

WECC Standard VAR-STD-2a-1 – Automatic Voltage Regulators

A. Introduction

1. Title: Automatic Voltage Regulators (AVR)

2. Number: VAR-STD-002a-1

3. Purpose: Regional Reliability Standard to ensure that automatic voltage control equipment on synchronous generators shall be kept in service at all times, unless one of the exemptions listed in Section C (Measures) applies, with outages coordinated to minimize the number out of service at any one time. All synchronous generators with automatic voltage control equipment shall normally be operated in voltage control mode and set to respond effectively to voltage deviations. (Source: WECC Criterion)

4. Applicability

4.1. The requirements of this criterion apply to all Generator Operators of synchronous generating units equipped with Automatic Voltage Regulators (AVR) within the Western Interconnection. The criterion shall be applied after a synchronous generator has achieved commercial operation. The criterion shall be applied on a generator-by-generator basis (a Responsible Entity can be subject to a separate sanction for each non-compliant synchronous generator). This criterion shall not be applicable to any synchronous generator for any calendar quarter in which such synchronous generator is in service for less than five percent of all hours in such quarter (the owners of the synchronous generator shall still be subject to the data reporting requirements for such quarter). (Source: Participants Subject to Criterion)

5. Effective Date: This Western Electricity Coordinating Council Regional Reliability Standard will be effective when approved by the Federal Energy Regulatory Commission under Section 215 of the Federal Power Act. This Regional Reliability Standard shall be in effect for one year from the date of Commission approval or until a North American Standard or a revised Western Electricity Coordinating Council Regional Reliability Standard goes into place, whichever occurs first. At no time shall this regional Standard be enforced in addition to a similar North American Standard.

B. Requirements

WR1. Automatic voltage control equipment on synchronous generators shall be kept in service at all times, unless one of the exemptions listed in Section C (Measures) applies, with outages coordinated to minimize the number out of service at any one time. All synchronous generators with automatic voltage control equipment shall normally be operated in voltage control mode and set to respond effectively to voltage deviations. (Source: WECC Criterion)

C. Measures

WM1.

Each synchronous generating unit equipped with AVR shall have the AVR in service when the unit is on line with the following exceptions:

- a) Maintenance and testing, maximum of seven calendar days per quarter.
- b) AVR exhibits instability due to nonstandard transmission line configuration.
- c) AVR does not operate properly due to a failed component in the AVR or resulting from a change in adjacent equipment, whether it is control oriented or physical equipment that defines system response. If these changes are outside the control of the owner and result in an operating condition that is unsuitable for operation of an AVR, an exception shall be granted until the operating condition is once again suitable, but in no event shall the period of

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operation without AVR exceed 60 days, AVR must be repaired and returned to service within 60 calendar days per incident from time of failure (Source: [AVR and PSS 60 Day Exclusion](#)). If, during this 60 day period, the decision is made to replace the excitation system, 1/ the excitation system, including AVR, must be back in service within one year of commitment to replace.

If more than 60 days are needed to repair an AVR or more than one year is needed to replace an excitation system due to the length of time needed to obtain parts, an extension will be granted upon receipt of documentation by the WECC. Such documentation shall include notice of the need for replacement or repair, the expected time required for the Entity's procurement process, plus the manufacturer delivery time, plus 30 days for installation or if an outage is required for installation the date of the next scheduled outage, and the expected completion date of the work. The total amount of time shall not exceed one year for repair of the AVR or fifteen months for replacement of the excitation system.

Responsible Entities shall provide the WECC such documentation as soon as practicable, but no later than the deadline for responding to the initial non-compliance notification letter issued by the WECC. Once repairs are complete, the WECC shall be notified with the next quarterly report of the time the AVR is back in service. (Source: Compliance Standard)

D. Compliance

1. Compliance Monitoring Process

1.1 Compliance Monitoring Responsibility

Compliance Monitor: British Columbia Utilities Commission
Compliance Monitor's Administrator: Western Electricity Coordinating Council

1.2 Compliance Monitoring Period

Quarterly

On or before the twentieth day of the month following the end of a quarter (or such other date specified in Form A.5), a Responsible Entity shall submit to the WECC Staff Automatic Voltage Regulator data in Form A.5 (available on the WECC web site) for the immediately preceding quarter. (Source: Data Reporting Requirement)

1.3 Data Retention

Data will be retained in electronic form for at least one year. The retention period will be evaluated before expiration of one year to determine if a longer retention period is necessary. If the data is being reviewed to address a question of compliance, the data will be saved beyond the normal retention period until the question is formally resolved. (Source: NERC Language)

¹ To qualify for excitation system replacement, the AVR, limiters and controls must be replaced. The power source and power bridge do not need to be replaced to qualify.

