

# WEM PROCEDURE: GENERATOR MONITORING PLANS

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## 1. INTRODUCTION

### 1.1. Purpose and scope

- 1.1.1. This WEM Procedure: Generator Monitoring Plans (Procedure) is made in accordance with AEMO's functions under clause 2.1A.2(h) of the Wholesale Electricity Market Rules (WEM Rules).
- 1.1.2. The *Electricity Industry Act 2004*, the WEM Regulations and the WEM Rules prevail over this Procedure to the extent of any inconsistency.
- 1.1.3. In this Procedure, where obligations are conferred on a Rule Participant, that Rule Participant must comply with the relevant obligations in accordance with clause 2.9.7A or 2.9.8 of the WEM Rules, as applicable.
- 1.1.4. The purpose of this Procedure is to document:
- (a) the requirements in a Template Generator Monitoring Plan;
  - (b) the process by which a Market Participant must submit a proposed Generator Monitoring Plan for a Transmission Connected Generating System;
  - (c) the process by which a Market Participant must submit proposed updates and amendments to a Generator Monitoring Plan previously approved by AEMO;
  - (d) the process by which AEMO must assess and approve:
    - (i) a Generator Monitoring Plan proposed by a Market Participant; and
    - (ii) updates and amendments to a proposed Generator Monitoring Plan approved by AEMO in paragraph 1.1.4(d)(i);
  - (e) the tests that a Facility must conduct in order to demonstrate compliance with its Registered Generator Performance Standards and Generator Monitoring Plan; and
  - (f) the process by which a Market Participant must report any alleged non-compliance or suspected non-compliance with:
    - (i) applicable Registered Generator Performance Standards;
    - (ii) an applicable approved Generator Monitoring Plan; or
    - (iii) an approved Rectification Plan.
- 1.1.5. Appendix A of this Procedure outlines the head of power clauses that this Procedure is made under, as well as other obligations in the WEM Rules covered by this Procedure.

### 1.2. Definitions

- 1.2.1. Terms defined in the *Electricity Industry Act 2004*, the WEM Regulations and the WEM Rules have the same meanings in this Procedure unless the context requires otherwise.
- 1.2.2. The following definitions apply in this Procedure unless the context requires otherwise.

**Table 1 Definitions**

Term	Meaning
Disturbance Data	Data obtained as a result of analysis of performance during and following a Power System Disturbance.
Generating System	Has the meaning given in clause A12.1 of the WEM Rules.
Monitoring Results or Monitoring Data	Data obtained as a result of continuous in-service monitoring under paragraph 3.2.3(a) of this Procedure.
Power System Disturbance	Power system deviating from normal operating conditions to the extent that could threaten the stability or change the operation of the Transmission Connected Generating System as a result of one or more Contingency Events.
Test Results or Test Data	Data obtained as a result of periodic online and/or offline testing under paragraph 3.2.3(b) of this Procedure.

### 1.3. Interpretation

- 1.3.1. The following principles of interpretation apply in this Procedure unless the context requires otherwise.
- (a) Clauses 1.3 to 1.5 of the WEM Rules apply in this Procedure.
  - (b) References to time are references to Australian Western Standard Time.
  - (c) Terms that are capitalised, but not defined in this Procedure, have the meaning given in the WEM Rules.
  - (d) A reference to the WEM Rules or WEM Procedures includes any associated forms required or contemplated by the WEM Rules or WEM Procedures.
  - (e) Words expressed in the singular include the plural and vice versa.
  - (f) A reference to a paragraph refers to a paragraph of this Procedure.
  - (g) A reference to a clause refers to a clause or section of the WEM Rules.
  - (h) References to WEM Rules in this Procedure in bold and square brackets [Clause XXX] are included for convenience only, and do not form part of this Procedure.
  - (i) Text located in boxes and headed as Explanatory Note X in this Procedure is included by way of explanation only and does not form part of this Procedure.

### 1.4. Related documents

- 1.4.1. The documents in Table 2 are associated with this Procedure.

**Table 2 Related documents**

Title	Location
<u>WEM Rules</u>	Economic Regulation Authority (ERA) website
<u>Technical Rules</u>	ERA website
WEM Procedure: Generator Model Submission and Maintenance (maintained by Western Power)	Western Power's website

Title	Location
WEM Procedure: Generator Performance Standards for Existing Transmission Connected Generating System (maintained by Western Power)	Western Power's website

## 2. TEMPLATE GENERATOR MONITORING PLAN

### 2.1. Introduction

- 2.1.1. A Market Participant that is responsible for a Transmission Connected Generating System must develop a Generator Monitoring Plan in accordance with the requirements of the Template Generator Monitoring Plan described in this paragraph 2 of this Procedure and submit this Generator Monitoring Plan to AEMO [Clause 3A.6.4(a)]. The Generator Monitoring Plan must meet the requirements of the Template Monitoring Plan and be in the format<sup>1</sup> specified by AEMO, other than in respect of variations made by the Market Participant that are permitted under clause 3A.6.4(b) of WEM Rules.
- 2.1.2. This paragraph 2 of this Procedure contains the Template Monitoring Plan and outlines:
- (a) how a Market Participant responsible for a Transmission Connected Generating System must monitor performance against the applicable Registered Generator Performance Standards including any testing and verification requirements [Clause 3A.6.2(a)i];
  - (b) record keeping obligations relating to monitoring compliance with Registered Generator Performance Standards [Clause 3A.6.2(a)ii];
  - (c) information and data provision obligations a Market Participant responsible for a Transmission Connected Generating System must comply with when requested by AEMO, the Network Operator or the Economic Regulation Authority, including the form by which that information and data must be provided [Clause 3A.6.2(a)iii].
- 2.1.3. The specific information contained in this Procedure outlined by AEMO in accordance with paragraph 2.1.2(a) of this Procedure includes:
- (a) the requirements in developing a Generator Monitoring Plan by a Market Participant, to enable monitoring of technical performance of a Transmission Connected Generating System against the applicable Registered Generator Performance Standards:
    - (i) the general principles that must be considered and incorporated by a Market Participant in developing a Generator Monitoring Plan (refer to paragraph 2.2 of this Procedure);
    - (ii) the information and data that must be incorporated by a Market Participant in developing a Generator Monitoring Plan (refer to paragraph 2.3 of this Procedure); and
    - (iii) the requirement to submit the evidence of compliance with the applicable Registered Generator Performance Standards by a Market Participant to AEMO (refer to paragraph 2.4 of this Procedure); and

<sup>1</sup> The Generator Monitoring Plan form is published on the WEM Website.

- (b) the compliance testing and monitoring requirements in paragraph 3 of this Procedure, which include the testing and monitoring regime, the compliance verification mechanism and the requirements for the frequency of obtaining the evidence of compliance.
- 2.1.4. The specific information contained in this Procedure outlined by AEMO in accordance with paragraph 2.1.2(b) and 2.1.2(c) of this Procedure includes:
- (a) in relation to monitoring compliance with the applicable Registered Generator Performance Standards, the information and data that a Market Participant must keep, and the period for which it must be kept (refer to paragraphs 2.5.1 and 2.5.2 of this Procedure); and
  - (b) the form in which the information and data must be provided when requested by AEMO, the Network Operator or the Economic Regulation Authority (refer to paragraph 2.5.3 of this Procedure).

## **2.2. General Principles**

- 2.2.1. A Market Participant must consider and incorporate the following compliance principles when developing a Generator Monitoring Plan:
- (a) the testing and monitoring regime (including the relevant recording devices to be used), verification mechanism and frequency that evidence of compliance will be obtained (as described in paragraph 3.4.2 of this Procedure), must be such that compliance with an applicable Registered Generator Performance Standard can be conclusively established at the required intervals;
  - (b) where the compliance of the relevant part of an applicable Registered Generator Performance Standard cannot be demonstrated through generator performance testing and monitoring, alternative methods to demonstrate compliance;
  - (c) explanation of any risks created by the Generator Monitoring Plan, while maintaining the ability to conclusively establish the relevant compliance status of an applicable Registered Generator Performance Standard;
  - (d) a description of the efficiency and practicality of implementing the Generator Monitoring Plan, which includes, but is not limited to, implementation costs and availability of skills and labour, while maintaining the ability to conclusively establish the relevant compliance status of an applicable Registered Generator Performance Standard; and
  - (e) regular reviews and updates incorporating learnings from past implementation of the Generator Monitoring Plan, and continuous changes and improvement relevant to any parts of the Generator Monitoring Plan (e.g. testing and monitoring regime and verification mechanisms).
- 2.2.2. To support the principles specified in paragraph 2.2.1 of this Procedure, a Market Participant must, as a minimum, provide the specified information and data in paragraph 2.3 of this Procedure.

## **2.3. Information and Data requirements**

- 2.3.1. A proposed Generator Monitoring Plan, submitted by a Market Participant to AEMO for approval in accordance with paragraph 4 of this Procedure, must contain as a minimum, for each Technical Requirement described in Appendix 12 of the WEM Rules:
- (a) the applicable Registered Generator Performance Standard for that Technical Requirement;

- (b) a compliance testing and monitoring methodology, in accordance with the specific requirements described in paragraph 3.2 of this Procedure;
- (c) a mechanism to verify compliance, in accordance with the specific requirements described in paragraph 3.3 of this Procedure;
- (d) a description of the frequency that evidence of compliance will be obtained, in accordance with the specific requirements described in paragraph 2.4 of this Procedure;
- (e) details of any non-compliance and suspected non-compliance that has occurred, any rectification action taken, the status of compliance at the time of submission of the proposed Generator Monitoring Plan, and, if applicable, the test results following a request by AEMO to undertake a test in accordance with clause 3A.9.4 of the WEM Rules (refer to paragraph 7.1.10 of this Procedure);
- (f) a process for future audits or reviews of the Generator Monitoring Plan, including the proposed process and frequency of the review;
- (g) any relevant information requested by AEMO and/or, where applicable, details of any notification provided by AEMO in accordance with clause 3A.9.2, 3A.10.3 and 3A.10.4 of the WEM Rules;
- (h) the commencement date of an approved Generator Monitoring Plan; and
- (i) a proposed timeframe for when the Market Participant will initially provide the evidence to AEMO that it is fully compliant with its Generator Monitoring Plan (as described in paragraph 2.4 of this Procedure).

