

## Mapping Document

### Project 2021-02 Modifications to VAR-002-4.1

Standard: VAR-002-5		
Requirement in Approved Standard	Translation to New Standard or Other Action	Description and Change Justification
<p>VAR-002-4.1, Requirement R1</p> <p>The Generator Operator shall operate each generator connected to the interconnected transmission system in the automatic voltage control mode (with its automatic voltage regulator (AVR) in service and controlling voltage) or in a different control mode as instructed by the Transmission Operator unless: 1) the generator is exempted by the Transmission Operator, or 2) the Generator Operator has notified the Transmission Operator of one of the following: <i>[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]</i></p> <ul style="list-style-type: none"> <li>• That the generator is being operated in start-up,1 shutdown,2 or testing mode pursuant to a Real-time communication or a procedure that was previously provided to the Transmission Operator; or</li> <li>• That the generator is not being operated in automatic voltage control mode or in the control mode that was instructed by the Transmission</li> </ul>	<p>VAR-002-5, Requirement R1</p> <p>The Generator Operator shall operate each generator or dispersed power producing resource connected to the interconnected transmission system in the automatic voltage control mode (with its automatic voltage regulator (AVR) or volt/VAR controller(s) in service and controlling voltage) or in a different control mode as instructed by the Transmission Operator unless: 1) the generator or dispersed power producing resources are exempted by the Transmission Operator, or 2) the Generator Operator has notified the Transmission Operator of one of the following: <i>[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]</i></p> <ul style="list-style-type: none"> <li>• That the generator or dispersed power producing resource is being operated in start-up1, shutdown2, or testing mode pursuant to a Real-time communication or a procedure that was previously provided to the Transmission Operator; or</li> </ul>	<p>Requirement R1 has been maintained due to the importance of Generator Operator running a unit with its automatic voltage regulator (AVR) in service and in either voltage controlling mode, or the mode instructed by the Transmission Operator. The Project 2021-02 SDT proposed minor changes to bring attention to dispersed power producing resource as defined by the Bulk Electric System definition in the NERC Glossary of Terms for inclusion to Generation voltage or Reactive Power control resources and difference in type of voltage control such as a volt/VAR controller for aggregated Generation system control at the Transmission Point of Interconnection or as stated in the Transmission Operator voltage or Reactive Power instruction.</p>

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Operator for a reason other than start-up, shutdown, or testing	<ul style="list-style-type: none"> <li>That the generator or dispersed power producing resource 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.</li> </ul>	
<p>VAR-002-4.1, Requirement R2</p> <p>Unless exempted by the Transmission Operator, each Generator Operator shall maintain the generator voltage or Reactive Power schedule<sup>3</sup> (within each generating Facility’s capabilities<sup>4</sup>) provided by the Transmission Operator, or otherwise shall meet the conditions of notification for deviations from the voltage or Reactive Power schedule provided by the Transmission Operator.  <i>[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]</i></p>	<p>VAR-002-5, Requirement R2</p> <p>Unless exempted by the Transmission Operator, each Generator Operator shall maintain the generator or dispersed power producing resource voltage or Reactive Power schedule<sup>3</sup> (within each generating Facility’s capabilities<sup>4</sup>) provided by the Transmission Operator, or otherwise shall meet the conditions of notification for deviations from the voltage or Reactive Power schedule provided by the Transmission Operator.  <i>[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]</i></p>	<p>Requirement R2 has been maintained due to the importance of Generator Operator maintaining voltage or Reactive Power schedule within each generating Facility capabilities. The Project 2021-02 SDT proposed minor changes to bring attention to dispersed power producing resource as defined by the Bulk Electric System definition in the NERC Glossary of Terms for inclusion to Generation voltage or Reactive Power control resources and difference in type of voltage control as a volt/VAR controller for aggregated Generation system control at the Transmission Point of Interconnection or as stated in the Transmission Operator voltage or Reactive Power schedule instruction.</p>

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		<p>Typical dispersed power producing resources have a site automatic voltage regulator (AVR) or volt/VAR controller(s) that coordinates the voltage of all generators to a common regulation point. If this site AVR or volt/VAR controller(s) fails each generator will typically either continue to regulate at the last known set point or revert to unity power factor. The Project 2021-02 SDT proposes adding language to provide Transmission Operator notification of limited control capability.</p> <p>The Project 2021-02 SDT agreed with the Project 2016-EPR-02 recommendations as stated in background section. The EPR final report provides additional rationale and background to the recommendations.</p>
<p>VAR-002-4.1, Requirement R2, Part 2.1</p> <p>When a generator’s AVR is out of service or the generator does not have an AVR, the Generator Operator shall use an alternative method to control the generator reactive output to meet the voltage or Reactive Power schedule provided by the Transmission Operator.</p>	<p>VAR-002-5, Requirement R2, Part 2.1</p> <p>When a generator’s AVR or volt/VAR controller(s) is out of service or the generator does not have an AVR, the Generator Operator shall use an alternative method to control the generator reactive output to meet the voltage or Reactive Power schedule provided by the Transmission Operator or provide an explanation if control capability is limited.</p>	<p>Requirement R2 has been maintained due to the importance of Generator Operator maintaining voltage or Reactive Power schedule within each generating Facility capabilities. The Project 2021-02 SDT proposed minor changes to bring attention to dispersed power producing resource as defined by the Bulk Electric System definition in the NERC Glossary of Terms for inclusion to Generation voltage or Reactive Power control resources and difference in type</p>

