

## Standard Development Timeline

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*This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.*

### Development Steps Completed

1. SAR posted for comment on July 19, 2013

### Description of Current Draft

This draft standard is concluding informal development and will move to formal development when authorized by the Standards Committee.

Anticipated Actions	Anticipated Date
SAR Authorized by the Standards Committee	July
45 Day SAR Comment and Initial Ballot Open	July
Nomination Period Opens	July
Standard Drafting Team Appointed	July
Initial Comment and Initial Ballot Closes	August
Final Ballot Opens	October
Final Ballot Closes	October
BOT Adoption	November
Filing to Applicable Regulatory Authorities	December

## Effective Dates

In those jurisdictions where regulatory approval is required, this standard shall become effective on the first day of the first calendar quarter after applicable regulatory approval or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities. In those jurisdictions where no regulatory approval is required, this standard shall become effective on the first day of the first calendar quarter after Board of Trustees approval.

## Version History

Version	Date	Action	Change Tracking
1	6/18/2007	Initial Standard is FERC approved	
2	1/10/2011	FERC approved added LSEs and Controllable Load to the standard.	
3	6/20/2013	WECC Variance is approved by FERC	

## **Definitions of Terms Used in the Standard**

*None.*

## Introduction

1. **Title:** Voltage and Reactive Control
2. **Number:** VAR-001-4
3. **Purpose:** To ensure that voltage levels, reactive flows, and reactive resources are monitored, controlled, and maintained within limits in real time to protect equipment and the reliable operation of the Interconnection.
4. **Applicability:**
  - 4.1. Transmission Operators
  - 4.2. Reliability Coordinators
  - 4.3. Generator Operators within the Western Interconnection

## Requirements and Measures

**Rationale for R1:** This requirement will allow each Transmission Operator (TOP) to establish its own policies and procedures, and the criteria for periodic updates will be individualized based on the stability of each TOP's regions. The language is refined to show that coordination with neighboring TOPs is required. It also states TOP shall provide data to the Reliability Coordinator (RC) for its monitoring functions to respond to address the FERC directive in P 1855 of Order No. 693, which directed NERC to add RC monitoring to the VAR standards. P 1868 requires NERC to add more "detailed and definitive requirements to include more detailed and definitive requirements on "established limits" and "sufficient reactive resources" and identify acceptable margins (i.e. voltage and/or reactive power margins)."

- R1.** Each Transmission Operator shall have documented policies or procedures that are implemented to establish, monitor, and control voltage levels and Reactive Power flows (Mvar flows) within limits as defined below. [*Violation Risk Factor: High*] [*Time Horizon: Operations*]
- 1.1.** These documented policies or procedures shall include criteria used in system assessments. The criteria for the assessments shall include established steady-state limits, voltage stability limits and associated operating margins, and voltage schedules along with associated tolerance bands.
  - 1.2.** Each Transmission Operator shall provide a copy of these documented policies or procedures to adjacent Transmission Operators.
  - 1.3.** Each Transmission Operator shall provide a copy of these documented policies or procedures to its Reliability Coordinator.
- M1.** The Transmission Operator shall have evidence of documented policies or procedures as specified in Requirement 1. As stated in R1, the policies and procedures must detail how criteria for steady-state and voltage stability limits are used in the Transmission Operator's assessments of the system. In order to demonstrate the Transmission Operator is implementing the policies or procedures, the Transmission Operator must be able to provide evidence that proves voltage is currently being monitored. Such evidence may include, but is not limited to: 1) proof that points are telemetered, 2) alarms are functioning, and 3) during events of low or high voltage the policies and procedures are being followed to respond to control voltage levels. The Transmission Operator must also provide evidence that the policies or procedures were communicated to adjacent Transmission Operators and to its Reliability Coordinator. Evidence may include, but is not limited to, emails, website postings, and meeting minutes. Simply posting a copy of the policies or procedure on a public website is not sufficient if the Transmission Operator and Reliability Coordinator were not notified as to where to find the policies or procedures.

**Rationale for R2:**

P 1875 from Order No. 693 directed NERC to include requirements to run voltage stability analysis periodically. The informal ad hoc group and industry participants concluded that the best models and tools are the ones that have been proven over time, and that the requirement should not require any utility to purchase new online simulations tools. Therefore, the new requirement does not specify when to use online tools. The sub-requirements detail the real-time and day-ahead assessments necessary under R1. The existing VAR-001 also requires a list of sufficient reactive resources; this was retained in the proposed requirement as FERC determined in a letter order that this list answered the directive in P 1868 to detail the list of "sufficient reactive resources." Controllable load is specifically included to answer FERC's directive in P 1879.