2.3.2. A proposed Generator Monitoring Plan, submitted by a Market Participant to AEMO for approval in accordance with paragraph 4 of this Procedure, may include additional information at the discretion of the Market Participant. This information may include details of the relevant implementation team for the Generator Monitoring Plan, including roles and responsibilities of this team.

## **2.4. Evidence of Compliance with the Generator Monitoring Plan**

- 2.4.1. Market Participants must implement an approved Generator Monitoring Plan in accordance with the proposed frequency of obtaining the evidence of compliance, as outlined in the approved Generator Monitoring Plan and, notwithstanding the self-reporting regime specified in clause 3A.10 of the WEM Rules, must complete and provide evidence that it is fully compliant with its approved Generator Monitoring Plan, or specify where there is a lack of compliance with the Generator Monitoring Plan, to AEMO no later than the date and time specified in the approved Generator Monitoring Plan under paragraph 2.3.1(i) of this Procedure.
- 2.4.2. A Market Participant must submit initial evidence that it is fully compliant with its approved Generator Monitoring Plan to AEMO, in accordance with paragraphs 2.4.1 and 4.1.8 of this Procedure, to demonstrate its ability to self-monitor in accordance with the approved Generator Monitoring Plan, and its ability to achieve compliance with its Generator Monitoring Plan, as described in paragraph 7.1.5 of this Procedure.

- 2.4.3. Evidence of compliance provided under paragraph 2.4.1 of this Procedure must include information and/or data to demonstrate that the required tests and/or monitoring specified in the Generator Monitoring Plan have been successfully conducted and recorded.
- 2.4.4. Evidence of compliance, provided under paragraph 2.4.1 of this Procedure, must clearly specify the period during which the testing and monitoring occurred, and the period in which the reporting of the evidence of compliance is applicable.
- 2.4.5. Evidence submitted to AEMO, in order to demonstrate absence of non-compliance, as described in paragraphs 7.1.1 and 7.1.2, or compliance as described in paragraph 7.1.5 of this Procedure, must be sufficient to enable AEMO, in its discretion, to clearly identify that it has been achieved.

### **E[A] Examples of inconclusive evidence of compliance**

Examples of evidence of compliance in paragraph 2.4 of this Procedure that do not conclusively establish that compliance has occurred are:

- (a) statements such as 'The active power ramp rate was observed to have operated satisfactorily' made without providing relevant active power measurements and results to substantiate the statement; and
- (b) Test Data failing to record and demonstrate that the post-step response has settled to a new level and, Settling Time has been calculated based on such Test Data; and
- (c) charts that have not been appropriately annotated and fail to provide clarity in relation to the Test Results.

## **2.5. Retention of records**

- 2.5.1. Market Participants must retain information and data related to Registered Generator Performance Standards and Generator Monitoring Plans for all Transmission Connected Generating Systems that are registered to them. This information and data include, but are not limited to:
- (a) all information and data stated in the Registered Generator Performance Standards;
  - (b) all inputs used in developing the Generator Monitoring Plans, including the information and data described in paragraph 2.3 of this Procedure;
  - (c) all information and data described in the Generator Monitoring Plans, including the evidence of compliance described in paragraph 2.4 of this Procedure, such as:
    - (i) records of tests conducted and the results of those tests, which include but are not limited to:
      - (A) date/time of the test;
      - (B) a description of the test;
      - (C) results of the test; and
      - (D) any other information in relation to compliance resulting from the test;
    - (ii) Monitoring Data, either from continuous recording or as a result of a disturbance or a test; and
    - (iii) records of relevant general or technical inspections conducted by a Market Participant; and
  - (d) all written correspondence with AEMO, the Network Operator and the Economic Regulation Authority in relation to Registered Generator Performance Standards and the Generator Monitoring Plans, including, but not limited to, emails, meeting minutes and, all exchanges and documents on Market Participant Interface (MPI).

- 2.5.2. Market Participants must retain all information and data referred to in paragraph 2.5.1 of this Procedure in accordance with clause 10.1.2 of the WEM Rules, including where paragraph 5.1.12 of this procedure applies.
- 2.5.3. Where requested by AEMO, the Network Operator or the Economic Regulator Authority, a Market Participant must provide any data and information referred to in paragraph 2.5.1 of this Procedure in electronic form within 5 Business Days. This information must be provided via email, the MPI or any other method specified by AEMO, the Network Operator or the Economic Regulator Authority, at the time of request. Where the data is stored in respect of continuous recording or as a result of a disturbance or a test, that data must be stored in a format that is non-proprietary and must be able to be accessed by AEMO, the Network Operator or the Economic Regulator Authority via typical office applications (e.g. CSV or Excel format).

### **3. COMPLIANCE TESTING AND MONITORING REQUIREMENTS**

#### **3.1. Overview**

- 3.1.1. Compliance testing and monitoring requirements specified in this paragraph 3 of this Procedure include the following aspects:
- (a) testing and monitoring regime;
  - (b) verification mechanism; and
  - (c) frequency that the evidence of compliance must be obtained.
- 3.1.2. This paragraph 3 of this Procedure specifies the testing and verification requirements (as required under clauses 3A.9.1 and clause 3A.6.2(i) of the WEM Rules) that are necessary to verify compliance:
- (a) with an applicable Registered Generator Performance Standard;
  - (b) with an applicable Generator Monitoring Plan; and
  - (c) with applicable Registered Generator Performance Standards before an Interim Approval to Generate Notification or an Approval to Generate Notification is issued.
- 3.1.3. Testing and verification requirements within this Procedure are the same for both Interim Approval to Generate Notifications and Approval to Generate Notifications.
- 3.1.4. Compliance with an applicable Registered Generator Performance Standard is verified by means of the testing and monitoring regime, verification mechanism and requirements for evidence of compliance described in an approved Generator Monitoring Plan. This includes the Market Participant demonstrating initial compliance in order to obtain an Interim Approval to Generate or Approval to Generate Notification, demonstrating continued compliance following generator maintenance or upgrades (including following Relevant Generator Modification), and demonstrating ongoing compliance.
- 3.1.5. Criteria for compliance with an applicable Generator Monitoring Plan are described in paragraph 7.1.5 of this Procedure.

### 3.2. Testing and monitoring regime

- 3.2.1. A testing and monitoring regime must be prepared by Market Participants for each Technical Requirement specified in Appendix 12 of the WEM Rules, and in accordance with the mandatory tests outlined in Appendix B of this Procedure, and Market Participants must monitor their performance against the applicable Registered Generator Performance Standards, in accordance with this testing and monitoring regime.
- 3.2.2. For each of the mandatory tests outlined in Appendix B of this Procedure, AEMO may agree for a test to be undertaken at a lesser requirement, if AEMO forms the view that, due to the conditions at the time of testing, undertaking the test in accordance with the Appendix B of this Procedure may result in unacceptable risks, including to Power System Security and/or Power System Reliability.
- 3.2.3. The testing and monitoring regime may consist of different forms of tests, including, but not limited to:
- (a) continuous in-service monitoring;
  - (b) periodic online and/or offline testing; and
  - (c) analysis of performance during and following a Power System Disturbance.
- 3.2.4. The testing and monitoring regime must consider and incorporate:
- (a) all relevant parts of an applicable Registered Generator Performance Standard that are required be verified under the Generator Monitoring Plan;
  - (b) information about how continuous monitoring must be performed, including location, quantities to measure, the recording device used and analysis of the measurement results;
  - (c) detailed steps of how an online and/or offline test must be performed;
  - (d) a requirement that, where tests are required under Appendix 12 of the WEM Rules, these tests must be undertaken in addition to any alternative test methodology that has been considered;
  - (e) a verification mechanism, in accordance with the specific requirements in paragraph 3.3 of this Procedure;
  - (f) a clear objective and expectation of the outcome of a test or monitoring;
  - (g) the quantities to be measured for a test, including the duration for which the quantities are measured, before, during and after a test, that establish the outcome of the test;
  - (h) information about the locations within the relevant Transmission Connected Generating System where the test or monitoring measurements are made, including those measurements necessary to assist with post-test or post-monitoring analysis;
  - (i) information about the appropriateness of the form of the Test Results and Monitoring Results (including those listed in Attachment 11 of the Technical Rules) to enable a compliance status to be established conclusively;
  - (j) information about the appropriateness and degree of accuracy of the units of measurement of the testing and monitoring, including those used in the recording devices and analysis of test results, such that they describe a measured quantity accurately and support a compliance status being established conclusively;

- (k) any other reasonable information that supports a conclusive assessment of the compliance status of the Transmission Connected Generating System with an applicable Registered Generator Performance Standard, where a quantity cannot be directly measured in the test environment;
- (l) information about the variation in technical performance of the Transmission Connected Generating System under power system operating conditions and/or ambient conditions, resulting in the requirement to repeat the tests multiple times under different conditions or via continuous monitoring, to conclusively establish the compliance status of an applicable Registered Generator Performance Standard under variable conditions;
- (m) information about the technical performance of the Transmission Connected Generating System in the most onerous power system operating conditions and/or ambient conditions that are applicable to the Transmission Connected Generating System;
- (n) all relevant test information that must be recorded to assist with post-test or post-monitoring analysis, including the time and date, relevant power system conditions during the period, operating arrangement and configuration within the Transmission Connected Generating System, and ambient conditions at the start of, end of, and during a test (or monitoring);
- (o) information about the suitability of the test and monitoring regime for validating modelled technical performance, where any parts of the modelled technical performance have been identified as requiring validation;
- (p) information about the appropriateness of the recording device, including the accuracy, resolution and reliability of the measurements. At a minimum, it must be demonstrated that the device meets the relevant requirements described in Attachment 11 of the Technical Rules, must not result in inaccurate or inconclusive results, and:
  - (i) the make and model of each of the recording device must be specified; and
  - (ii) the calibration or relevant test certificates must be provided for each of the devices;
- (q) confirmation that measurements are synchronised to within the timeframe specified in the Technical Rules, where multiple quantities are measured using multiple recording devices during a test;
- (r) a requirement to verify each type of Generating Unit and/or each type of control and protection system, or justification for the lack of such requirement, where a Transmission Connected Generating System consists of Generating Units of different makes or Generating Units having different control and Protection Systems installed;
- (s) information about any potential risks, which include, but are not limited to, those related to:
  - (i) Power System Security and Power System Reliability;
  - (ii) health and safety of personnel on-site;
  - (iii) health and safety of the public; and
  - (iv) damage to equipment;
- (t) information about any mitigation actions taken for each of the potential risks identified in paragraph 3.2.4(s) of this Procedure.

