

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 third draft of the proposed standard for a formal 45-day comment period.

Completed Actions	Date
Standards Committee approved Standard Authorization Request (SAR) for posting	January 20, 2021
SAR posted for comment	March 3 – April 6, 2022
SAR posted for comment	April 14 – May 13, 2021

Anticipated Actions	Date
45-day formal comment period with ballot	October 31, 2022 – January 13, 2023
45-day formal comment period with additional ballot	May 10 – June 23, 2023
45-day formal comment period with additional ballot	September 22 – November 6, 2023
10-day final ballot	TBD
Board adoption	TBD

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 listed below will be presented for approval with the proposed standard. Upon Board adoption, this section will be removed.

Term(s):

None

A. Introduction

1. **Title:** Generator Operation for Maintaining Network Voltage Schedules
2. **Number:** VAR-002-5
3. **Purpose:** To ensure Bulk Electric System generating resource(s) provide reactive support and voltage control, within generating resource capabilities, in order to protect equipment, and maintain Reliable Operation of the Interconnection.
4. **Applicability:**
 - 4.1. **Functional Entities:**
 - 4.1.1. Generator Operator
 - 4.1.2. Generator Owner
5. **Effective Date:** See Implementation Plan for VAR-002-5.

B. Requirements and Measures

- R1.** The Generator Operator shall operate each generating resource(s) connected to the interconnected Transmission System in the automatic voltage control mode (with its automatic voltage regulator (AVR¹ in service and controlling voltage) or in a different control mode as instructed by the Transmission Operator unless: 1) the generating resource(s) is exempted by the Transmission Operator, or 2) the Generator Operator has notified the Transmission Operator of one of the following: [*Violation Risk Factor: Medium*] [*Time Horizon: Real-time Operations*]
- That the generating resource(s) is being operated in start-up², shutdown³, or testing mode pursuant to a Real-time communication or a procedure that was previously provided to the Transmission Operator; or
 - That the generating resource(s) is not being operated in automatic voltage control mode or in the control mode that was instructed by the Transmission Operator for a reason other than start-up, shutdown, or testing.
- M1.** The Generator Operator shall have evidence to show that it notified its associated Transmission Operator any time it failed to operate a generating resource(s) in the automatic voltage control mode or in a different control mode as specified in Requirement R1. If a generating resource(s) is being started up or shut down with the automatic voltage control off, or is being tested, and no notification of the AVR status is made to the Transmission Operator, the Generator Operator will have evidence that it notified the Transmission Operator of its procedure for placing the unit into automatic voltage control mode as required in Requirement R1. Such evidence may include, but is not limited to, dated evidence of transmittal of the procedure such as an electronic message or a transmittal letter with the procedure included or attached. If a generating resource(s) is exempted from automatic voltage control mode (with its AVR in service and controlling voltage), the Generator Operator will maintain evidence of an exception.
- R2.** Unless exempted by the Transmission Operator, each Generator Operator shall maintain the generating resource(s) voltage or Reactive Power schedule⁴ (within each generating Facility's capabilities⁵) provided by the Transmission Operator, or otherwise shall meet the conditions of notification for deviations from the voltage or

¹ For dispersed power producing resources identified through inclusion I4 of the Bulk Electric System definition, the automatic voltage regulator (AVR) refers to the voltage & reactive power control system controlling and coordinating plant voltage.

² Start-up is deemed to have ended when the generating resource(s) is ramped up to its minimum continuously sustainable Load and the generating resource(s) is prepared for continuous operation.

³ Shutdown is deemed to begin when the generating resource(s) is ramped down to its minimum continuously sustainable Load and the generating resource(s) is prepared to go offline.

⁴ The voltage or Reactive Power schedule is a target value with a tolerance band, or a voltage or Reactive Power range communicated by the Transmission Operator to the Generator Operator.

⁵ Generating resource(s) capability may be established by test or other means and may not be sufficient at times to pull the System voltage within the schedule tolerance band. Also, when a generating resource(s) is operating in manual control, Reactive Power capability may change, based on stability considerations.

Reactive Power schedule provided by the Transmission Operator. *[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]*

- 2.1.** When a generating resource(s)'s AVR is out of service or the applicable Facility does not have an AVR, the Generator Operator shall use an alternative method to control the applicable Facility reactive output to meet the voltage or Reactive Power schedule provided by the Transmission Operator or if no other method of control is available, notify the Transmission Operator as soon as becoming aware of the condition.
 - 2.2.** When instructed to modify voltage, the Generator Operator shall comply or provide an explanation of why the schedule cannot be met.
 - 2.3.** Generator Operators that do not monitor the voltage at the location specified in their voltage schedule shall have a methodology for converting the scheduled voltage to the voltage point being monitored by the Generator Operator.
- M2.** In order to identify when a generating resource(s) is deviating from its schedule, the Generator Operator will monitor voltage based on existing equipment at its Facility. The Generator Operator will have evidence to show that the generating resource(s) maintained the voltage or Reactive Power schedule provided by the Transmission Operator or will have evidence of meeting the conditions of notification for deviations from the voltage or Reactive Power schedule provided by the Transmission Operator.