- R2.** Each Transmission Operator and Reliability Coordinator shall perform assessments on their respective areas in order to ensure sufficient reactive resources are available for scheduling to maintain voltage stability under normal and contingency conditions in order to provide the voltage levels as defined in Requirement R1. [*Violation Risk Factor: High*] [*Time Horizon: Operations*]
- 2.1.** Each Transmission Operator shall operate or direct the real-time operation of devices necessary to regulate transmission voltage and reactive flow necessary to regulate transmission voltage and reactive flow which may include, but is not limited to reactive generation scheduling; transmission line and reactive resource switching; controllable load; and, if necessary, load shedding, to maintain system voltages within established limits.
- 2.2.** As a result of the assessments, each Transmission Operator shall ensure that sufficient reactive resources have been scheduled to meet acceptable day-ahead voltage limits identified in Requirement R1. Sufficient reactive resources may include, but is not limited to reactive generation scheduling; transmission line and reactive resource switching; and controllable load.
- M2.** Each Transmission Operator and Reliability Coordinator shall have evidence of current or past studies used to schedule sufficient reactive resources. Each Transmission Operator shall also provide proof that additional resources were scheduled when necessary. During a real-time event where voltage must be adjusted, a Transmission Operator shall show evidence to show directions were given to adjust the operation of capacitive and inductive resources. This may include directions to Generator Operators to operate within new tolerance bands or to make manual adjustments if necessary. Transmission Operators shall also have evidence to show proof of directing new resources to come online. Those resources can include, but is not limited to capacitor banks, switching, adjusting controllable load, and when necessary load can be shed. For the day-ahead scheduling, Transmission Operators shall provide copies of provide day-ahead studies used to schedule enough resources to meet expected voltage requirements.

**Rationale for R3:**

These exemptions offer TOPs the option to exempt certain generators during maintenance or system events when those units are not able to maintain voltage schedules. Sub-requirements containing an exemption list were removed from the existing standard because this created more compliance issues with regard to how often the list would be updated and maintained.

- R3.** The Transmission Operator shall specify the criteria that will exempt generators from compliance with the requirements defined in Requirement 4 and any associated notification requirements.  
*[Violation Risk Factor: Lower] [Time Horizon: Operations]*
- 3.1.** In the event a Transmission Operator approves a generator as satisfying the criteria, it shall notify the associated Generator Operator.
- M3.** Each Transmission Operator shall have evidence of the documented criteria for generator exemptions. The Transmission Operator shall also have evidence to show that, for each generating unit in its area that is exempt from following a voltage or Reactive Power schedule, the associated Generator Owner was notified of this exemption in accordance with Requirement 3. Temporary exemptions maybe provided to generators during scenarios where notifications/communications are not necessary due to a system event that prevents a Generator Operator from maintaining a schedule. Similarly, when an Automatic Voltage Regulator (AVR) is malfunctioning, which prevents a Generator Operator from maintaining a voltage schedule and tolerance band, temporary exemptions may be provided. For temporary exemptions, evidence showing the exemptions were granted must be provided. If the exemptions were given verbally from the Transmission Operator, the phone recordings or emails commemorating the phone call must be provided. For temporary exemptions, the evidence of communication must also include the timeframe for how long the exemption will last.

**Rationale for R4:**

The new requirement adds “tolerance band” in order to provide more detailed information when establishing limits.

- R4.** Each Transmission Operator shall specify a voltage or Reactive Power schedule and tolerance band (at either the high side or low side of the Generator Step-Up transformer at the TOP's discretion)

at the interconnection point between the generator facility and the Transmission Owner's facilities to be maintained by each generator. *[Violation Risk Factor: Medium] [Time Horizon: Operations]*

- 4.1.** The Transmission Operator shall provide the voltage or Reactive Power schedule and tolerance band to the associated Generator Operator and direct the Generator Operator to comply with the schedule in automatic voltage control mode (the AVR is in service and controlling voltage).
- M4.** The Transmission Operator shall have evidence it provided a voltage or Reactive Power schedule and tolerance band as specified in Requirement 4 to the applicable Generator Operators. For real-time directives, evidence may include recorded phone logs.