- 3.2.5. Any information provided under paragraph 3.2.4 of this Procedure must be specific and detailed, for example, where a proposed test is referenced from another document (such as Australian Standards or other international standards), the test may be quoted, but details of the compliance test and monitoring test must be specified in relation to the exact characteristics of the Transmission Connected Generating System.
- 3.2.6. Market Participants may propose any suitable testing and monitoring methods, and any numbers of tests and monitoring regimes, as necessary to verify compliance against any part of the applicable Registered Generator Performance Standards. However, these tests must demonstrate incorporation of all relevant principles and requirements described in paragraphs 2.2 and 2.3 of this Procedure, and the mandatory tests described in Appendix B of this Procedure.

### **3.3. Compliance verification mechanism**

- 3.3.1. Market Participants must formulate a mechanism to verify their compliance with each Registered Generator Performance Standard.
- 3.3.2. The verification mechanism in this paragraph 3.3 of this Procedure describes generally how a Technical Requirement must be verified, including considering the testing and monitoring regime (including the available Test Results and Monitoring Results), and providing evidence necessary to substantiate a claim of compliance.
- 3.3.3. A Market Participant must verify a Technical Requirement by incorporating the following into the verification mechanism:
- (a) where a requirement for performance is quantified in a Technical Requirement (such as speed of response and accuracy level), the verification mechanism must be such that the required performance can be quantified;
  - (b) where a Technical Requirement requires provision of certain information and requires updates to that information, the verification mechanism must include confirmation that the information has been provided and this information is valid at the time the evidence of compliance is submitted to AEMO;
  - (c) where a Technical Requirement specifies how a test is to be performed, including the location at which the technical performance must be established is specified, the verification mechanism must ensure the tests are conducted in the required manner and include measurements that demonstrate the test has been conducted in required location;
  - (d) where a Technical Requirement is in relation to installation and/or availability of a control system or equipment, the verification mechanism must include confirmation that the relevant system or equipment has been installed and all required functionality is available on a continuous basis;
  - (e) where a Technical Requirement is in relation to the connection status of a Transmission Connected Generating System (such as a requirement to remain in Continuous Uninterrupted Operation, or not to disconnect following a disturbance), the verification mechanism must include, as applicable:
    - (i) if the Transmission Connected Generating System or equipment within the Transmission Connected Generating System was disconnected, evidence to support the notion that the disconnection was intentional and in compliance with an approved protection scheme;

- (ii) evidence that a Transmission Connected Generating System remains connected during a disturbance; and/or
  - (iii) confirmation of relevant in-service protection settings;
- (f) where a requirement is in relation to an obligation of AEMO and/or a Network Operator, consideration that must be made during a negotiation process of a Generator Performance Standard, and the requirement cannot be verified by means of testing and monitoring, a verification mechanism is not required by the Market Participants;
- (g) where a requirement is in relation to conformance to a WEM Procedure, the Technical Rules, Australian Standards or any internal standards of the Market Participant, the verification mechanism must consider how the requirement is described in the relevant document; and
- (h) in any case, consideration must be given to ensuring that the verification mechanism supports a compliance status being established conclusively.

### **3.4. Frequency of obtaining evidence of compliance**

- 3.4.1. A Generator Monitoring Plan must include the proposed frequency of obtaining evidence of compliance, for each of the tests and monitoring arrangements.
- 3.4.2. Frequency of obtaining evidence of compliance refers to the frequency of periodic testing required under a Generator Monitoring Plan, and/or where evidence of compliance is available from other monitoring mechanisms, including those described in Appendix C, for ongoing verification of compliance against a Registered Generator Performance Standard. The evidence of compliance must be obtained at the frequency of obtaining evidence of compliance specified in the approved Generator Monitoring Plan.
- 3.4.3. In setting the frequency of obtaining evidence of compliance, the Market Participant must consider and address the following factors:
  - (a) the technology adopted by the Transmission Connected Generating System in relation to a Technical Requirement;
  - (b) past learnings/experience with the specific Transmission Connected Generating System, or the relevant parts of the Transmission Connected Generating System;
  - (c) industry experience with the particular generation technology;
  - (d) manufacturer's advice, for example with respect to the particular model of equipment within a Transmission Connected Generating System or control system version; and
  - (e) an assessment of the frequency of obtaining evidence of compliance, required to provide reasonable assurance of compliance.
- 3.4.4. A Generator Monitoring Plan must also propose how the frequency of obtaining evidence of compliance should be reviewed and updated, including the philosophy and basis on which the frequency of obtaining evidence of compliance will be reviewed.

## 4. SUBMISSION PROCESS

- 4.1.1. A Market Participant must submit a proposed Generator Monitoring Plan to AEMO no later than six months from the date the Market Participant responsible for a Transmission Connected Generating System has a Registered Generator Performance Standard for each Technical Requirement for the Transmission Connected Generating System, as submitted by Network Operator to AEMO.
- 4.1.2. Where a Facility with Registered Generator Performance Standards commences operation for the first time, or following a Relevant Generator Modification, the Market Participant responsible for the Facility must submit the relevant Generator Monitoring Plan to AEMO prior to the issue of an Approval to Generate Notification by a Network Operator, and must allow for time required by AEMO to assess the Generator Monitoring Plan in accordance with paragraph 5 of this Procedure and allowing for any additional time that may be required following notification of the outcome of such assessment.
- 4.1.3. A Market Participant must submit a revised proposed Generator Monitoring Plan, containing updates and amendments to an approved Generator Monitoring Plan, to AEMO in accordance with the following conditions and timeframes, and paragraph 4.1.8 of this Procedure:
- (a) within 6 months of a new Registered Generator Performance Standard taking effect, where a new Registered Generator Performance Standard<sup>2</sup> supersedes an existing Registered Generator Performance Standard, including in accordance with clause 3A.14.1(b) of the WEM Rules where there has been a Relevant Generator Modification;
  - (b) within 6 months of amendments to the Template Generator Monitoring Plan as specified in paragraph 2 of this Procedure taking effect, as required by clause 3A.6.9 of the WEM Rules; and
  - (c) within 20 Business Days of implementing the approved Generator Monitoring Plan, or another timeframe as agreed with AEMO, where any parts of the approved Generator Monitoring Plan have not been implemented by a Market Participant because the relevant parts described in the approved Generator Monitoring Plan have been found to be infeasible during its execution; and as soon as practically possible after identifying the infeasibility, notify AEMO of the infeasibility and intent to submit a revised proposed Generator Monitoring Plan.
- 4.1.4. A Market Participant must notify AEMO as soon as practically possible, after it forms the view that any parts of the approved Generator Monitoring Plan are no longer valid due to reasons other than those specified in paragraphs 4.1.3 of this Procedure and, must:
- (a) provide details as to which parts of the approved Generator Monitoring Plan have been deemed invalid; and
  - (b) submit an updated proposed Generator Monitoring Plan in accordance with paragraph 4.1.8 of this Procedure, and no later than 20 Business Days after notifying AEMO that the information is invalid.

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<sup>2</sup> A Registered Generator Performance Standard may be superseded due to a range of reasons, which include, but are not limited to, updates to relevant requirements in WEM Rules, changes to this Procedure, or re-negotiation of a Registered Generator Performance Standard due to changes in technical performance.

- 4.1.5. Where a previously submitted proposed Generator Monitoring Plan or an approved Generator Monitoring Plan has been amended and re-submitted to AEMO by a Market Participant, the Market Participant must include:
- (a) reasons for the updates and amendments; and
  - (b) references within the document where the approved Generator Monitoring Plan has been updated.
- 4.1.6. A Generator Monitoring Plan submitted by a Market Participant, including a Generator Monitoring Plan containing amendments and updates requested by AEMO in accordance with clause 3A.6.8(b) of the WEM Rules, is not an approved Generator Monitoring Plan until it has been assessed and approved by AEMO in accordance with paragraph 5 of this Procedure, and AEMO has issued a notice to the Market Participant that the Generator Monitoring Plan has been approved.
- 4.1.7. Where there is an existing approved Generator Monitoring Plan, the existing approved Generator Monitoring Plan remains in effect and, must be complied with by a Market Participant to the extent reasonably able, until another Generator Monitoring Plan submitted by a Market Participant, including a Generator Monitoring Plan containing amendments and updates requested by AEMO in accordance with clause 3A.6.8(b) of the WEM Rules, has been approved by AEMO in accordance with paragraph 5 of this Procedure, and AEMO has issued a notice to the Market Participant that the submitted Generator Monitoring Plan has been approved.
- 4.1.8. Rule Participants must make all required notifications and submissions related to the Generator Monitoring Plans, including those described in paragraphs 4 and 7 in this Procedure, via MPI, unless otherwise agreed by AEMO or specified in this Procedure.