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2. Levels of Non-Compliance

For levels of noncompliance with a specific number of days associated, (e.g., 7 days for maintenance and testing, etc.) the level of noncompliance will be calculated by the maximum number of contiguous calendar days of non-compliance reached for that incident during the calendar quarter. If an incident continues from one quarter to another, the number of days accumulated will be the contiguous calendar days from the beginning of the incident to the end of the incident. When an incident continues from one quarter to another it will be considered a higher level of non-compliance, not a repeat occurrence. (Source: Sanctions)

When calculating the in-service percentages in the following levels, do not include the time the AVR is out of service due to the exceptions listed above (Section C Measures).

2.1. Level 1: There shall be a Level 1 non-compliance if any of the following conditions exist:

- 2.1.1. AVR is in service less than 98% but at least 96% or more of all hours during which the synchronous generating unit is on line for each calendar quarter, or
- 2.1.2. AVR is out of service more than 7 calendar days but not more than 14 calendar days due to maintenance or testing, or
- 2.1.3. AVR is out of service for more than 60 calendar days but not more than 90 calendar days due to failed component, or
- 2.1.4. Following the granting of an extension for repairs, the AVR was returned to service greater than zero days but less than or equal to 30 days beyond the specified extension repair completion date.

2.2. Level 2: There shall be a Level 2 non-compliance if any of the following conditions exist:

- 2.2.1. AVR is in service less than 96% but at least 94% or more of all hours during which the synchronous generating unit is on line for each calendar quarter, or
- 2.2.2. AVR is out of service for more than 90 calendar days but not more than 120 calendar days due to failed component, or
- 2.2.3. Following the granting of an extension for repairs, the AVR was returned to service greater than 30 days but less than or equal to 60 days beyond the specified extension repair completion date.

2.3. Level 3: There shall be a Level 3 non-compliance if any of the following conditions exist:

- 2.3.1. AVR is in service less than 94% but at least 92% or more of all hours during which the synchronous generating unit is on line for each calendar quarter, or
- 2.3.2. AVR is out of service for more than 120 calendar days but not more than 150 calendar days due to failed component, or
- 2.3.3. Following the granting of an extension for repairs, the AVR was returned to service greater than 60 days but less than or equal to 90 days beyond the specified extension repair completion date.

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2.4. Level 4: There shall be a Level 4 non-compliance if any of the following conditions exist:

2.4.1. AVR is in service less than 92% of all hours during which the synchronous generating unit is on line for each calendar quarter, or

2.4.2. AVR is out of service more than 14 calendar days due to maintenance or testing, or

2.4.3. AVR is out of service for more than 150 calendar days due to failed component, or

2.4.4. Following the granting of an extension for repairs the AVR was not returned to service or was returned to service greater than 90 days beyond the specified extension repair completion date, or

2.4.5. Following the granting of an extension for replacement of the excitation system, the AVR is not in service after the specified extension replacement completion date.

E. Regional Differences

Version History – Shows Approval History and Summary of Changes in the Action Field

Version	Date	Action	Change Tracking
1	November 27, 2006	Remove “7 calendar days but not more than” from Section 2.4.2	Errata

References²:

NERC Standard VAR-002-1 requires the Generator Operator to 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. However, there are no measures associated with this requirement. WECC believes that the requirement for generating units to be operated with AVR in automatic voltage control mode is essential to the reliability of the Western Interconnection.

²References are provided for informational purposes only and are not a component of VAR-STD-002-1

DEFINITIONS

Unless the context requires otherwise, all capitalized terms shall have the meanings as set out below:

Generating Unit Capability means the MVA nameplate rating of a generator.

Disturbance means (i) any perturbation to the electric system, or (ii) the unexpected change in ACE that is caused by the sudden loss of generation or interruption of load.

Extraordinary Contingency shall have the meaning set out in Excuse of Performance, section B.4.c.

EXCUSE OF PERFORMANCE

A. Excused Non-Compliance

Non-compliance with any of the reliability criteria contained in this Standard shall be excused and no sanction applied if such non-compliance results directly from one or more of the actions or events listed in below.

B. Specific Excuses

1. Governmental Order

The Reliability Entity's compliance with or action under any applicable law or regulation or other legal obligation related thereto or any curtailment, order, regulation or restriction imposed by any governmental authority (other than the Reliability Entity, if the Reliability Entity is a municipal corporation or a federal, state, or provincial governmental entity or subdivision thereof).

2. Order of Reliability Coordinator

The Reliability Entity's compliance or reasonable effort to comply with any instruction, directive, order or suggested action ("Security Order") by the WECC Reliability Coordinator for the WECC subregion within which the Reliability Entity is operating, provided that the need for such Security Order was not due to the Reliability Entity's non-compliance with (a) the WECC Reliability Criteria for Transmission System Planning, (b) the WECC Power Supply Design Criteria, (c) the WECC Minimum Operating Reliability Criteria, or (d) any other WECC reliability criterion, policy or procedure then in effect (collectively, "WECC Reliability Standards"), and provided further that the Participant in complying or attempting to comply with such Security Order has taken all reasonable measures to minimize Reliability Entity's noncompliance with the reliability criteria.

