

**Comparison between NERC VAR-002-WECC-1 and Alberta VAR-002-WECC-AB-1  
Automatic Voltage Regulators and Voltage Regulating Systems**

<b>Section</b>	<b>NERC VAR-002-WECC-1</b>	<b>Alberta VAR-002-WECC-AB-1</b>	<b>Reason for Difference<sup>1</sup></b>
<b>Purpose</b>	To ensure that Automatic Voltage Regulators on synchronous generators and condensers shall be kept in service and controlling voltage.	<p>The purposes of this reliability standard are to:</p> <ul style="list-style-type: none"> <li>• Ensure that automatic voltage regulators on synchronous generating units and condensers are in service and controlling voltage.</li> <li>• Ensure that voltage regulating systems at wind aggregated generating facilities are in service and controlling voltage.</li> </ul>	Expanded purpose to include wind power facilities.

<sup>1</sup> The following revisions have been made throughout this proposed reliability standard:

- Identified the responsible entities in Alberta.
- Applied a consistent writing style and added clarity.
- Changed passive terms such as “shall” to “must”.
- Developed measures specific to the requirements.

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<b>Applicability</b>	<p>4.1. Generator Operators</p> <p>4.2. Transmission Operators that operate synchronous condensers</p> <p>4.3. This VAR-002-WECC-1 Standard only applies to synchronous generators and synchronous condensers that are connected to the Bulk Electric System.</p>	<p>This reliability standard applies to:</p> <ul style="list-style-type: none"> <li>• Operators of synchronous generating units and wind aggregated generating facilities equipped with voltage regulating systems connected to the transmission system.</li> <li>• GFOs of synchronous generating units and wind aggregated generating facilities equipped with voltage regulating systems connected to the transmission system.</li> <li>• TFOs that operate synchronous condensers.</li> </ul>	<p>Added that this standard also applies to voltage regulating systems at wind aggregated generating facilities.</p>
<b>Effective Date</b>	<p>On the first day of the first quarter, after applicable regulatory approval.</p>	<p>Ninety calendar days after the date of approval by the Commission.</p>	
<b>Requirement</b>	<p><b>R1.</b> Generator Operators and Transmission Operators shall have AVR in service and in automatic voltage control mode 98% of all operating hours for synchronous generators or synchronous condensers. Generator Operators and Transmission Operators may exclude hours for R1.1 through R1.10 to achieve the 98% requirement. <i>[Violation Risk Factor: Medium] [Time</i></p>	<p><b>R1.</b> Each operator of a synchronous generating unit, wind aggregated generating facility and each TFO that operates a synchronous condenser, must have the automatic voltage regulator or voltage regulating system in service and in automatic voltage control mode, 98% of all operating hours provided that the foregoing requirement does not apply to the extent of any of the circumstances determined in accordance with requirements R1.1 to R1.10 inclusive.</p>	<p>Reworded for consistency.</p>

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	<i>Horizon: Operations Assessment]</i>		
<b>Measure</b>	<b>M1.</b> Generator Operators and Transmission Operators shall provide quarterly reports to the compliance monitor and have evidence for each synchronous generator and synchronous condenser of the following:	<b>MR1</b> Documentation shows that the calculated availability is within the percentage requirements specified in requirement R1, and excluded hours were included correctly in the calculation.	
<b>Requirement</b>	<b>R1.1.</b> The synchronous generator or synchronous condenser operates for less than five percent of all hours during any calendar quarter.	<b>R1.1</b> The operating hours during which the synchronous generating unit, wind aggregated generating facilities or synchronous condenser operates for less than five per cent of all hours during any calendar quarter.	Clarified for all sub-requirements that all hours as identified in the NERC sub-requirements are operating hours.
<b>Measure</b>	<b>M1.1</b> The actual number of hours the synchronous generator or synchronous condenser was on line.	<b>MR1.1</b> Records or logs exist and confirm a generating unit, wind aggregated generating facility or synchronous condenser did not operate over the percentage of hours specified in requirement R1.1.	
<b>Requirement</b>	<b>R1.2.</b> Performing maintenance and testing up to a maximum of seven calendar days per calendar quarter.	<b>R1.2.</b> The operating hours during which maintenance or testing on any of the foregoing was performed, up to a maximum of seven calendar days per calendar quarter.	Reworded for clarity and consistency.