## **5. ASSESSMENT AND APPROVAL PROCESS**

- 5.1.1. AEMO must adopt the assessment and approval process outlined in this Paragraph 5 of this Procedure for a proposed Generator Monitoring Plan, including a proposed Generator Monitoring Plan that is an update or amendment to an approved Generator Monitoring Plan, submitted by a Market Participant responsible for a Transmission Connected Generating System.
- 5.1.2. Where a Market Participant submits a proposed Generator Monitoring Plan to AEMO under clause 3A.6.4 of the WEM Rules, AEMO must perform an assessment to inform AEMO's decision to approve or reject a proposed Generator Monitoring Plan.
- 5.1.3. The scope of AEMO's assessment of a proposed Generator Monitoring Plan is limited to:
- (a) the content of the Generator Monitoring Plan required by paragraph 2 of this Procedure; and
  - (b) the applicable Registered Generator Performance Standards, including applicable equipment settings and control modes approved by the Network Operator,
- and is conducted for the purpose of confirming suitability for monitoring ongoing compliance with a Facility's Registered Generator Performance Standards.

- 5.1.4. Where a Market Participant has submitted a proposed Generator Monitoring Plan that includes evidence of compliance with the applicable Registered Generator Performance Standards, AEMO's approval of the proposed Generator Monitoring Plan extends to the Generator Monitoring Plan itself, but does not include AEMO's approval or acceptance of the compliance, or lack thereof, with any other part of the Registered Generator Performance Standards for that Facility.
- 5.1.5. AEMO's approval of a proposed Generator Monitoring Plan does not preclude any other necessary processes, arrangements and approvals (e.g. approval for Outages) being undertaken to execute the testing and monitoring regime in accordance with the approved Generator Monitoring Plan.
- 5.1.6. AEMO's approval of a proposed Generator Monitoring Plan does not include AEMO's acceptance of any obligations or responsibilities related to the implementation of the approved Generator Monitoring Plan, and does not include acceptance of any potential risks identified within the Generator Monitoring Plan.
- 5.1.7. Where a Generator Monitoring Plan has been submitted without an active set of Registered Generator Performance Standards or Approval to Generate Notification being issued, it may be assessed by AEMO but it must not be approved by AEMO until the Registered Generator Performance Standards become active and, in the case of a Transmission Connected Generating System commencing operation for the first time, where an Approval to Generate Notification is ready to be issued by the Network Operator.
- 5.1.8. In assessing whether to approve or reject a proposed Generator Monitoring Plan, AEMO must consider:
- (a) the requirements described in clauses 1.41.12, 3A.6.5 and 3A.6.6 of the WEM Rules, where applicable; and
  - (b) whether the Generator Monitoring Plan demonstrates consideration of all principles and requirements described in paragraphs 2.1 to 2.4 of this Procedure.
- 5.1.9. AEMO must use its best endeavours to notify a Market Participant of the outcome of the assessment described in paragraph 5.1.8 within 30 Business Days of submission, via MPI or in the event that MPI is not available, another method as agreed with the Market Participant.
- 5.1.10. Where a modification has been made to a proposed Generator Monitoring Plan following a rejection notification by AEMO, made in accordance with clause 3A.6.8 of the WEM Rules, AEMO must assess the proposed Generator Monitoring Plan in accordance with the requirements and timeframe specified in paragraph 5.1.8 and paragraph 5.1.9 of this Procedure respectively.
- 5.1.11. There must only be one approved Generator Monitoring Plan for a Transmission Connected Generating System in effect at any time. The applicable approved Generator Monitoring Plan remains effective until such time that:
- (a) it has been superseded by another approved Generator Monitoring Plan; or
  - (b) the Transmission Connected Generating System is de-registered.

- 5.1.12. Where there is a transfer of ownership or registration of a Transmission Connected Generating System, the approved Generator Monitoring Plan continues to be in effect until such time it has been superseded by another approved Generator Monitoring Plan. The transferee assumes all obligations related to the Registered Generator Performance Standards and Generator Monitoring Plans for the Transmission Connected Generating System, including obtaining and retaining the relevant information as described in paragraph 2.5 in this Procedure, upon completion of the transfer of ownership.

## **6. GENERATOR MONITORING PLANS FOR EXISTING TRANSMISSION CONNECTED GENERATING SYSTEMS**

### **6.1. Overview**

- 6.1.1. For a Market Participant responsible for an Existing Transmission Connected Generating System, clause 1.41 of the WEM Rules describes all relevant requirements and obligations that must be fulfilled by Market Participants and AEMO in relation to a Generator Monitoring Plan. This Procedure does not require additional information to be provided by a Market Participant, or steps to be taken by AEMO, when submitting and considering a proposed Generator Monitoring Plan submitted under clause 1.41.2 of the WEM Rules, in addition to those outlined in clause 1.41 of the WEM Rules. However, this Paragraph 6 of this Procedure describes additional processes for requesting an extension of the time for submission of and for approval of proposed Generator Monitoring Plans submitted under clause 1.41.2 of the WEM Rules.

### **6.2. Requests for extension**

- 6.2.1. Where a request for an extension of the time period for the submission of a proposed Generator Monitoring Plan is made in accordance with clauses 1.41.3 and 1.41.4 of the WEM Rules by a Market Participant, the information that must be provided by a Market Participant to AEMO, in order for AEMO to consider if a Market Participant is making reasonable progress towards having a Generator Monitoring Plan, includes but is not limited to:
- (a) reasons for the request for extending the date by which a proposed Generator Monitoring Plan must be submitted;
  - (b) the time by which the Market Participant expects the proposed Generator Monitoring Plan to be submitted; and
  - (c) the actions the Market Participants must take to complete and submit the proposed Generator Monitoring Plan.
- 6.2.2. Market Participants must submit the request for extension as described in paragraph 6.2.1 of this Procedure by email, or another method specified by AEMO on the WEM Website.
- 6.2.3. In determining whether a request for extending the submission deadline for a proposed Generator Monitoring Plan for an Existing Transmission Connected Generating System is to be approved or rejected, AEMO must consider, where relevant:
- (a) whether the Existing Transmission Connected Generating System is still progressing with reaching an Agreed Generator Performance Standard;
  - (b) the risks that the relevant Existing Transmission Connected Generating System poses to Power System Security and Power System Reliability, considering the size, location,

technology, expected frequency and duration of operation of the Existing Transmission Connected Generating System;

- (c) complexity in developing the Generator Monitoring Plan, in particular, the testing and monitoring regime, considering factors such as the age and technology of the relevant Existing Transmission Connected Generating System; and
- (d) whether a Market Participant has a large number of Existing Transmission Connected Generating Systems for which it needs to develop Generator Monitoring Plans.

6.2.4. AEMO must use its best endeavours to notify a Market Participant of the outcome of the request for extension made in accordance with paragraph 6.2.1 of this Procedure, within 20 Business Days of receiving the request, by email to the Market Participant, or another method specified by AEMO on the WEM Website.

## **6.1. Approval process**

6.1.1. For a proposed Generator Monitoring Plan, submitted in accordance with clause 1.41.2 of the WEM Rules, the assessment and approval for the proposed Generator Monitoring Plan and the effect of an approved Generator Monitoring Plan is specified in paragraph 5 of this Procedure.

6.1.2. For a proposed Generator Monitoring Plan, submitted in accordance with clause 1.41.2 of the WEM Rules, where there is no Existing Monitoring Plan, AEMO must consider all requirements of the Template Generator Monitoring Plan (described in paragraph 2 of this Procedure), in assessing and approving the proposed Generator Monitoring Plan.

6.1.3. For a proposed Generator Monitoring Plan, submitted in accordance with clause 1.41.2 of the WEM Rules, where there is an Existing Monitoring Plan, AEMO must consider the requirement specified in clause 1.41.9 of the WEM Rules, that it must approve the method of monitoring as it relates to a Technical Requirement as set out in the Existing Monitoring Plan, in conjunction with all other requirements specified for the Template Generator Monitoring Plan (described in paragraph 2 of this Procedure), in assessing and approving the proposed Generator Monitoring Plan.

## **7. NON-COMPLIANCE**

7.1.1. For the purposes of this Procedure, a non-compliance for a Transmission Connected Generating System includes a failure to comply with:

- (a) an applicable Registered Generator Performance Standard, as described under paragraph 7.1.2 of this Procedure; and
- (b) an applicable Generator Monitoring Plan, as described in paragraph 7.1.5 of this Procedure.

7.1.2. Non-Compliance with an applicable Registered Generator Performance Standard for a Transmission Connected Generating System includes, but is not limited to:

- (a) when any part of an applicable Registered Generator Performance Standard has been established as non-compliant, including when clause 3A.10.2 of the WEM Rules applies; and
- (b) where a non-compliance is suspected and, following the relevant tests, including the tests described in paragraph 7.1.9 of this Procedure, by the Market Participant responsible for the Transmission Connected Generating System, AEMO cannot reasonably conclude that that the Transmission Connected Generating System is compliant with the applicable Registered

Generator Performance Standard, except where AEMO determines it was not feasible to conduct the required tests due to risks to Power System Security or Power System Reliability, or any other risks deemed by AEMO to be significant enough to prevent the tests from being undertaken.