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		<p>of voltage control as a volt/VAR controller for aggregated Generation system control at the Transmission Point of Interconnection or as stated in the Transmission Operator voltage or Reactive Power schedule instruction.</p> <p>Typical dispersed power producing resources have a site automatic voltage regulator (AVR) or volt/VAR controller(s) that coordinates the voltage of all generators to a common regulation point. If this site AVR or volt/VAR controller(s) fails each generator will typically either continue to regulate at the last known set point or revert to unity power factor. The Project 2021-02 SDT proposes adding language to provide Transmission Operator notification of limited control capability.</p> <p>The Project 2021-02 SDT agreed with the Project 2016-EPR-02 recommendations as stated in background section. The EPR final report provides additional rationale and background to the recommendations.</p>
VAR-002-4.1, Requirement R2, Part 2.3  Generator Operators that do not monitor the voltage at the location specified in their voltage	VAR-002-5, Requirement R2, Part 2.3  Generator Operators that do not monitor the voltage at the location specified in their voltage	Requirement R2 has been maintained due to the importance of Generator Operator maintaining voltage or Reactive Power schedule within each generating Facility capabilities. The

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<p>schedule shall have a methodology for converting the scheduled voltage specified by the Transmission Operator to the voltage point being monitored by the Generator Operator.</p>	<p>schedule shall have a methodology for converting the scheduled voltage to the voltage point being monitored by the Generator Operator.</p>	<p>Project 2021-02 SDT proposed minor changes to bring attention to dispersed power producing resource as defined by the Bulk Electric System definition in the NERC Glossary of Terms for inclusion to Generation voltage or Reactive Power control resources and difference in type of voltage control as a volt/VAR controller for aggregated Generation system control at the Transmission Point of Interconnection or as stated in the Transmission Operator voltage or Reactive Power schedule instruction.</p> <p>Typical dispersed power producing resources have a site automatic voltage regulator (AVR) or volt/VAR controller(s) that coordinates the voltage of all generators to a common regulation point. If this site AVR or volt/VAR controller(s) fails each generator will typically either continue to regulate at the last known set point or revert to unity power factor. The Project 2021-02 SDT proposes adding language to provide Transmission Operator notification of limited control capability.</p> <p>The Project 2021-02 SDT agreed with the Project 2016-EPR-02 recommendations as stated in background section. The EPR final</p>

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		report provides additional rationale and background to the recommendations.
<p>VAR-002-4.1, Requirement R3</p> <p>Each Generator Operator shall notify its associated Transmission Operator of a status change on the AVR, power system stabilizer, or alternative voltage controlling device within 30 minutes of the change. If the status has been restored within 30 minutes of such change, then the Generator Operator is not required to notify the Transmission Operator of the status change. <i>[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]</i></p>	<p>VAR-002-5, Requirement R3</p> <p>Each Generator Operator shall notify, in a mutually-agreeable format<sup>5</sup>, its associated Transmission Operator of a status or functionality change of applicable AVR, volt/VAR controller(s), power system stabilizer, or alternative voltage controlling device which degrades/restores its ability to automatically control voltage. Status or functionality change notifications shall be made within 30 minutes of becoming aware of a change. If the status has been restored within 30 minutes of becoming aware of the change, then the Generator Operator is not required to notify the Transmission Operator of the status change. <i>[Violation Risk Factor: Medium] [Time Horizon: Real-time Operations]</i></p>	<p>Requirement R3 has been modified to clarify the intent of the requirement for the Generator Operator to communicate to the Transmission Operator in a mutually-agreed format like other NERC Standards, e.g., TOP-003, for required notifications for when an AVR or volt/VAR controller(s) meets the notification criteria. The Project 2021-02 SDT proposes additional clarity of status or functionality changes are those that impact the ability to control voltage which degrades or restores from degradation and to exclude notifications that have change in status due to normal characteristics of running the Generation resource or do not meet the Transmission Operator threshold for reporting.</p> <p>The Generator Operator is required to notify the Transmission Operator of power system stabilizer (PSS) unavailability. The Project 2021-02 SDT agreed that the operational requirements for initial state of PSS (on/off) clarity was needed for expectations on startup, shutdown, or testing mode. To clarify notification for PSS status change, the Project</p>