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<b>Measure</b>	<b>M1.2</b> The actual number of hours the AVR was out of service.	<b>MR1.2</b> Records or logs exist and confirm that maintenance or testing activities were performed for hours excluded.	
<b>Requirement</b>	<b>R1.3.</b> AVR exhibits instability due to abnormal system configuration.	<b>R1.3</b> The operating hours during which the automatic voltage regulator or voltage regulating system exhibits instability due to abnormal system configuration.	Reworded for clarity and consistency.
<b>Measure</b>	<b>M1.3</b> The AVR in service percentage.	<b>MR1.3</b> Records or logs exist and confirm that operations and /or conditions specified in requirement R1.3 were present for hours excluded.	
<b>Requirement</b>	<b>R1.4.</b> Due to component failure, the AVR may be out of service up to 60 consecutive days for repair per incident.	<b>R1.4</b> The operating hours up to a maximum of 60 consecutive days per incident, during which the automatic voltage regulator or voltage regulating system is out of service for repair due to component failure.	Reworded for clarity and consistency.
<b>Measure</b>		<b>MR1.4</b> Records or logs exist and confirm that operations and /or conditions specified in R1.4 were present for hours excluded.	
<b>Requirement</b>	<b>R1.5.</b> Due to a component failure, the AVR may be out of service up to one year provided the Generator Operator or Transmission Operator submits documentation identifying the need for	<b>R1.5</b> The operating hours up to one year during which the automatic voltage regulator or voltage regulating system had a component failure, provided the operator of a generating unit, wind aggregated generating	Reworded for clarity and consistency.

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	time to obtain replacement parts and if required to schedule an outage.	facility or TFO submitted documentation to the ISO identifying the need for time to obtain replacement parts and if required, to schedule an outage.	
<b>Measure</b>		<b>MR1.5</b> Records, logs, or other documentation exists and shows the ISO was provided with notification as specified in requirement R1.5.	
<b>Requirement</b>	<b>R1.6.</b> Due to a component failure, the AVR may be out of service up to 24 months provided the Generator Operator or Transmission Operator submits documentation identifying the need for time for excitation system replacement (replace the AVR, limiters, and controls but not necessarily the power source and power bridge) and to schedule an outage.	<b>R1.6</b> The operating hours up to 24 months during which the automatic voltage regulator or voltage regulating system had a component failure, provided the operator of a generating unit, wind aggregated generating facility or TFO submitted documentation to the ISO identifying the need for time for excitation system replacement (replace the automatic voltage regulator or voltage regulating system, limiters, and controls but not necessarily the power source and power bridge) and to schedule an outage.	Reworded for consistency.
<b>Measure</b>		<b>MR1.6</b> Records, logs, or other documentation exists and shows the ISO was provided with notification as specified in requirement R1.6.	
<b>Requirement</b>	<b>R1.7.</b> The synchronous generator or synchronous condenser has not achieved Commercial Operation.	<b>R1.7</b> The operating hours during which the synchronous generating unit, wind aggregated generating facility or synchronous	Reworded for clarity and consistency.