- 7.1.3. Where AEMO determines, in accordance with paragraph 7.1.2(b) of this Procedure, that it is not feasible to conduct the required tests, it may, at its discretion, propose an alternative method of determining compliance with a Registered Generator Performance Standard for that Transmission Connected Generating System.
- 7.1.4. Where AEMO determines, in accordance with paragraph 7.1.2(b) of this Procedure, that it is not feasible to conduct the required tests, and at its discretion, there is no available alternative method of determining compliance with a Registered Generator Performance Standard for that Transmission Connected Generating System, the Market Participant will be deemed as compliant with the applicable Registered Generator Performance Standard.
- 7.1.5. Compliance with a Generator Monitoring Plan requires that all tests and data recording requirements specified in the approved Generator Monitoring Plan to support self-monitoring, have been, and are able to be, conducted in accordance with the requirements of the approved Generator Monitoring Plan and that any required evidence is able to be produced.
- 7.1.6. Market Participants must report any non-compliance described in paragraphs 7.1.1 to 7.1.2 of this Procedure, and non-compliance with paragraph 7.1.5 of this Procedure, to AEMO in accordance with paragraph 4.1.8 of this Procedure, including alleged non-compliance and suspected non-compliance, in accordance with relevant processes described in clauses 3A.10 of the WEM Rules, and must provide all information and documents relevant to the non-compliance.
- 7.1.7. AEMO may request any information and documents relevant to the non-compliance, in addition to those provided under paragraph 7.1.6 of this Procedure.
- 7.1.8. In addition to all timeframe requirements specified in clauses 3A.10, 3A.11 and 3A.12 of the WEM Rules, within 5 Business Days of returning to a compliant state, a relevant Market Participant must notify AEMO that the non-compliance has been resolved and compliance has been re-established.
- 7.1.9. Where a Market Participant is requested by AEMO to undertake a test to determine whether it is compliant in accordance with clause 3A.9.4 of the WEM Rules:
  - (a) AEMO may propose any reasonable tests described in Appendix B and Appendix C of this Procedure, Attachment 11 of the Technical Rules, or any other tests proposed by AEMO that are consistent with the principles and requirements set out in paragraph 2 in this Procedure; and
  - (b) AEMO must specify a reasonable timeframe, and may consult the Market Participant prior to specifying this reasonable timeframe, by which a test proposed in paragraph 7.1.9(a) of this Procedure must be undertaken, and a reasonable timeframe for which evidence of compliance must be submitted;

A Market Participant must undertake a test proposed by AEMO in accordance with paragraphs 7.1.9(a) and 7.1.9(b) of this Procedure. However, a Market Participant may propose alternative tests and/or timeframes and, after undertaking an assessment consistent with the process described in paragraph 5 of this Procedure, AEMO may approve the alternative test if it is satisfied that the

alternative tests and/or timeframes support the relevant compliance status being established conclusively, and there are no unacceptable risks to Power System Security and/or Power System Reliability.

- 7.1.10. Where a Market Participant is required by AEMO to undertake a test, in accordance with clause 3A.9.4 of the WEM Rules to determine whether it is compliant, AEMO may require that the test results and outcomes be included in the applicable approved Generator Monitoring Plan and submitted to AEMO.
- 7.1.11. Where a Market Participant has submitted a proposed Rectification Plan for consideration by AEMO, in accordance with clause 3A.11.1 of the WEM Rules, and AEMO has proposed an alternative Rectification Plan in accordance with clause 3A.11.3(d) of the WEM Rules, a Market Participant must re-submit the proposed Rectification Plan reflecting the alternative Rectification Plan as soon as practicable if the Market Participant accepts the proposed Rectification Plan.
- 7.1.12. A Market Participant must report to AEMO in accordance with paragraph 4.1.8 of this Procedure, that it has not met or complied with, or may not be able to meet or comply with an approved Rectification Plan in accordance with clause 3A.11.9 of the WEM Rules, and must provide all information and documents relevant to the reporting.
- 7.1.13. AEMO may request any information and documents relevant to the reporting, in addition to those provided under paragraph 7.1.12 of this Procedure.

## APPENDIX A. RELEVANT CLAUSES OF THE WEM RULES

Table 3 details:

- (a) the head of power clauses in the WEM Rules under which the Procedure has been developed; and
- (b) each clause in the WEM Rules requiring an obligation, process or requirement be documented in a WEM Procedure, where the obligation, process or requirement has been documented in this Procedure.

**Table 3 Relevant clauses of the WEM Rules**

Clause
1.41.6(a)
1.41.6(b)
3A.6.2(a)(i)
3A.6.2(a)(ii)
3A.6.2(a)(iii)
3A.6.2(b)
3A.6.2(c)
3A.6.2(d)
3A.6.2(e)
3A.9.1(a)
3A.9.1(b)
3A.9.4

## APPENDIX B. MANDATORY TESTS

Table 4 details the mandatory tests that must be undertaken by Market Participants in order to establish compliance during connection of a new Transmission Connected Generating System or following a Relevant Generator Modification (where AEMO determines tests are relevant to the Relevant Generator Modification). The tests must be included in a Generator Monitoring Plan, but they must not form the entirety of a Generator Monitoring Plan. For ongoing compliance verification, a Market Participant must adopt a verification mechanism that incorporates other testing and monitoring methods, as described in Appendix D of this Procedure.

**Table 4 Mandatory tests**

Technical Requirement	Test Descriptions <sup>3</sup>	Suggested frequency of obtaining evidence of compliance
Active Power capability	<ul style="list-style-type: none"> <li>Test the Generating Unit or Generating System at the Rated Maximum Active Power output level or another relevant Active Power output level specified in the Registered Generator Performance Standard, at a range of ambient temperature, including the maximum ambient temperature described in clause A12.2.3.3 of WEM Rules where practically possible<sup>4</sup>, and under a range of relevant operating arrangements within the Generating System;</li> <li>the operating arrangements, ambient temperature on-site on the day of testing and location where temperature is measured must be recorded.</li> </ul>	Every 3 years and/or after every Relevant Generator Modification.
Reactive Power Capability	<ul style="list-style-type: none"> <li>Test the Generating System at the maximum Active Power specified in the Registered Generator Performance Standard, at the Connection Point or another agreed location, as described in test C9 in Attachment 11 of the Technical Rules;</li> <li>repeat the tests at other Active Power levels, which typically include Rated Minimum Active Power output level, and 25%, and 50% and 75% of maximum Active Power output level. The selected Active Power levels must be sufficient to reasonably establish the Reactive Power Capability in both supply and absorb regions on the Reactive Power Capability curve; and</li> <li>the relevant operating arrangements within the Generating System, ambient temperature on-site on the day of testing and location where temperature is measured must be recorded.</li> </ul>	Every 3 years and/or after every Relevant Generator Modification.

<sup>3</sup> Where a test described in Attachment 11 of the Technical Rules is not suitable for the technology of a Generating System or a Generating Unit, and/or verifying the compliance with an applicable Registered Generator Performance Standard, AEMO may request the test with modification suitable for the technology and/or establishing compliance with the Registered Generator Performance Standards.

<sup>4</sup> The Market Participants must demonstrate the intent to undertake the tests during the period where the temperature is forecasted to be high.

Technical Requirement	Test Descriptions <sup>3</sup>	Suggested frequency of obtaining evidence of compliance
Voltage and Reactive Power Control	<ul style="list-style-type: none"> <li>Perform voltage step response and voltage control tests in accordance with tests C1 to C4, C6 to C8, S5 to S7 described in Attachment 11 of the Technical Rules;</li> <li>perform Reactive Power step response tests, including tests S1 and S2 described in Attachment 11 of the Technical Rules; and</li> <li>perform both lagging and leading Power Factor step response tests, in 0.025 steps from unity to 0.95 or another Power Factor specified by AEMO.</li> </ul>	Every 3 years and/or after every Relevant Generator Modification.
Active Power control	<ul style="list-style-type: none"> <li>Perform Active Power step response test, as described in test S10 in Attachment 11 of the Technical Rules, and the step tests must be performed for different pre-step Active Power levels. The steps must be repeated with other additional step sizes if deemed warranted; and</li> <li>perform tests to demonstrate that for a loss of communications, Remote Monitoring Equipment or Remote Control Equipment, Active Power level is sustained.</li> </ul>	Every 3 years and/or after every Relevant Generator Modification.
Inertia and frequency control	<ul style="list-style-type: none"> <li>Perform speed or frequency step tests, for frequency step sizes both within the dead band and outside the dead band;</li> <li>frequency step tests can be performed by means of Active Power step tests such that the Active Power steps are equivalent to the desired frequency step sizes, as described in test S10 in Attachment 11 of the Technical Rules; and</li> <li>frequency step tests must be performed for different pre-step Active Power levels and different sizes of frequency change. The measured Active Power response for a frequency change must be compared to expected (as-calculated) Active Power changes in order to ascertain accuracy of the response.</li> </ul>	Every 3 years and/or after every Relevant Generator Modification.
Disturbance ride through for a frequency disturbance	<ul style="list-style-type: none"> <li>Where possible, perform speed or frequency setpoint tests such that the speed for frequency setpoints is set to just below the over-frequency disconnection settings and just above the under-frequency disconnection settings (similar to the described methods in test S11 in Attachment 11 of the Technical Rules), and is sustained for a period longer than defined in the disconnection settings. The tests must be performed for all disconnection settings, unless proven not feasible; and</li> <li>any other equivalent tests appropriate to the technology of a Transmission Connected Generating System.</li> </ul>	Every 3 years and/or after every Relevant Generator Modification.
Disturbance ride through for a voltage disturbance	<ul style="list-style-type: none"> <li>Where possible, perform voltage setpoint tests with the voltage setpoints at just below the disconnection settings and just above the disconnection settings, and sustain for a period longer than defined in the disconnection settings. The tests must be performed for all disconnection settings, unless proven not feasible; and</li> <li>any other equivalent tests as appropriate to the technology of a Generating System.</li> </ul>	Every 3 years and/or after every Relevant Generator Modification.

Technical Requirement	Test Descriptions <sup>3</sup>	Suggested frequency of obtaining evidence of compliance
Disturbance ride through for multiple disturbances	<ul style="list-style-type: none"> <li>Any tests as appropriate to the technology of a Generating System.</li> </ul>	Every 3 years and/or after every Relevant Generator Modification.
Disturbance ride through for partial load rejection	<ul style="list-style-type: none"> <li>Perform load rejection tests as described in test C5 in Attachment 11 of the Technical Rules.</li> </ul>	Every 3 years and/or after every Relevant Generator Modification.
Disturbance ride through for quality of supply	<ul style="list-style-type: none"> <li>Not applicable, unless appropriate to the technology of a Generating System.</li> </ul>	If applicable, every 3 years and/or after every Relevant Generator Modification.
Quality of electricity generated	<ul style="list-style-type: none"> <li>Direct measurements and continuous monitoring of harmonics, flicker and negative sequence voltage under a selected range of power system conditions, including possible permutations of operating arrangements within the Generating System, using power quality recording devices; and</li> <li>the tests must be such that harmonics, flicker and negative sequence voltage contribution by the Generating System can be reasonably derived from the measurements, including repeat tests, as required, such that contribution by the Generating System can be reasonably established.</li> </ul>	Immediately after every Relevant Generator Modification.
Generation Protection Systems	<ul style="list-style-type: none"> <li>Test the relevant sub-systems by means of secondary injection into protection system relays.</li> </ul>	Every 5 years or longer depending on the self-diagnostic mechanism <sup>5</sup> available, and/or after every Relevant Generator Modification.
Remote monitoring requirements	<ul style="list-style-type: none"> <li>Test availability and continual functionality of relevant sub-systems of Remote Monitoring Equipment routinely.</li> </ul>	Annually and/or after every Relevant Generator Modification.
Remote control requirements	<ul style="list-style-type: none"> <li>Test availability and continual functionality of relevant sub-systems of Remote Control Equipment.</li> </ul>	Annually and/or after every Relevant Generator Modification.
Communications equipment requirements	<ul style="list-style-type: none"> <li>Routinely test the availability of communication links, including any redundancies;</li> <li>Routinely test relevant sub-systems, including power backup or Uninterruptible Power Supply (UPS) system; and</li> <li>Test routine and emergency control telephone calls, as described in clause A12.16.3.2 in WEM Rules.</li> </ul>	Annually and/or after every Relevant Generator Modification.

