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Description automatically generated

**Reliability Standard Audit Worksheet[[1]](#footnote-1)**

**VAR-501-WECC-4 — Power System Stabilizer (WECC)**

***This section to be completed by the Compliance Enforcement Authority***

|  |  |
| --- | --- |
| **Registered Entity:** | Registered name of entity being audited |
| **NCR Number:** | NCRnnnnn |
| **Compliance Enforcement Authority:** | Region or NERC performing audit |
| **Compliance Assessment Date(s)[[2]](#footnote-2):** | Month DD, YYYY, to Month DD, YYYY |
| **Compliance Monitoring Method:** | [On-site Audit | Off-site Audit | Spot Check] |
| **Names of Auditors:** | Supplied by CEA |

# **Applicability of Requirements**

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|  | **BA** | **DP** | **GO** | **GOP** | **IA** | **LSE** | **PA** | **PSE** | **RC** | **RP** | **RSG** | **TO** | **TOP** | **TP** | **TSP** |
| **R1** |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |
| **R2** |  |  |  | X |  |  |  |  |  |  |  |  |  |  |  |
| **R3** |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |
| **R4** |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |
| **R5** |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |

**Legend:**

|  |  |
| --- | --- |
| Text with blue background: | Fixed text – do not edit |
| Text entry area with green background: | Entity-supplied information |
| Text entry area with white background: | Auditor-supplied information |

**Findings Table:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Req.** | **Finding** | **Summary & Documentation** | **Functions Monitored** |
| [**R****1**](#R1_Summary)**.** |  |  | GO |
| [**R2**](#R2)**.** |  |  | GOP |
| [**R3**](#R3)**.** |  |  | GO |
| [**R4**](#R4)**.** |  |  | GO |
| [**R5**](#R5)**.** |  |  | GO |

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| --- | --- |
| **Req.** | **Recommendations** |
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| **Req.** | **Areas of Concern** |
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| **Req.** | **Positive Observations** |
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# **Subject Matter Experts**

Identify subject matter expert(s) responsible for this Reliability Standard. Insert additional lines if necessary.

**Registered Entity Response** (**Required**; Insert additional rows if needed)**:**

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| --- | --- | --- | --- |
| **SME Name** | **Title** | **Organization** | **Requirement(s)** |
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# 

# **R1 Supporting Evidence and Documentation**

R1. Each Generator Owner shall provide to its Transmission Operator, the Generator Owner’s written Operating Procedure or other document(s) describing those known circumstances during which the Generator Owner’s PSS will not be providing an active signal to the Automatic Voltage Regulator (AVR), within 180 days of any of the following events:

* The effective date of this standard;
* The PSS’s Commercial Operation date, or;
* Any changes to the PSS operating specifications.

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this requirement.

Evidence Requested:

|  |
| --- |
| **Provide the following evidence, or other evidence to demonstrate compliance.** |
| List of applicable generating units with associated TOP identified. |
| Operating Procedure or other document(s) describing those known circumstances during which the PSS will not be providing an active signal to the AVR. |
| Evidence the Operating Procedure or other document(s) were provided to the associated TOP with 180 days of the effective date of the standard, the PSS’s Commercial Operation date, or any changes to the PSS operating specifications. |

Registered Entity Evidence (Required; Insert additional rows if needed):

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.** | | | | | |
| **File Name** | **Document Title** | **Revision or Version** | **Document Date** | **Relevant Page(s) or Section(s)** | **Description of Applicability of Document** |
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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to VAR-501-WECC-4 R1

***This section must be completed by the Compliance Enforcement Authority.***

Review the evidence to verify the entity has the following:

|  |  |
| --- | --- |
|  | Verify the entity provided its TOP(s), a written Operating Procedure or other document(s) describing those known circumstances during which the entity’s PSS will not be providing an active signal to the AVR, within 180 days of any of the following events:   * The effective date of this standard; * The PSS’s Commercial Operation date, or; * Any changes to the PSS operating specifications. |
| **Note to Auditor:** | |

[**Compliance Summa****ry:**](#R1_Finding)

(Finding Summary):

Primary Documents Supporting Finding:

**Auditor Notes:**

# **R2 Supporting Evidence and Documentation**

**R2.** Each Generator Operator shall have its PSS in service while synchronized, except during any of the following:

* Component failure
* Testing of a Bulk Electric System Element affecting or affected by the PSS
* Maintenance
* As agreed upon by the Generator Operator and the Transmission Operator

A PSS that is out of service for less than 30 minutes does not create a violation of this Requirement, regardless of cause.

**Question:**

Was a PSS out of service at any time when the generator was synchronized?

Yes  No

If no, provide statement below.

If yes, provide a list of instances when PSS was out of service, the duration of each instance, and the reasons for each outage.

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this requirement.

