

Interpretation of VAR-002-1a Generator Operation for Maintaining Network Voltage Schedules (Project 2008-11)

Request for Interpretation Received from ICF Consulting on June 16, 2008:

ICF Consulting's June 16, 2008 request for a formal interpretation of VAR-002-1a states:

“VAR-002 - Generator Operation for Maintaining Network Voltage Schedules, addresses the generator’s provision of voltage and VAR control. Confusion exists in the industry and regions as to which requirements in this standard apply to Generator Operators that operate generators that do not have automatic voltage regulation capability.

The Standard’s requirements do not identify the subset of generator operators that need to comply – forcing some generator operators that do not have any automatic voltage regulation capability to demonstrate how they complied with the requirements, even when they aren’t physically able to comply with the requirements. Generator owners want clarification to verify that they are not expected to acquire AVR devices to comply with the requirements in this standard.

Many generators do not have automatic voltage regulators and do not receive voltage schedules. These entities are at a loss as to how to comply with these requirements and are expending resources attempting to demonstrate compliance with these requirements. A clarification will avoid challenges and potential litigation stemming from sanctions and penalties applied to entities that are being audited for compliance with this standard, but who do not fall within the scope or intent of the standard itself.

Please identify which requirements apply to generators that do not operate generators equipped with AVRs.”

VAR-002-1a Generator Operation for Maintaining Network Voltage Schedules

- R1.** The Generator Operator shall operate each generator connected to the interconnected transmission system in the automatic voltage control mode (automatic voltage regulator in service and controlling voltage) unless the Generator Operator has notified the Transmission Operator.
- R2.** Unless exempted by the Transmission Operator, each Generator Operator shall maintain the generator voltage or Reactive Power output (within applicable Facility Ratings¹) as directed by the Transmission Operator.
 - R2.1.** When a generator’s automatic voltage regulator is out of service, the Generator Operator shall use an alternative method to control the generator voltage and reactive output to meet the voltage or Reactive Power schedule directed by the Transmission Operator.
 - R2.2.** When directed to modify voltage, the Generator Operator shall comply or provide an explanation of why the schedule cannot be met.

¹ When a Generator is operating in manual control, reactive power capability may change based on stability considerations and this will lead to a change in the associated Facility Ratings.

- R3.** Each Generator Operator shall notify its associated Transmission Operator as soon as practical, but within 30 minutes of any of the following:
- R3.1.** A status or capability change on any generator Reactive Power resource, including the status of each automatic voltage regulator and power system stabilizer and the expected duration of the change in status or capability.
 - R3.2.** A status or capability change on any other Reactive Power resources under the Generator Operator's control and the expected duration of the change in status or capability.
- R4.** The Generator Owner shall provide the following to its associated Transmission Operator and Transmission Planner within 30 calendar days of a request.
- R4.1.** For generator step-up transformers and auxiliary transformers with primary voltages equal to or greater than the generator terminal voltage:
 - R4.1.1.** Tap settings.
 - R4.1.2.** Available fixed tap ranges.
 - R4.1.3.** Impedance data.
 - R4.1.4.** The +/- voltage range with step-change in % for load-tap changing transformers.
- R5.** After consultation with the Transmission Operator regarding necessary step-up transformer tap changes, the Generator Owner 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.
- R5.1.** If the Generator Operator can't comply with the Transmission Operator's specifications, the Generator Operator shall notify the Transmission Operator and shall provide the technical justification.

The following interpretation of VAR-002-1a was developed by a subset of the members of the Phase III and IV and Generator Verification standard drafting teams on July 29, 2008:

Please note that the interpretation response cites version 1a of VAR-002 as the ICF request did not specify a version.

Response: All the requirements and associated subrequirements in VAR-002-1a apply to Generator Owners and Generator Operators that own or operate generators whether equipped with an automatic voltage regulator or not. The standard is predicated on the assumption that the generator has the physical equipment (automatic voltage regulator) that is capable of automatic operation. A generator that is not equipped with an automatic voltage regulator results in a functionally equivalent condition to a generator equipped with an automatic voltage regulator that is out of service due to maintenance or failure.