<sup>5</sup> The self-diagnostic mechanism must be specified and outlined in the Generator Monitoring Plan to support the proposed frequency of testing for generation Protection Systems.

Technical Requirement	Test Descriptions <sup>3</sup>	Suggested frequency of obtaining evidence of compliance
Generation system model	<ul style="list-style-type: none"><li>• Verify various aspects of the modelled technical performances as demonstrated by a generation system model against all mandatory tests specified in Appendix B.</li></ul>	Immediately after every Relevant Generator Modification and/or whenever modelled technical performances

## APPENDIX C. SUGGESTED TESTS AND MONITORING

Table 5 details the suggested tests and monitoring that may be undertaken by the Market Participants, in addition to the mandatory tests specified in Appendix B, in order to establish ongoing verification of their compliance with a Registered Generator Performance Standard.

**Table 5 Suggested tests and monitoring**

Technical Requirement	Suggested test and monitoring descriptions	Suggested frequency of testing/monitoring period
Active Power capability	<ul style="list-style-type: none"> <li>Monitor and assess the Active Power level using Monitoring Data at the required location under all relevant operating arrangements within the Generating System, with operating arrangements, ambient temperature on-site and location where temperature is measured continuously recorded.</li> </ul>	Continuous monitoring with assessment performed half-yearly.
Reactive Power Capability	<ul style="list-style-type: none"> <li>Monitor and assess the Reactive Power Capability using SCADA data at the required location all relevant operating arrangements within the Generating System, with operating arrangements, ambient temperature on-site and location where temperature is measured continuously recorded.</li> </ul>	Continuous monitoring with assessment performed half-yearly.
Voltage and Reactive Power Control	<ul style="list-style-type: none"> <li>Monitor and assess in-service performance of voltage, Reactive Power or Power Factor using high speed recorders during every event involving a significant variation to voltage, Reactive Power and/or Power Factor.</li> </ul>	Continuous monitoring with assessment undertaken whenever relevant disturbance takes place.
Active Power control	<ul style="list-style-type: none"> <li>Monitor and assess in-service Active Power response to target Active Power levels continuously.</li> </ul>	Continuous monitoring with assessment performed half-yearly.
Inertia and frequency control	<ul style="list-style-type: none"> <li>Monitor and assess in-service performance using high speed recorders, for every event involving a significant variation to system frequency.</li> </ul>	Continuous monitoring with assessment undertaken whenever relevant disturbance takes place.

Technical Requirement	Suggested test and monitoring descriptions	Suggested frequency of testing/monitoring period
Disturbance ride through for a frequency disturbance	<ul style="list-style-type: none"> <li>• Monitor and assess performance of a Generating System, using high speed recorders, for every event involving a significant variation in system frequency, including events that result in both the Generating System or any generating unit(s) within a Generating System disconnecting and where the Generating System remains connected. Time of the event, frequency, as recorded by the Generating System, and the response of the Generating System, during fault and post-fault, must be recorded; and/or</li> <li>• investigate every disconnection of a Generating System, or any generating unit(s) within a Generating System that occurs during a significant frequency disturbance, which includes where the relevant Protection Systems activate (which may be based on protection relay activity logs).</li> </ul>	Continuous monitoring with assessment undertaken whenever relevant disturbance takes place.

Technical Requirement	Suggested test and monitoring descriptions	Suggested frequency of testing/monitoring period
Disturbance ride through for a voltage disturbance	<ul style="list-style-type: none"> <li>Monitor and assess performance of a Generating System, using high speed recorders, for every event involving significant variation in voltage as recorded by the Generating System, including events that result in both the Generating System or any generating unit(s) within a Generating System disconnecting and where the Generating System remains connected. Time of the event, voltage as recorded by the Generating System, and the response of the Generating System, during fault and post-fault, must be recorded; and/or</li> <li>investigate every disconnection of a Generating System or any generating unit(s) within a Generating System that occurs during a significant voltage disturbance, which includes where the relevant protection systems activate (which may be based on protection relay activity logs).</li> </ul>	Ongoing monitoring with assessment undertaken whenever relevant disturbance takes place.

Technical Requirement	Suggested test and monitoring descriptions	Suggested frequency of testing/monitoring period
Disturbance ride through for multiple disturbances	<ul style="list-style-type: none"> <li>Monitor and assess performance of a Generating System, using high speed recorders, for every event involving significant variation in voltage as recorded by the Generating System, including events that result in both the Generating System or any generating unit(s) within a Generating System disconnecting and where the Generating System remains connected. Time of the event, voltage as recorded by the Generating System and the response of the Generating System, during fault and post-fault, must be recorded; and/or</li> <li>investigate every disconnection of a Generating System or any generating unit(s) within a Generating System that occurs.</li> </ul>	Ongoing monitoring with assessment undertaken whenever relevant disturbance takes place.
Disturbance ride through for partial load rejection	<ul style="list-style-type: none"> <li>Monitor and assess performance of a Generating System, using high speed recorders, for every event involving sudden and significant reduction in Active Power, including events that result in both the Generating System disconnecting and where the Generating System remains connected. Time of the event, frequency as recorded by the Generating System and the response of the Generating System, during fault and post-fault, must be recorded; and/or</li> <li>investigate every disconnection of a Generating System or any generating unit(s) within a Generating System that occurs during significant frequency disturbances, which includes where the relevant Protection Systems activate (which may be based on protection relay activity logs).</li> </ul>	Ongoing monitoring with assessment undertaken whenever relevant disturbance takes place.

Technical Requirement	Suggested test and monitoring descriptions	Suggested frequency of testing/monitoring period
Disturbance ride through for quality of supply	<ul style="list-style-type: none"> <li>Investigate every disconnection of a Generating System or any generating unit(s) within a Generating System, including verifying the applied settings of the Protection Systems; and/or</li> <li>monitor and measure harmonics, flicker and negative sequence voltage continuously under a selected range of power system conditions, including a range of operating arrangements within the Generating System, using a power quality recording device.</li> </ul>	Ongoing monitoring with assessment undertaken whenever relevant disturbance takes place.
Quality of electricity generated	<ul style="list-style-type: none"> <li>Refer to relevant tests in Appendix B.</li> </ul>	Continuous, or periodically with each monitoring period sufficiently long to capture a range of power system conditions.
Generation Protection Systems	<ul style="list-style-type: none"> <li>Investigate every disconnection of a Generating System, or any generating unit(s) within a Generating System; and/or</li> <li>investigate every protection failure, especially where a protection has not operated the way it is designed to; and/or</li> <li>routinely verify the applied settings of the Protection Systems; and/or</li> <li>test the relevant sub-systems by means of secondary injection into Protection System relays.</li> </ul>	Ongoing monitoring with assessment undertaken whenever relevant disturbance takes place.
Remote monitoring requirements	<ul style="list-style-type: none"> <li>Continuously monitor the availability and continual functionality of Remote Monitoring Equipment by means of an automated monitoring and logging system; and/or</li> <li>continuously monitor the availability and continual functionality of all specified signals, as required by clause A12.14.3.3 of the WEM Rules.</li> </ul>	Continuous monitoring with assessment performed half-yearly.

Technical Requirement	Suggested test and monitoring descriptions	Suggested frequency of testing/monitoring period
Remote control requirements	<ul style="list-style-type: none"> <li>Continuously monitor the availability and functionality of Remote Control Equipment by means of an automated monitoring and logging system or any other means, as appropriate.</li> </ul>	Continuous monitoring with assessment performed half-yearly.
Communications equipment requirements	<ul style="list-style-type: none"> <li>Continuously monitor the availability and functionality of communications equipment by means of an automated monitoring and logging system.</li> </ul>	Continuous monitoring with assessment performed half-yearly.
Generation system model	<ul style="list-style-type: none"> <li>Verify various aspects of the technical performance of a generation system model against disturbances. This must include modelled technical performances that have been identified as requiring verification.</li> </ul>	Whenever modelled technical performances have been identified requiring verification or when disturbances deemed appropriate for verification of a modelled technical performance are available.

## APPENDIX D. COMPLIANCE VERIFICATION MECHANISMS

Table 6 to Table 21 detail the verification mechanisms for ongoing verification of Registered Generator Performance Standards considered reasonable and appropriate by AEMO. They serve as a guide to assist development of a relevant testing and monitoring regime in a proposed Generator Monitoring Plan.