Evidence Requested:

|  |
| --- |
| **Provide the following evidence, or other evidence to demonstrate compliance.** |
| List of all applicable generating units. |
| List of instances when a PSS was out of service, the duration of the outage, and the reason for the outage. |
|  |

Registered Entity Evidence (Required; Insert additional rows if needed):

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.** | | | | | |
| **File Name** | **Document Title** | **Revision or Version** | **Document Date** | **Relevant Page(s) or Section(s)** | **Description of Applicability of Document** |
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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to VAR-501-WECC-4 R2

***This section must be completed by the Compliance Enforcement Authority.***

Review the evidence to verify the entity has the following:

|  |  |
| --- | --- |
|  | Verify the entity had PSS in service while synchronized, except during any of the following:   * Component failure * Testing of a BES Element affecting or affected by the PSS * Maintenance * As agreed upon by the entity and the TOP * Outages of less than 30 minutes |
| **Note to Auditor:**  One of the above reasons must be identified if PSS is out of service for 30 minutes or more to be compliant for that period. | |

[**Complia****nce Summary:**](#R1_Finding)

(Finding Summary):

Primary Documents Supporting Finding:

**Auditor Notes:**

# **R3 Supporting Evidence and Documentation**

**R3.** Each Generator Owner shall tune its PSS to meet the following inter-area mode criteria, except as specified in Requirement R3, Part 3.5 below:

**3.1.** PSS shall be set to provide the measured, simulated, or calculated compensated VT/Vref frequency response of the excitation system and synchronous machine such that the phase angle will not exceed ± 30 degrees through the frequency range from 0.2 Hertz to the lesser of 1.0 Hertz or the highest frequency at which the phase of the Vt/Vref frequency response does not exceed 90 degrees.

**3.2.** PSS output limits shall be set to provide at least ±5% of the synchronous machine’s nominal terminal voltage.

**3.3.** PSS gain shall be set to between 1/3 and 1/2 of maximum practical gain.

**3.4.** PSS washout time constant shall be no greater than 30 seconds.

**3.5**. Units that have an excitation system or PSS that is incapable of meeting the tuning requirements of Requirement R3 are exempt from Requirement R3 until the voltage regulator is either replaced or retrofitted such that the PSS becomes capable of meeting the tuning requirements.

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this requirement.

Evidence Requested:

|  |
| --- |
| **Provide the following evidence, or other evidence to demonstrate compliance.** |
| List of all applicable generating units. For Part 3.5, identify units without PSS capable of meeting the turning requirements and the reasons for the lack of capability. |
| Documentation PSS was set meeting each specific criteria of R3, Part 3.1 through Part 3.4. |
|  |

Registered Entity Evidence (Required; Insert additional rows if needed):

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| **The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.** | | | | | |
| **File Name** | **Document Title** | **Revision or Version** | **Document Date** | **Relevant Page(s) or Section(s)** | **Description of Applicability of Document** |
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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to VAR-501-WECC-4 R3

***This section must be completed by the Compliance Enforcement Authority.***

Review the evidence to verify the entity did the following:

|  |  |
| --- | --- |
|  | Verify the entity tuned its PSS to meet the following inter-area mode criteria, except as specified in R3, Part 3.5: |
|  | 3.1. PSS set to provide the measured, simulated, or calculated compensated VT/Vref frequency response of the excitation system and synchronous machine such that the phase angle will not exceed ± 30 degrees through the frequency range from 0.2 Hertz to the lesser of 1.0 Hertz or the highest frequency at which the phase of the Vt/Vref frequency response does not exceed 90 degrees. |
|  | 3.2. PSS output limits set to provide at least ±5% of the synchronous machine’s nominal terminal voltage. |
|  | 3.3. PSS gain set to between 1/3 and 1/2 of maximum practical gain. |
|  | 3.4. PSS washout time constant no greater than 30 seconds. |
|  | 3.5. Determine if the entity has any units not capable of meeting the tuning requirements. |
| **Note to Auditor:** | |

[**Compliance Su****mmary:**](#R1_Finding)

(Finding Summary):

Primary Documents Supporting Finding:

**Auditor Notes:**

# **R4 Supporting Evidence and Documentation**

**R4.** Each Generator Owner shall install and complete start-up testing of a PSS on its generator within 180 days of either of the following events:

* The Generator Owner connects a generator to the BES, after achieving Commercial Operation, and after the Effective Date of this standard.
* The Generator Owner replaces the voltage regulator on its existing excitation system, after achieving Commercial Operation for its generator that is connected to the BES, and after the Effective Date of this standard.

**Question:** Did the entity have an applicable generator achieve Commercial Operation after the effective date of this requirement?  Yes  No

If no, provide statement below. If yes, provide the date of Commercial Operation, first date of connection to the BES after achieving Commercial Operation, and the date PSS start-up testing was complete.

**Question:** Did the entity replace the voltage regulator on an applicable existing generator excitation system after having achieved Commercial Operation and after the effective date of this standard?  Yes  No

If no, provide statement below. If yes, provide the date the voltage regulator was replaced, the date of first connection to the BES after voltage regulator replacement, and the date PSS start-up testing was complete.

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this requirement.