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3. Protection of Facilities

Any action taken or not taken by the Reliability Entity which, in the reasonable judgment of the Reliability Entity, was necessary to protect the operation, performance, integrity, reliability or stability of the Reliability Entity's computer system, electric system (including transmission and generating facilities), or any electric system with which the Reliability Entity's electric system is interconnected, whether such action occurs automatically or manually; provided that the need for such action or inaction was not due to Reliability Entity's non-compliance with any WECC Reliability Standard and provided further that Reliability Entity could not have avoided the need for such action or inaction through reasonable efforts taken in a timely manner. Reasonable efforts shall include shedding load, disconnecting facilities, altering generation patterns or schedules on the transmission system, or purchasing energy or capacity, except to the extent that the Reliability Entity demonstrates to the WECC Staff and/or the RCC that in the particular circumstances such action would have been unreasonable.

4. Extraordinary Contingency

- a. Any Extraordinary Contingency (as defined in subsection c); provided that this provision shall apply only to the extent and for the duration that the Extraordinary Contingency actually and reasonably prevented the Reliability Entity from complying with any applicable reliability criteria; and provided further that Reliability Entity took all reasonable efforts in a timely manner to mitigate the effects of the Extraordinary Contingency and to resume full compliance with all applicable reliability criteria contained in this Standard. Reasonable efforts shall include shedding load, disconnecting facilities, altering generation patterns or schedules on the transmission system, or purchasing energy or capacity, except to the extent that the Participant demonstrates to the WECC Staff and/or the RCC that in the particular circumstances such action would have been unreasonable. Reasonable efforts shall not include the settlement of any strike, lockout or labor dispute.
- b. Any Reliability Entity whose compliance is prevented by an Extraordinary Contingency shall immediately notify the WECC of such contingency and shall report daily or at such other interval prescribed by the WECC the efforts being undertaken to mitigate the effects of such contingency and to bring the Reliability Entity back into full compliance.
- c. An Extraordinary Contingency means any act of God, actions by a non-affiliated third party, labor disturbance, act of the public enemy, war, insurrection, riot, fire, storm or flood, earthquake, explosion, accident to or breakage, failure or malfunction of machinery or equipment, or any

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other cause beyond the Reliability Entity's reasonable control; provided that prudent industry standards (e.g., maintenance, design, operation) have been employed; and provided further that no act or cause shall be considered an Extraordinary Contingency if such act or cause results in any contingency contemplated in any WECC Reliability Standard (e.g., the "Most Severe Single Contingency" as defined in the WECC Reliability Criteria or any lesser contingency).

5. Participation in Field Testing

Any action taken or not taken by the Reliability Entity in conjunction with the Reliability Entity's involvement in the field testing (as approved by either the WECC Operating Committee or the WECC Planning Coordination Committee) of a new reliability criterion or a revision to an existing reliability criterion where such action or non-action causes the Reliability Entity's non-compliance with the reliability criterion to be replaced or revised by the criterion being field tested; provided that Reliability Entity's non-compliance is the result of Reliability Entity's reasonable efforts to participate in the field testing.

AVR and PSS 60 Day Exclusion

The Procedure for requesting the sixty consecutive day PSS and/or AVR exclusion is as follows:

a. Submit, by email, a notification request to rms@wecc.biz as soon as practicable but no later than the deadline for responding to the initial noncompliance notification letter when the AVR and/or PSS was removed for repair. The notification request should contain the following:

- i. The name of the organization making the request (use the WECC four letter acronym when available).
- ii. The name of the generating unit being repaired (same as on reporting form).
- iii. The date and time AVR and/or PSS was removed for repair.
- iv. Identify the equipment to be repaired (AVR and/or PSS).
- v. The schedule for completion of repairs.

b. Submit the notification by email to rms@wecc.biz stating that AVR and/or PSS repairs have been completed by the twentieth of the month following the quarter when repairs were completed. The email should be part of the AVR and PSS reporting process, and should contain the following:

- i. The name of the organization reporting (use the WECC four letter acronym when available).
- ii. The name of the generating unit that was repaired (same as on reporting form).
- iii. Identify the equipment that was repaired.
- iv. The date and time the equipment was removed from service for repair.
- v. The date and time the equipment was placed back in service after being repaired.
- vi. The number of hours the unit operated without AVR and/or PSS under the sixty consecutive day exclusion.

AVR and PSS data submission by the reporting entity should report all hours that AVR and/or PSS were noncompliant, including the exclusion request. The WECC staff will adjust the noncompliant hours report on the AVR and PSS reporting forms to reflect the sixty day exclusion.