### D.1 Active Power Capability

**Table 6 Suggested compliance verification for clause A12.2 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.2.2.1, A12.2.3.1	<ul style="list-style-type: none"> <li>Demonstration that all tests and monitoring undertaken to verify the requirements under A12.2 of the WEM Rules have been performed at the required location.</li> </ul>
A12.2.2.1, A12.2.3.2	<ul style="list-style-type: none"> <li>Active Power capability vs ambient temperature from Test Data and Monitoring Data is consistent with the provided Temperature Dependency Data.</li> </ul>
A12.2.2.1, A12.2.3.3	<ul style="list-style-type: none"> <li>Active Power capability vs maximum ambient temperature specified by the Network Operator, from Test Data and Monitoring Data, is consistent with the provided Temperature Dependency Data.</li> </ul>
A12.2.2.1, A12.2.3.4	<ul style="list-style-type: none"> <li>Test Data and Monitoring Data demonstrate that rated Active Power output is capable of sustaining for at least 5 minutes under different operating conditions.</li> </ul>
A12.2.2.1, A12.2.3.5	<ul style="list-style-type: none"> <li>Specifying and outlining the agreement to allow for temporary reduction in Active Power.</li> </ul>

### D.2 Reactive Power Capability

**Table 7 Suggested compliance verification for clause A12.3 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.3.1.1	<ul style="list-style-type: none"> <li>Demonstration that all tests and monitoring undertaken to verify the requirements under A12.3 of the WEM Rules have been performed at the required location.</li> </ul>
A12.3.1.2	<ul style="list-style-type: none"> <li>The required Reactive Power achieved at all selected Active Power levels are consistent with those in provided Generator Capability Chart, considering the range of ambient temperatures recorded during the tests.</li> </ul>
A12.3.1.3	<ul style="list-style-type: none"> <li>Demonstration that Reactive Power level required by the Generator Capability Chart is achieved at all selected Active Power levels with all relevant limitation and Protection Systems in service.</li> </ul>
A12.3.1.4	<ul style="list-style-type: none"> <li>Monitoring Data shows that the required Reactive Power achieved at all selected Active Power levels are consistent with those in the provided Generator Capability Chart, which is specified for the maximum ambient temperature.</li> </ul>

Appendix 12 clauses	Verification of compliance
A12.3.1.5	<ul style="list-style-type: none"> <li>Test Data and/or Monitoring Data show required Reactive Power achieved at Rated Maximum Active Power output, consistent with the provided Generator Capability Chart.</li> </ul>
A12.3.2.1, A12.3.3.1	<ul style="list-style-type: none"> <li>Test Data and/or Monitoring Data show required Reactive Power level successfully achieved at all selected Active Power levels in both supply and absorb regions, consistent with the provided Generator Capability Chart.</li> </ul>
A12.3.2.2, A12.3.3.2	<ul style="list-style-type: none"> <li>Monitoring Data shows Reactive Power can be delivered continuously for voltages at the Connection Point within the allowable steady state voltage range specified in the Technical Rules, or between 0.9 per unit and 1.1 unit, whichever is applicable.</li> </ul>
A12.3.3.3	<ul style="list-style-type: none"> <li>Where Active Power level is reduced, ambient temperature must be above 25 degrees in the location where the Generating System is situated.</li> </ul>

### D.3 Voltage and Reactive Power Control

**Table 8 Suggested compliance verification for clause A12.4 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.4.2.2(a), A12.4.3.2(a)	<ul style="list-style-type: none"> <li>Test Data and/or Disturbance Data show all post-step and post-disturbance responses are Adequately Damped, thereby confirming that the Equipment capabilities and Control Systems are sufficient to ensure power system oscillations are Adequately Damped.</li> </ul>
A12.4.2.2(b), A12.4.3.2(b)	<ul style="list-style-type: none"> <li>Test Data and/or Disturbance Data show all post-step and post-disturbance responses of the power system are Adequately Damped, thereby confirming that the Generating System does not degrade the damping of any critical mode of oscillation of the power system.</li> </ul>
A12.4.2.2(c)	<ul style="list-style-type: none"> <li>Monitoring Data and/or Disturbance Data show continual stable responses.</li> </ul>
A12.4.2.3, A12.4.3.2(c)	<ul style="list-style-type: none"> <li>Test Data and/or Disturbance Data show all required quantities can be monitored and recorded.</li> </ul>
A12.4.2.4(a), A12.4.3.3	<ul style="list-style-type: none"> <li>Test Data shows all requirements are met in all the relevant control modes, thereby demonstrating that the Generating System has Control Systems that able to operate in all control modes.</li> </ul>
A12.4.2.4(b)	<ul style="list-style-type: none"> <li>Test Data shows all requirements are met in all the relevant control modes, thereby demonstrating that the Generating System has Control Systems that able to switch between control modes.</li> </ul>

Appendix 12 clauses	Verification of compliance
A12.4.2.5(a), A12.4.3.4(a)	<ul style="list-style-type: none"> <li>All step Test Data shows the voltage is controlled to within 0.5% of the setpoint, where the setpoint may be adjusted to incorporate any voltage droop or reactive current compensation agreed with AEMO and the Network Operator.</li> </ul>
A12.4.2.5(b)	<ul style="list-style-type: none"> <li>Disturbance Data confirm Reactive Power vs voltage response during fault is correct, thereby demonstrating that the Generating System has a voltage control system that regulates voltage in a manner that helps to support network voltages during fault.</li> </ul>
A12.4.2.5(c), A12.4.3.4(b)	<ul style="list-style-type: none"> <li>Test Data show the voltage can be continuously controlled within the specified range without tap-changing of a relevant transformer if applicable, subject to the Generator Performance Standards for Reactive Power Capability with the voltage control location agreed with AEMO and the Network Operator. Record of transformer tap positions are provided for confirmation; or</li> <li>Test Data show the voltage can be continuously controlled within the specified range, subject to Reactive Power Capability with the voltage control location agreed with AEMO and the Network Operator. Record of transformer tap positions are provided for confirmation.</li> </ul>
A12.4.2.5(d)	<ul style="list-style-type: none"> <li>Confirmation that the relevant limiting devices exist and are in service; and</li> <li>all requirements under Appendix 12.4 of the WEM Rules can be met with the tests performed with all relevant limiters in service, unless required otherwise by the mandatory tests in Appendix B.</li> </ul>
A12.4.2.6	<ul style="list-style-type: none"> <li>Provision of block diagrams of the Generating Unit's power system stabiliser, and the block diagram demonstrates that the power system stabiliser meets the specified requirements.</li> </ul>
A12.4.2.7(a), A12.4.3.5(a)	<ul style="list-style-type: none"> <li>Reactive Power or Power Factor step Test Data shows the Reactive Power is controlled to the level of the accuracy levels specified.</li> </ul>
A12.4.2.7(b), A12.4.3.5(b)	<ul style="list-style-type: none"> <li>Test Data shows the Reactive Power can be continuously controlled within specified Reactive Power Capability range without tap-changing of a relevant transformer. Record of transformer positions during a relevant test must be provided as part of evidence of compliance for confirmation.</li> </ul>
A12.4.2.8	<ul style="list-style-type: none"> <li>Confirmation that approved structure and parameter settings of all components of the Control System that have been approved by the Network Operator and AEMO and are still applicable and valid.</li> </ul>
A12.4.2.9	<ul style="list-style-type: none"> <li>Test Data shows all post-step and post-disturbance responses are Adequately Damped.</li> </ul>

Appendix 12 clauses	Verification of compliance
A12.4.2.10(a)	<ul style="list-style-type: none"> <li>Step Test Data shows that the voltage at the stator of the Generating Unit can be sustained at 105% of nominal voltage continuously at Rated Maximum Active Power output.</li> </ul>
A12.4.2.10(b), A12.4.3.6(a)	<ul style="list-style-type: none"> <li>Step Test Data shows the excitation ceiling voltage can be achieved at the specified levels.</li> </ul>
A12.4.2.10(c)	<ul style="list-style-type: none"> <li>Provision of block diagrams of the Generating Unit's power system stabiliser.</li> </ul>
A12.4.2.10(d), A12.4.2.14	<ul style="list-style-type: none"> <li>Test Data shows the minimum gain of 200 is achieved in the control system.</li> </ul>
A12.4.2.12	<ul style="list-style-type: none"> <li>Provision of block diagrams of the Generating Unit's power system stabiliser, and the block diagram demonstrates that the power system stabiliser meets the specified requirements.</li> </ul>
A12.4.2.13	<ul style="list-style-type: none"> <li>Test Data and/or Disturbance Data show all post-step and post-disturbance responses are Adequately Damped; and</li> <li>confirmation that the Generating Unit's power system stabiliser is responsive and adjustable over frequency range from 0.1 Hz and 2.5 Hz; and</li> <li>provision of block diagrams of the Generating Unit's power system stabiliser demonstrating it has power system frequency and Active Power output of the Generating Unit as inputs.</li> </ul>
A12.4.2.11, A12.4.2.15	<ul style="list-style-type: none"> <li>Test Data shows Rise Time of all required step response tests are measured according to the WEM Procedure: Generator Model Submission and Maintenance and must be within the criteria specified in Appendix 12 of the WEM Rules.</li> </ul>
A12.4.2.11, A12.4.2.15, A12.4.3.6(b), A12.4.3.7	<ul style="list-style-type: none"> <li>Test Data shows Settling Time of all required step response tests are measured according WEM Procedure: Generator Model Submission and Maintenance and must be within the criteria specified in Appendix 12 of the WEM Rules.</li> </ul>
A12.4.2.11, A12.4.2.15	<ul style="list-style-type: none"> <li>Test Data shows Settling Time of all required step response tests resulting in controlled output limits being reached are measured according to WEM Procedure: Generator Model Submission and Maintenance and must be within the criteria specified in Appendix 12 of the WEM Rules.</li> </ul>
A12.4.2.16	<ul style="list-style-type: none"> <li>Confirmation that the controlled parameters agreed with the Network Operator and AEMO and are still applicable and valid.</li> </ul>
A12.4.3.5(c)	<ul style="list-style-type: none"> <li>As demonstrated in disturbance ride through for a voltage disturbance</li> </ul>
A12.4.4.1	<ul style="list-style-type: none"> <li>N/A.</li> </ul>