#### **Rationale for R5:**

Since power system stabilizers (PSS) equipment is not highlighted in any other standard, the VAR standard is the appropriate place to ensure the equipment is being monitored. This requirement is not duplicative of the TOP standards because the voltage regulators and power system stabilizer are highlighted.

- R5.** The Transmission Operator shall know the status of all transmission Reactive Power resources, automatic voltage regulators, and power system stabilizers in their system. *[Violation Risk Factor: Medium] [Time Horizon: Operations]*
- M5.** The Transmission Operator shall have evidence to show Reactive Power resources are being monitored. Evidence may include, but is not limited to screen shots of EMS/SCADA data, alarms, and phone logs. In the event the monitoring system does not work, each Transmission Operator should have a protocol in place to show these resources are being monitored.

#### **Rationale for R6:**

Although tap settings are first established at interconnection, this requirement could not be deleted because no other standard addresses when a tap setting must be adjusted. If the tap setting is not properly set, then the amount of VARs produced by a unit can be affected.

- R6.** After consultation with the Generator Owner regarding necessary step-up transformer tap changes, the Transmission Operator shall provide documentation to the Generator Owner specifying the required tap changes, a timeframe for making the changes, and technical justification for these changes. *[Violation Risk Factor: Lower] [Time Horizon: Operations]*
- M6.** The Transmission Operator shall have evidence that it provided documentation to the Generator Owner when a change was needed to a generating unit's step-up transformer tap in accordance with the requirement.



## Compliance

### 1. Compliance Monitoring Process:

#### 1.1. Compliance Enforcement Authority:

As defined in the NERC Rules of Procedure, “Compliance Enforcement Authority” means NERC or the Regional Entity in their respective roles of monitoring and enforcing compliance with the NERC Reliability Standards.

#### 1.2. Evidence Retention:

The Transmission Operator shall retain evidence for Measures 1 through 4 for 12 months. The Compliance Monitor shall retain any audit data for three years.

#### 1.3. Compliance Monitoring and Assessment Processes:

As defined in the NERC Rules of Procedure, “Compliance Monitoring and Assessment Processes” 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.

#### 1.4. Additional Compliance Information:

- None

**Table of Compliance Elements**

R #	Time Horizon	VRF	Violation Severity Levels			
			Lower VSL	Moderate VSL	High VSL	Severe VSL
<b>R1</b>	<b>Operations</b>	<b>High</b>	The Transmission Operator has documented criteria for assessments, but has provided a copy to only one of the parties that should have received a copy (either a neighboring TOPs or its RC).	The Transmission Operator has documented policies and procedures, but has not provided copies to either the neighboring TOPs or its RC.	The Transmission Operator has documented policies or procedures, but none of the sub-requirements were followed.	The Transmission Operator has no documented policies or procedures.
<b>R2</b>	<b>Operations</b>	<b>High</b>	N/A	The Transmission Operator only performs day-ahead assessments and only schedules day-ahead resources.	N/A	The Transmission Operator does not perform assessments and therefore does not have policies and procedures implemented to have sufficient Mvars. A lack of real-time operations is also severe.
<b>R3</b>	<b>Operations Planning</b>	<b>Lower</b>	N/A	N/A	N/A	The Transmission Operator does not have exemption criteria.
<b>R4</b>	<b>Operations</b>	<b>Medium</b>	N/A	N/A	The Transmission Operator provides voltage or Reactive Power schedules to only some of the GOPs.	The Transmission Operator does not provide voltage or Reactive Power schedules and tolerance bands at all.

R #	Time Horizon	VRF	Violation Severity Levels			
			Lower VSL	Moderate VSL	High VSL	Severe VSL
<b>R5</b>	<b>Operations</b>	<b>Lower</b>	N/A	The Transmission Operator is unaware of the status in a stable area.	The Transmission Operator does not know the status of important equipment in weaker areas that were identified in assessments as part of R1.	N/A
<b>R6</b>	<b>Operations</b>	<b>Lower</b>	Either the technical justification or timeframe are not provided.	Neither the technical justification nor the timeframe are provided.	N/A	N/A

**Regional Variances**

Regional Variance for the Western Electricity Coordinating Council from VAR-001-3 is retained.

**Interpretations**

None.

**Associated Documents**

None.

## **Guidelines and Technical Basis**

For technical basis for each requirement, please see the VAR White Paper for further technical information.