There are no requirements in the standard that require a generator to have an automatic voltage regulator, nor are there any requirements for a Generator Owner to modify its generator to add an

automatic voltage regulator. Unless exempted by the Transmission Operator, each Generator Operator shall maintain the generator voltage or Reactive Power output (within applicable Facility Ratings) as directed by the Transmission Operator.

Background and Discussion

VAR-002-1a is predicated on the assumption that the generator has the physical equipment (automatic voltage regulator) that is capable of automatic operation. Considered in the context that an out of service automatic voltage regulator and the lack thereof are functionally equivalent conditions will aid in the understanding of the intent of the requirements in VAR-002-1a.

The following explains how to interpret the requirements:

- R1.** The Generator Operator shall operate each generator connected to the interconnected transmission system in the automatic voltage control mode (automatic voltage regulator in service and controlling voltage) unless the Generator Operator has notified the Transmission Operator. (underline emphasis added)

The intent of Requirement R1 is for the Generator Operator to inform its Transmission Operator that automatic voltage control capability is not available, which may be due to the automatic voltage regulator not functioning or the absence of one. Generator Operators operating generators not equipped with an automatic voltage regulator simply must inform the Transmission Operator that the generator is not capable of automatic voltage control.

- R2.** Unless exempted by the Transmission Operator, each Generator Operator shall maintain the generator voltage or Reactive Power output (within applicable Facility Ratings¹) as directed by the Transmission Operator.

***R2.1.** When a generator's automatic voltage regulator is out of service, the Generator Operator shall use an alternative method to control the generator voltage and reactive output to meet the voltage or Reactive Power schedule directed by the Transmission Operator.*

***R2.2.** When directed to modify voltage, the Generator Operator shall comply or provide an explanation of why the schedule cannot be met.*

¹ When a Generator is operating in manual control, reactive power capability may change based on stability considerations and this will lead to a change in the associated Facility Ratings.

Requirement R2 allows a Transmission Operator to exempt generators from maintaining a generator voltage or Reactive Power output schedule.

Requirement R2.1 states that the Generator Operator must control voltage and reactive output in accordance with the schedule provided by the Transmission Operator using alternative methods when the automatic voltage regulator is not available. The action required is to control voltage or Reactive Power and the desired result is for the voltage schedule to be met. This requirement

applies to a generator irrespective of whether it is equipped with an out of service automatic voltage regulator or no automatic voltage regulator at all.

Requirement R2.2 is independent of the presence of an automatic voltage regulator and does allow the Generator Operator without an automatic voltage regulator to provide an explanation for not being able to comply with the Transmission Operator directed voltage schedule.

Similarly, Requirement R2 is also independent of the presence of an automatic voltage regulator but does allow the Transmission Operator to consider information provided by the Generator Operator in accordance with R1 and possibly R2.2 regarding the fact that the generator is not automatic voltage regulator equipped.

R3. *Each Generator Operator shall notify its associated Transmission Operator as soon as practical, but within 30 minutes of any of the following:*

R3.1. *A status or capability change on any generator Reactive Power resource, including the status of each automatic voltage regulator and power system stabilizer and the expected duration of the change in status or capability.*

R3.2. *A status or capability change on any other Reactive Power resources under the Generator Operator's control and the expected duration of the change in status or capability.*

In the case of generators not equipped with an automatic voltage regulator, Requirement R3 and associated sub-requirements simply require the Generator Operator to inform the Transmission Operator if and when such capability is installed.

R4. *The Generator Owner shall provide the following to its associated Transmission Operator and Transmission Planner within 30 calendar days of a request.*

R4.1. *For generator step-up transformers and auxiliary transformers with primary voltages equal to or greater than the generator terminal voltage:*

R4.1.1. *Tap settings.*

R4.1.2. *Available fixed tap ranges.*

R4.1.3. *Impedance data.*

R4.1.4. *The +/- voltage range with step-change in % for load-tap changing transformers.*

R5. *After consultation with the Transmission Operator regarding necessary step-up transformer tap changes, the Generator Owner 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.*

***R5.1.** If the Generator Operator can't comply with the Transmission Operator's specifications, the Generator Operator shall notify the Transmission Operator and shall provide the technical justification.*

Whether or not a generator is equipped with an automatic voltage regulator is not relevant to either Requirement R4 or Requirement R5 Generator Operators of all generators without an automatic voltage regulator must comply.