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		<p>2021-02 SDT proposes to add language of functionality changes that degrade or restore its ability to automatically control voltage.</p> <p>The SDT agreed with the Project 2014-01 VAR-002 SDT as to reasoning for not excluding the individual dispersed Generator for reporting change of status or functionality of volt/VAR control as shown in the background section. This determination for system impacts should have Transmission Operator determine in notification criteria taking facility configuration and type of control into consideration.</p>
<p>VAR-002-4.1, Requirement R4</p> <p>Each Generator Operator shall notify its associated Transmission Operator within 30 minutes of becoming aware of a change in reactive capability due to factors other than a status change described in Requirement R3. 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. <i>[Violation Risk</i></p>	<p>VAR-002-5, Requirement R4</p> <p>Each Generator Operator shall notify, in a mutually-agreeable format, its associated Transmission Operator within 30 minutes of becoming aware of a change in reactive capability that exceeds the threshold for notification due to factors other than specified in Requirement R3. 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</p>	<p>Requirement R4 has been modified to clarify the intent of Requirement for Generator Operator to communicate to the Transmission Operator in a mutually agreed format like other NERC Standards, e.g., TOP-003, for required notifications when Generator controlled reactive resources change in real time operations and impact the output of the generation facility other than AVR or volt/VAR controller(s) specified in R3. The Project 2021-02 SDT proposes additional clarity of capability changes are those that meet the threshold for</p>

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<p><i>Factor: Medium</i>] [<i>Time Horizon: Real-time Operations</i>]</p> <ul style="list-style-type: none"> <li>Reporting of status or capability changes as stated in Requirement R4 is not applicable to the individual generating units of dispersed power producing resources identified through Inclusion I4 of the Bulk Electric System definition.</li> </ul>	<p>the Transmission Operator of the change in reactive capability. [<i>Violation Risk Factor: Medium</i>] [<i>Time Horizon: Real-time Operations</i>]</p>	<p>notification from the Transmission Operator that Transmission would deem to have an impact on assessing Generation reactive resources in real time as required by the Transmission Operator in VAR-001 R2. The Project 2021-02 SDT proposes to remove the bulleted requirement exempting individual generating units of dispersed Generation resources determining this requirement was not necessary if Transmission Operator provides the threshold of reporting. The Transmission Operator would be in best position to evaluate BES element impacts to system operations for Real-time assessment and monitoring as reactive resources change and excluding single generating units of dispersed Generation does not provide enough clarity to what reporting is required for dispersed generation. Furthermore, excluding individual generating units of dispersed Generation resources from Requirement R4 reporting may pose a conflict with other enforceable Standards requiring this type of data such individual generating unit on/off status.</p> <p>The SDT agrees with the Project 2014-01 VAR-002 SDT that coming offline for dispersed Generation would not need to be reported for</p>



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		capability changes but feel the details of these impacts should be mutually agreed with the Transmission Operator.
VAR-002-4.1, Requirement R5  The Generator Owner shall provide the following to its associated Transmission Operator and Transmission Planner within 30 calendar days of a request. <i>[Violation Risk Factor: Lower] [Time Horizon: Real-time Operations]</i>	VAR-002-5, Requirement R5  The Generator Owner shall provide the following to its associated Transmission Operator and Transmission Planner within 30 calendar days of a request. <i>[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]</i>	Requirement R5 and corresponding measure have been maintained due to the importance of having accurate tap settings. If not properly set, then the VARs available from that unit can be affected. This requirement has been modified to update R5.1 for technology neutral language with respect to transformer modeling data by removing the words, “fixed tap ranges.” The Project 2021-02 SDT agrees with the Project 2016-EPR-02 and proposes to update the Operations Planning horizon to Real-Time horizon, due to requirement for Generator Owner to provide data to the Transmission Operator and Transmission Planner within 30 calendar days of a request.
VAR-002-4.1, Requirement R5, Part 5.1.2  Available fixed tap ranges.	VAR-002-5, Requirement R5, Part 5.1.2  Available tap ranges.	Requirement R5 and corresponding measure have been maintained due to the importance of having accurate tap settings. If not properly set, then the VARs available from that unit can be affected. This requirement has been modified to

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		update R5.1 for technology neutral language with respect to transformer modeling data by removing the words, “fixed tap ranges.” The Project 2021-02 SDT agrees with the Project 2016-EPR-02 and proposes to update the Operations Planning horizon to Real-Time horizon, due to requirement for Generator Owner to provide data to the Transmission Operator and Transmission Planner within 30 calendar days of a request.
<p>VAR-002-4.1, Requirement R6</p> <p>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. <i>[Violation Risk Factor: Lower] [Time Horizon: Real-time Operations]</i></p>	<p>VAR-002-5, Requirement R6</p> <p>After consultation with the Transmission Operator regarding necessary generator owned 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. <i>[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]</i></p>	<p>Requirement R6 and corresponding measure have been maintained due to the importance of having accurate tap settings. If not properly set, then the VARs available from that unit can be affected. This requirement has been modified to capitalize the words, “equipment rating,” for a NERC defined term. Step-up transformer tap changes according to the specifications provided by the Transmission Operator will typically involve an outage of the transformer and is the culmination of a longer term process to determine if a transformer tap change is appropriate, therefore the Project 2021-02 SDT agrees with the Project 2016-EPR-02 and proposes changing the time horizon from Real-</p>

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		Time Operations to Operations Planning horizon.