Evidence may include, but is not limited to, operator logs, SCADA data, phone logs, and any other notifications that would alert the Transmission Operator or otherwise demonstrate that the Generator Operator complied with the Transmission Operator's instructions for addressing deviations from the voltage or Reactive Power schedule.

For Part 2.1, when a generating resource(s)'s AVR is out of service or the generating resource(s) does not have an AVR, a Generator Operator shall have evidence to show an alternative method was used to control the generator reactive output to meet the voltage or Reactive Power schedule provided by the Transmission Operator or evidence of notification to the Transmission Operator if no other method of control is available.

For Part 2.2, the Generator Operator will have evidence that it complied with the Transmission Operator's instructions to modify its voltage or provided an explanation to the Transmission Operator of why the Generator Operator was unable to comply with the instruction. Evidence may include, but is not limited to, operator logs, SCADA data, and phone logs.

For Part 2.3, for Generator Operators that do not monitor the voltage at the location specified on the voltage schedule, the Generator Operator will demonstrate the methodology for converting the scheduled voltage to the voltage point being monitored by the Generator Operator.

- R3.** Each Generator Operator shall notify its associated Transmission Operator, in a mutually-agreed communication method, within 30 minutes of status change of its AVR or within 30 minutes of becoming aware of an unexpected functionality change of its AVR, power system stabilizer, or alternative voltage controlling device. If the status or functionality has been restored within 30 minutes, then the Generator Operator is not required to notify the Transmission Operator of the change. *[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]*
- M3.** Each Generator Operator shall have evidence it notified its associated Transmission Operator within 30 minutes of status change of its AVR or within 30 minutes of becoming aware of an unexpected functionality change identified in Requirement R3. If the status or functionality change has been restored within the first 30 minutes, no notification is necessary.
- R4.** Each Generator Operator shall notify its associated Transmission Operator, in a mutually-agreeable communication method, within 30 minutes of becoming aware of a reactive capability change due to factors other than those specified in Requirement R3 at the generating resource(s). Where the Transmission Operator has specified a reactive capability threshold, the Generator Operator shall report reactive capability changes that create degradation or restores from degradation. If the capability has been restored within 30 minutes of the Generator Operator becoming aware of such change, then the Generator Operator is not required to notify the Transmission Operator of the change in reactive capability. *[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]*
- M4.** Each Generator Operator shall have evidence it notified its associated Transmission Operator within 30 minutes of becoming aware of a change in reactive capability in accordance with Requirement R4. If the capability has been restored within the first 30 minutes, no notification is necessary.
- R5.** The Generator Owner for each generating resource(s) shall provide the following to its associated Transmission Operator and Transmission Planner within 30 calendar days of a request. *[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]*
- 5.1.** For generator step-up⁶ and auxiliary transformers⁷ with primary voltages equal to or greater than the generator terminal voltage:
- 5.1.1.** Tap settings.
- 5.1.2.** Available tap ranges.
- 5.1.3.** Impedance data.
- M5.** The Generator Owner for each generating resource(s) shall have evidence it provided its associated Transmission Operator and Transmission Planner with information on its

⁶ Generator step-up and auxiliary transformers would be owned and maintained by the Generator Owner.

⁷ For dispersed power producing resources identified through Inclusion I4 of the Bulk Electric System definition, this requirement (Requirement R5 and its subparts) applies only to those transformers that have at least one winding at a voltage of 100 kV or above.

step-up and auxiliary transformers as required in Requirement R5, Part 5.1.1 through Part 5.1.3 within 30 calendar days.

- R6.** After consultation with the Transmission Operator regarding necessary generator owned step-up transformer tap changes, the Generator Owner for each generating resource(s) shall ensure that transformer tap positions are changed according to the specifications provided by the Transmission Operator, unless such action would violate safety, an Equipment Rating, a regulatory requirement, or a statutory requirement. *[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]*
- 6.1.** If the applicable Generator Owner for each generating resource(s) cannot comply with the Transmission Operator’s specifications, the Generator Owner for each generating resource(s) shall notify the Transmission Operator and shall provide the technical justification.
- M6.** The generating resource(s) shall have evidence that its step-up transformer taps were modified per the Transmission Operator’s documentation in accordance with Requirement R6. The generating resource(s) shall have evidence that it notified its associated Transmission Operator when it could not comply with the Transmission Operator’s step-up transformer tap specifications in accordance with Requirement R6, Part 6.1.

C. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority: “Compliance Enforcement Authority” means NERC or the Regional Entity, or any entity as otherwise designated by an Applicable Governmental Authority, in their respective roles of monitoring and/or enforcing compliance with mandatory and enforceable Reliability Standards in their respective jurisdictions.