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		condenser has not achieved commercial operation.	
<b>Measure</b>		<b>MR1.7</b> Records or logs exist and confirm that operations and /or conditions specified in requirement R1.7 were present for hours excluded.	
<b>Requirement</b>	<b>R1.8.</b> The Transmission Operator directs the Generator Operator to operate the synchronous generator, and the AVR is unavailable for service.	<b>R1.8</b> The operating hours during which the ISO directs the operator of a synchronous generating unit or wind aggregated generating facility to operate the synchronous generating unit or wind aggregated generating facility and the automatic voltage regulator or voltage regulating system is unavailable for service.	Reworded for clarity and consistency.
<b>Measure</b>		<b>MR1.8</b> Records, logs, or other documentation exists and shows the ISO directed operations as specified in requirement R1.8.	
<b>Requirement</b>	<b>R1.9.</b> The Reliability Coordinator directs Transmission Operator to operate the synchronous condenser, and the AVR is unavailable for service.	<b>R1.9</b> The operating hours during which the ISO directs a TFO to operate a synchronous condenser, and the automatic voltage regulator is unavailable for service.	Reworded for clarity and consistency.

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<b>Measure</b>		<b>MR1.9</b> Records, logs, or other documentation exists and shows the ISO directed operations as specified in requirement R1.9.	
<b>Requirement</b>	<b>R1.10.</b> If AVR exhibits instability due to operation of a Load Tap Changer (LTC) transformer in the area, the Transmission Operator may authorize the Generator Operator to operate the excitation system in modes other than automatic voltage control until the system configuration changes.	<b>R1.10</b> The operating hours during which an automatic voltage regulator or voltage regulating system exhibits instability due to operation of a on-load tap changer transformer in the area and the ISO authorized the operator of a generating unit, wind aggregated generating facility or TFO for synchronous condensers to operate the excitation system in modes other than automatic voltage control until the system configuration changes.	Reworded for clarity and consistency.
<b>Measure</b>	<b>M1.4</b> If excluding AVR out of service hours as allowed in R1.1 through R1.10, provide: <b>M1.4.1</b> The number of hours excluded, and <b>M1.4.2</b> The adjusted AVR in-service percentage. <b>M2.</b> If excluding hours for R1.1 through R1.10, provide the date of the outage, the number of hours out of service, and supporting documentation for each requirement that applies.	<b>MR1.10</b> Records, logs, or other documentation exists and shows the ISO directed or authorized operations as specified in requirement R1.10.	

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<b>Requirement</b>	<b>R2.</b> Generator Operators and Transmission Operators shall have documentation identifying the number of hours excluded for each requirement in R1.1 through R1.10. <i>[Violation Risk Factor: Low] [Time Horizon: Operations Assessment]</i>	<b>R2</b> Each operator of a generating unit, wind aggregated generating facility and TFO must have documentation identifying the number of hours excluded for each requirement in requirement R1.1 through R1.10.	Reworded for clarity and consistency.
<b>Measure</b>		<b>MR2</b> Documentation identifies and reports hours excluded for each eligible exclusion specified in requirements R1.1 to R1.10.	
<b>Compliance</b>	To view the compliance section D of the NERC reliability standard follow this link: <a href="http://www.nerc.com/files/VAR-002-WECC-1.pdf">http://www.nerc.com/files/VAR-002-WECC-1.pdf</a>		There is no compliance section currently proposed in the Alberta Reliability Standards.  A compliance program is under development for Alberta Reliability Standards that recognizes the compliance monitoring and enforcement structure in Alberta.  This approach is deemed consistent with the existing ISO Rules.
<b>Regional Differences</b>	None identified.		Not applicable in Alberta



## Proposed Terms for the Consolidated Authoritative Document Glossary<sup>2</sup>:

“**aggregated generating facilities**” means an aggregation of **generating units**, including any **reactive power** resources, which are:

- (i) designated by the **ISO**; and
- (ii) situated in the same proximate location at one or more **point of connections**.

“**voltage regulating system**” means the equipment that automatically controls the **reactive power** resources to regulate the voltage level at any **collector bus**.

## Defined Terms Used in this Standard:

(As included in the Consolidated Authoritative Document Glossary)

- automatic voltage regulator
- Commission
- day
- generating facility owner (GFO)
- ISO
- outage
- reliability standard
- system

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<sup>2</sup> These proposed defined terms are also being consulted on as part of the ISO rules consultation on Section G1 Definitions (Package 4).