Evidence Requested:

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| --- |
| **Provide the following evidence, or other evidence to demonstrate compliance.** |
| List of generators achieving Commercial Operation after the effective date of the standard with the date of Commercial Operation, first date of connection to the BES after achieving Commercial Operation, and the date PSS start-up testing was complete. |
| List of generators in which the entity replaced the voltage regulator after achieving Commercial Operation and after the effective date of the standard. Include the date the voltage regulator was replaced, the date of first connection to the BES after voltage regulator replacement, and the date PSS start-up testing was complete. |
|  |

Registered Entity Evidence (Required; Insert additional rows if needed):

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| --- | --- | --- | --- | --- | --- |
| **The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.** | | | | | |
| **File Name** | **Document Title** | **Revision or Version** | **Document Date** | **Relevant Page(s) or Section(s)** | **Description of Applicability of Document** |
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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to VAR-501-WECC-4 R4

***This section must be completed by the Compliance Enforcement Authority.***

Review the evidence to verify the entity has the following:

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| --- | --- |
|  | Verify the entity installed and completed start-up testing of a PSS on its applicable generator within 180 days of either of the following events: |
|  | The entity connected a generator to the BES, after achieving Commercial Operation, and after the effective date of this standard. |
|  | The entity replaced the voltage regulator on the existing excitation system of its applicable generator, after achieving Commercial Operation, and after the effective date of the standard. |
| **Note to Auditor:** | |

[**Compliance S****ummary:**](#R1_Finding)

(Finding Summary):

Primary Documents Supporting Finding:

**Auditor Notes:**

# **R5 Supporting Evidence and Documentation**

**R5.** Each Generator Owner shall repair or replace a PSS within 24 months of that PSS becoming incapable of meeting the tuning specifications stated in Requirement R3.

**Question:** Did the entity have a PSS become incapable of meeting the tuning specifications stated in R3?

Yes  No

If no, provide statement below. If Yes, identify the generator, provide the date the PSS was determined to be incapable of meeting the tuning specifications, and provide the date PSS was repaired or replaced.

**Registered Entity Response (Required):**

Describe, in narrative form, how you meet compliance with this requirement.

Evidence Requested:

|  |
| --- |
| **Provide the following evidence, or other evidence to demonstrate compliance.** |
| List of generators with PSS that became incapable of meeting the tuning specifications with the date of that determination and the date the PSS was repaired or replaced. |
|  |
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Registered Entity Evidence (Required; Insert additional rows if needed):

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| **The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.** | | | | | |
| **File Name** | **Document Title** | **Revision or Version** | **Document Date** | **Relevant Page(s) or Section(s)** | **Description of Applicability of Document** |
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Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to VAR-501-WECC-4 R5

***This section must be completed by the Compliance Enforcement Authority.***

Review the evidence to verify the entity has the following:

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| --- | --- |
|  | Verify the entity repaired or replaced a PSS within 24 months of the PSS becoming incapable of meeting the tuning specifications stated in R3. |
| **Note to Auditor:** | |

[**Compliance Su****mmary:**](#R1_Finding)

(Finding Summary):

Primary Documents Supporting Finding:

**Auditor Notes:**

**Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Version** | **Reviewers** | **Revision Description** |
| August 2018 | 1.0 | WECC Compliance | Initial RSAW for VAR-501-WECC-3.1 |
| August 2024 | 2.0 | WECC Compliance | Initial RSAW for VAR-501-WECC-4 |

1. WECC developed this Reliability Standard Audit Worksheet (RSAW) language in order to facilitate WECC’s assessment of a registered entity’s compliance with this Reliability Standard. The WECC RSAW language is written to specific versions of each WECC Reliability Standard. Entities using this RSAW should choose the version of the RSAW applicable to the Reliability Standard being assessed. While the information included in this RSAW provides some of the methodology that WECC has elected to use to assess compliance with the requirements of the Reliability Standard, this document should not be treated as a substitute for the Reliability Standard or viewed as additional Reliability Standard requirements. In all cases, the registered entity should rely on the language contained in the Reliability Standard itself, and not on the language contained in this RSAW, to determine compliance with the Reliability Standard. WECC Reliability Standards are updated frequently, and this RSAW may not necessarily be updated with the same frequency. Therefore, it is imperative that entities treat this RSAW as a reference document only, and not as a substitute or replacement for the Reliability Standard. It is the responsibility of the registered entity to verify its compliance with the latest approved version of the Reliability Standards, by the applicable governmental authority, relevant to its registration status.

   The WECC RSAW language contained within this document provides a non‑exclusive list, for informational purposes only, of examples of the types of evidence a registered entity may produce or may be asked to produce to demonstrate compliance with the Reliability Standard. A registered entity’s adherence to the examples contained within this RSAW does not necessarily constitute compliance with the applicable Reliability Standard, and WECC using this RSAW reserves the right to request additional evidence from the registered entity that is not included in this RSAW. Additionally, this RSAW includes excerpts from FERC Orders and other regulatory references. The FERC Order cites are provided for ease of reference only, and this document does not necessarily include all applicable Order provisions. In the event of a discrepancy between FERC Orders, and the language included in this document, FERC Orders shall prevail. [↑](#footnote-ref-1)
2. Compliance Assessment Date(s): The date(s) the actual compliance assessment (on-site audit, off-site spot check, etc.) occurs. [↑](#footnote-ref-2)