1.2. Evidence Retention: The following evidence retention 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 period since the last audit.

The Generator Owner and Generator Operator shall each 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.

The Generator Owner for each generating resource(s) shall keep its latest version of documentation on its step-up and auxiliary transformers.

The Generator Operator for each generating resource(s) shall retain evidence of Requirements R1, R2, R3 and R4 for three calendar years.

1.3. Compliance Monitoring and Enforcement Program: As defined in the NERC Rules of Procedure, “Compliance Monitoring and Enforcement Program” refers to the identification of the processes that will be used to evaluate data or information for the purpose of assessing performance or outcomes with the associated Reliability Standard.

Violation Severity Levels

R #	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1.	N/A	N/A	N/A	Unless exempted, the Generator Operator did not operate each generator and dispersed power producing resource connected to the interconnected Transmission System in the automatic voltage control mode or in a different control mode as instructed by the Transmission Operator, and failed to provide the required notifications to Transmission Operator as identified in Requirement R1.
R2.	N/A	N/A	The Generator Operator did maintain voltage or Reactive Power as instructed by the Transmission Operator. AND, The Generator Operator did make the necessary notifications required by the Transmission Operator.	The Generator Operator did not maintain the voltage or Reactive Power schedule as instructed by the Transmission Operator. AND The Generator Operator did not make the necessary notifications required by the Transmission Operator.

R #	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
			<p>BUT</p> <p>The Generator Operator did not have a conversion methodology when it monitored voltage at a location different from the schedule provided by the Transmission Operator.</p>	<p>OR</p> <p>The Generator Operator did not have an operating AVR, and did not use an alternative method for controlling voltage or provide notification to the Transmission Operator if no alternative method of control was available.</p> <p>OR</p> <p>The Generator Operator did not modify voltage when directed, and did not provide any explanation.</p>
R3.	N/A	N/A	N/A	The Generator Operator did not make the required notification within 30 minutes of the status or functionality change.
R4.	N/A	N/A	N/A	The Generator Operator did not make the required notification within 30 minutes of becoming aware

R #	Violation Severity Levels			
	Lower VSL	Moderate VSL	High VSL	Severe VSL
				of the capability change.
R5.	N/A	N/A	The Generator Owner for each generating resource(s) failed to provide its associated Transmission Operator and Transmission Planner one of the types of data specified in Requirement R5 Parts 5.1.1, 5.1.2, and 5.1.3.	The Generator Owner for each generating resource(s) failed to provide to its associated Transmission Operator and Transmission Planner two or more of the types of data specified in Requirement R5 Parts 5.1.1, 5.1.2, and 5.1.3.
R6.	N/A	N/A	N/A	The Generator Owner for each generating resource(s) did not ensure the tap changes were made according to the Transmission Operator’s specifications. OR The Generator Owner for each generating resource(s) failed to perform the tap changes, and the Generator Owner for each generating resource(s) did not provide technical justification for why it could not comply with the Transmission Operator specifications.

D. Regional Variances

None.

E. Associated Documents

None.

Version History

Version	Date	Action	Change Tracking
1	5/1/2006	Added "(R2)" to the end of levels on non-compliance 2.1.2, 2.2.2, 2.3.2, and 2.4.3.	July 5, 2006
1a	12/19/2007	Added Appendix 1 – Interpretation of R1 and R2 approved by BOT on August 1, 2007.	Revised
1a	1/16/2007	In Section A.2., Added "a" to end of standard number. Section F: added "1."; and added date.	Errata
1.1b	3/3/2009	Added Appendix 2 – Interpretation of VAR-002-1.1a approved by BOT on February 10, 2009.	Revised
2b	4/16/2013	Revised R1 to address an Interpretation Request. Also added previously approved VRFs, Time Horizons and VSLs. Revised R2 to address consistency issue with VAR001-2, R4. FERC Order issued approving VAR002-2b.	Revised
3	5/5/2014	Revised under Project 2013-04 to address outstanding Order 693 directives.	Revised
3	5/7/2014	Adopted by NERC Board of Trustees.	
3	8/1/2014	Approved by FERC in docket RD14-11-000.	
4	8/27/2014	Revised under Project 2014-01 to clarify applicability of Requirements to BES dispersed power producing resources.	Revised
4	11/13/2014	Adopted by NERC Board of Trustees.	
4	5/29/2015	FERC Letter Order in Docket No. RD15- 3-000 approving VAR-002-4.	
4.1	6/14/2017	Project 2016-EPR-02 errata recommendations.	Errata
4.1	8/10/2017	Adopted by the NERC Board of Trustees.	Errata
4.1	9/26/2017	FERC Letter Order issued approving VAR-002-4.1 RD17-7-000.	
5	TBD	Revised under Project 2021-02 to clarify applicability of Requirements to BES dispersed power producing resources and to address recommendations from Project 2016-EPR-02.	Revised