VerificationTriggering Condition**	**Required Action**
23	Subsequent verificationModel Validation and Model Verification for an applicable unitfacility. (Applies to Requirement R2 and Requirement R3)	Transmit the verified model.(s) and accompanying documentation and data to themeeting Requirement R2, Parts 2.1 through 2.3 and, if applicable, Requirement R3, Parts 3.1 through 3.5 to its Transmission Planner on or before thewithin 10-year anniversary calendar years of the lastmost recent transmittal (per Note 1).
34	Initial verification for a new applicable unit or for an existing applicable unit with new excitation control system or plant volt/var control function equipment installed. Applicable facility with installed and operating recording equipment does not experience a frequency excursion as applicable per Footnote 2 by the date otherwise required to meet the dates per Attachment 2, Rows 1, 2, or 3. (Applies to Requirement R2 and Requirement R3) This row applies only if a frequency excursion from a system disturbance that meets Footnote 2 is selected for the validation method because a unit is unable to accept a frequency or speed test signal to perform Model Validation by a stage test.	Transmit the verified model, documentation and data to theRequirement R2, Part 2.3.2 and Requirement R3, Part 3.3.2 are met with a written statement transmitted to its Transmission Planner within. Transmit the model meeting Requirement R2, Parts 2.1 through 2.3 or Requirement R3, Parts 3.1 through 3.5 and accompanying information to its Transmission Planner on or before 365 calendar days after the commissioning date.a frequency excursion per Footnote 2 occurs and the recording equipment captures the applicable facility's active power response as expected.
5	For an existing applicable facility with a change to in-service equipment as described under Requirement R4. (Applies to Requirement R4)	In order for the transmittal to reset the 10-year anniversary transmittal date for Requirement R2 and Requirement R3 as described in Row 3, all model(s) and model parameters must be verified according to the applicable requirement(s) and included in the transmittal.

MOD-026-026-2 Attachment 12 Excitation Control System or Plant Volt/Var Function Model Verification Periodicity		
Row Number	**VerificationTriggering Condition**	**Required Action**
46	Existing applicable unit, new, or upgraded synchronous generating unit or synchronous condenser that is equivalent to anotherother unit(s) at the same physical location. AND Each applicable unit has the same MVA nameplate rating.; AND The nameplate rating is ≤ 350 MVA.; AND Each applicable unit has the same components, ratings, and settings.; AND The model for one of these equivalent applicable units has been verified. (Applies to Requirement R2)	Document circumstance withProvide a written statementexplanation and include with the verified model.(s) and accompanying documentation and data provided to theits Transmission Planner for the verified equivalent unit. VerifyModel Verification and Model Validation shall be performed for a different equivalent unit during each 10-year verification period. Applies to Row 1 when calculating generation fleet compliance during the 10-year implementation period.

MOD-026-026-2 Attachment 12 Excitation Control System or Plant Volt/Var Function Model Verification Periodicity		
Row Number	**VerificationTriggering Condition**	**Required Action**
57	The Generator Owner has submitted a verification plan. Applicable facility is not responsive to voltage excursion events during normal operation; OR New or existing applicable facility does not have an installed closed loop voltage or reactive power control function or has a disabled closed loop voltage or reactive power control system function. (Applies to Requirement R2, Part 2.3.1 or Requirement R3, R4 or R5Part 3.3.1)	Transmit the verified model, documentation and data to theRequirement R2, Part 2.3.1 or Requirement R3, Part 3.3.1 is met with a written statement to that effect transmitted to its Transmission Planner within 365 calendar days after the submittal of the verification plan..

MOD-026-026-2 Attachment 12 Excitation Control System or Plant Volt/Var Function Model Verification Periodicity		
Row Number	**VerificationTriggering Condition**	**Required Action**
68	Applicable facility is not designed to be responsive to frequency excursion events during normal operation. (The applicable facility does not operate in a frequency control mode, except during normal start up and shut down, that would result in a prime mover/governor and load control or active power/frequency control mode response.) OR New or existing applicable unitfacility does not include an active closed loop voltage or reactive powerhave an installed frequency control functionsystem or has a disabled frequency control system. (Applies to Requirement R2, Part 2.3.2 or Requirement R3, Part 3.3.2) (Requirement R2)If the applicable facility is operating in a frequency control mode that is responsive to a frequency excursion event in only one direction (over- or under-frequency), then Requirement R2, Part 2.3.2 and Requirement R3, Part 3.3.2 are still applicable.	Requirement 2R2, Part 2.3.2 or Requirement R3, Part 3.3.2 is met with a written statement to that effect transmitted to theits Transmission Planner. Perform verification per the periodicity specified in Row 3 for a "New Generating Unit" (or new equipment) only if active closed loop function is established. See Footnote 1 (see Section A.3) for clarification of what constitutes an active closed loop function for both conventional synchronous machines (reference Footnote 1a) and aggregate generating plants (reference Footnote 1b).

MOD-026-026-2 Attachment 12 Excitation Control System or Plant Volt/Var Function Model Verification Periodicity		
Row Number	**VerificationTriggering Condition**	**Required Action**
79	Existing applicable unit or facility, excluding synchronous condensers, FACTS devices, and HVDC facilities, has a current average net capacity factor over the most recent three calendar years, beginning on January 1 and ending on December 31, of 5% or less. (Requirement R2 or Requirement R3 periodicity exemption of Row 3; does not exempt obligation under Requirement R4 or Requirement R6.)	Requirements R2 or Requirement 2 isR3 are met with a written statement to that effect transmitted to theits Transmission Planner annually. At the end of this 10-year timeframe, the current average three year net capacity factor (for years 8, 9, and 10) can be examined to determine if the capacity factor exemption can be declared for the next 10-year period. If not eligible for the capacity factor exemption, then model verification must be completed within 365 calendar days of the date the capacity factor exemption expired. If the current average net capacity factor over the most recent three calendar years exceeds 5%, then transmit the model(s) and accompanying documentation meeting Requirement R2, Parts 2.1 through 2.3 and, if applicable, Requirement R3, Parts 3.1 through 3.5 within 365 calendar days. For the definition of net capacity[11] factor, refer to Appendix F of the GADS Data Reporting Instructions on the NERC website.[12]

[11] Net Capacity Factor: **NCF** = [**Σ** (**Net Actual Generation**) / **Σ** (Net **M**aximum **C**apacity **x** Period **H**ours)] **x 100**%
Where, Period Hours = 8760 x 3 = 26280. In the case of batteries, the absolute value of discharging and charging shall be summed into Net Actual Generation.
[12] Refer to Appendix F of the GADS Conventional Data Reporting Instructions.
https://www.nerc.com/pa/RAPA/gads/DataReportingInstructions/Appendix_F_Equations_2025_DRI.pdf

MOD-026-026-2 Attachment 12 Excitation Control System or Plant Volt/Var Function Model Verification Periodicity		
Row Number	**VerificationTriggering Condition**	**Required Action**

NOTES:

NOTE 1: Establishing the recurring 10-year unit verification period start date:

The start date is the actual date of submittal of a verified model to the Transmission Planner for the most recently performed unit verification.

NOTE 2: Consideration for early compliance:

Existing generator excitation control system or plant volt/var control function model verification is sufficient for demonstrating compliance for a 10-year period from the actual transmittal date if either of the following applies:

- The Generator Owner has a verified model that is compliant with the applicable regional policies, guidelines or criteria existing at the time of model verification.
- The Generator Owner has an existing verified model that is compliant with the requirements of this standard.