## D.4 Active Power Control

**Table 9 Suggested compliance verification for clause A12.5 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.5.1.1	<ul style="list-style-type: none"> <li>All relevant requirements in Dispatch Systems Requirements are listed and evidence of compliance is provided.</li> </ul>
A12.5.1.2	<ul style="list-style-type: none"> <li>Confirmation of the Arrangement for Access to limit Active Power output and that the arrangement is still applicable and valid.</li> </ul>
A12.5.1.3	<ul style="list-style-type: none"> <li>Test Data and/or Monitoring Data show that post-step Active Power is Adequately Damped, at different pre-step or pre-disturbance Active Power levels.</li> </ul>
A12.5.1.4	<ul style="list-style-type: none"> <li>Provision of all applicable disconnection settings.</li> </ul>
A12.5.1.5	<ul style="list-style-type: none"> <li>Test Data and/or Monitoring Data showing sustained Active Power level despite loss of communications, or failure of Remote Monitoring Equipment or Remote Control Equipment.</li> <li>Monitoring Data showing Active Power change is not due to loss of communications, or failure of Remote Monitoring Equipment or Remote Control Equipment.</li> </ul>
A12.5.2.1, A12.5.3.1	<ul style="list-style-type: none"> <li>Monitoring Data show Active Power change, in accordance with the requirements of Appendix 12 of the WEM Rules, appropriately and continually in response to its Dispatch Instructions, for different sizes of Active Power changes and to different Active Power levels.</li> </ul>
A12.5.2.2, A12.5.3.2	<ul style="list-style-type: none"> <li>Test Data and/or Monitoring Data show rate of change of Active Power is continuously within the requirements specified in Appendix 12 of the WEM Rules for different sizes of Active Power change.</li> </ul>

## D.5 Inertia and Frequency Control

**Table 10 Suggested compliance verification for clause A12.6 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.6.1.1	<ul style="list-style-type: none"> <li>Test Data and/or Disturbance Data show post-step or post-fault Active Power is Adequately Damped at different pre-step or pre-disturbance Active Power levels, and for different rates of frequency change.</li> </ul>
A12.6.1.2	<ul style="list-style-type: none"> <li>Demonstration of how ramp rate, expressed as the change in Active Power, as shown in Test Data, Monitoring Data and/or Disturbance Data, is calculated.</li> </ul>
A12.6.1.3	<ul style="list-style-type: none"> <li>Provision of all applicable disconnection settings.</li> </ul>

Appendix 12 clauses	Verification of compliance
A12.6.1.4	<ul style="list-style-type: none"> <li>Test Data and/or Disturbance Data show all required quantities can be monitored and recorded and appropriate permanently installed equipment is used.</li> </ul>
A12.6.1.5	<ul style="list-style-type: none"> <li>Test Data and/or Disturbance Data show Active Power response recovery post 10 sec, at different pre-step or pre-disturbance Active Power levels, and for different sizes of frequency change, to confirm that the Generating System can meet the relevant the requirements of clause A12.5 of the WEM Rules when returning to regular Active Power output.</li> </ul>
A12.6.2.1(a), A12.6.3.1(a),	<ul style="list-style-type: none"> <li>Test Data and/or Disturbance Data show Active Power respond correctly to each frequency change, thereby confirming the Generating System has an automatic variable Active Power control characteristic.</li> </ul>
A12.6.2.1(b), A12.6.3.1(b),	<ul style="list-style-type: none"> <li>Applicable control system settings are provided to confirm Generating System is in frequency control or frequency response mode;</li> <li>Test Data and/or Monitoring Data confirm Generating System Active Power correctly responds to observed frequency in Normal Operating Frequency Band, thereby demonstrating that the Generating System is capable of operating in a mode in which it will automatically alter its Active Power output to arrest and correct to changes in power system frequency; and</li> <li>Test Data and/or Disturbance Data confirm Generating System Active Power correctly responds to observed frequency that is outside the Normal Operating Frequency Band during a fault, thereby demonstrating that the Generating System is capable of operating in a mode in which it will automatically alter its Active Power output to arrest and correct to changes in power system frequency.</li> </ul>
A12.6.2.1(c), A12.6.3.1(c)	<ul style="list-style-type: none"> <li>As-applied protection settings confirm required frequency dead band on each Generating Unit or Generating System;</li> <li>Frequency step Test Data confirm the non-response when the frequency change is within the dead band;</li> <li>Frequency step Test Data confirm the Active Power response is correct, given the frequency step change and the frequency dead band;</li> <li>Monitoring Data confirm Generating System Active Power correctly responds to observed frequency in Normal Operating Frequency Band;</li> <li>Disturbance Data confirm Generating System Active Power correctly responds to observed frequency during a fault for which the frequency is outside the Normal Operating Frequency Band.</li> </ul>

Appendix 12 clauses	Verification of compliance
A12.6.2.1(d)(i), A12.6.3.2(a)	<ul style="list-style-type: none"> <li>Applicable Control System settings confirm the required frequency-Active Power response.</li> <li>Test Data and/or Disturbance Data show required response for Active Power vs frequency, at different pre-step or pre-disturbance Active Power levels, and for different sizes of frequency change.</li> </ul>
A12.6.2.1(d)(ii), A12.6.3.2(b)	<ul style="list-style-type: none"> <li>Applicable Control System settings confirm the required frequency-Active Power response.</li> <li>Test Data and/or Disturbance Data show required response for Active Power vs frequency, at different pre-step or pre-disturbance Active Power levels, and for different sizes of frequency change.</li> </ul>
A12.6.2.1(d)(iii), A12.6.3.2(d)	<ul style="list-style-type: none"> <li>Test Data and/or Disturbance Data show the Generating System can sustain Active Power changes of at least the amounts specified for frequency increase and frequency decrease respectively, and for not less than 10 seconds, at different pre-step or pre-disturbance Active Power levels.</li> </ul>
A12.6.2.1(d)(iv), A12.6.2.1(d)(v), A12.6.3.2(e), A12.6.3.2(f)	<ul style="list-style-type: none"> <li>Test Data and/or Disturbance Data show Active Power reaches the required response level within the specified time requirement for different rates of frequency change.</li> </ul>
A12.6.3.2(c)	<ul style="list-style-type: none"> <li>Confirmation that response capability included as part of the relevant Generator performance Standard is still applicable and valid.</li> </ul>
A12.6.4.1	<ul style="list-style-type: none"> <li>Monitoring Data show Active Power and ramp rate are within the required limits.</li> </ul>
A12.6.4.2	<ul style="list-style-type: none"> <li>N/A.</li> </ul>

## D.6 Disturbance Ride Through for a Frequency Disturbance

**Table 11 Suggested compliance verification for clause A12.7 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.7.1.1	<ul style="list-style-type: none"> <li>Demonstration that all tests and monitoring undertaken to verify the requirements under A12.7 of the WEM Rules have been performed at the required location.</li> </ul>
A12.7.1.2	<ul style="list-style-type: none"> <li>Provision of all applicable disconnection settings.</li> </ul>
A12.7.2.1, A12.7.3.1	<ul style="list-style-type: none"> <li>Evidence from investigation of every disconnection of the Generating System is provided to confirm that disconnection of Generating System is not due to over frequency and/or overspeed protection</li> </ul>
A12.7.2.2, A12.7.3.2	<ul style="list-style-type: none"> <li>Evidence from investigation of every disconnection of the Generating System is provided to confirm that disconnection of Generating System is not due to RoCoF or equivalent protection.</li> </ul>

Appendix 12 clauses	Verification of compliance
A12.7.4.1	<ul style="list-style-type: none"> <li>Not applicable.</li> </ul>

## D.7 Disturbance Ride Through for a Voltage Disturbance

**Table 12 Suggested compliance verification for clause A12.8 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.8.1.1	<ul style="list-style-type: none"> <li>Demonstration that all tests and monitoring undertaken to verify the requirements under A12.8 of the WEM Rules have been performed at the required location.</li> </ul>
A12.8.1.2	<ul style="list-style-type: none"> <li>Evidence from investigation of every disconnection of the Generating System is provided to confirm that disconnection of the Generating System while the Connection Point voltage was still within the specified voltage ranges, was not due to voltage protection, thereby demonstrating that the Generating System can remain in Continuous Uninterrupted Operation while the voltage varies within the specified ranges.</li> </ul>
A12.8.1.3	<ul style="list-style-type: none"> <li>Provision of all applicable disconnection settings.</li> </ul>
A12.8.2.1, A12.8.3.1	<ul style="list-style-type: none"> <li>Evidence from investigation of every disconnection of the Generating System is provided to confirm that disconnection of the Generating System while variance in voltage was still within the specified voltage ranges, was not due to voltage protection, thereby demonstrating that the Generating System can remain in Continuous Uninterrupted Operation while the voltage varies within the specified ranges.</li> </ul>
A12.8.3.2	<ul style="list-style-type: none"> <li>Evidence from investigation of every disconnection of the Generating System is provided to confirm that, where agreed by the Network Operator and AEMO, the Generating System did not disconnect while the voltage was at 0% for a duration less than that prescribed in Registered Generator Performance Standards.</li> </ul>
A12.8.3.3	<ul style="list-style-type: none"> <li>Confirmation that the operational arrangements necessary to ensure the Generating System and each of its operating Generating Units will meet its Generator Performance Standard are still applicable and valid.</li> </ul>

## D.8 Disturbance Ride Through for Multiple Disturbances

**Table 13 Suggested compliance verification for clause A12.9 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.9.1.2	<ul style="list-style-type: none"> <li>Provision of all applicable disconnection settings.</li> </ul>

Appendix 12 clauses	Verification of compliance
A12.9.1.3	<ul style="list-style-type: none"> <li>Confirmation that any operational arrangements have been included in the Generator Performance Standard and are still applicable and valid.</li> </ul>
A12.9.1.4	<ul style="list-style-type: none"> <li>Where there are multiple disturbances, confirmation that a fault that is re-established following an automatic reclose Protection Scheme has been considered as a separate disturbance.</li> </ul>
A12.9.1.5, A12.9.1.6	<ul style="list-style-type: none"> <li>Provision of Manufacturer's datasheet to confirm that the reactive current contribution at the required location, is equal to or exceeds the required Maximum Continuous Current of the Generating System or Generating Unit, whichever is applicable; or</li> <li>Generation System Model confirms that the reactive current contribution at the required location is equal to or exceeds the required Maximum Continuous Current of the Generating System or Generating Unit, whichever is applicable, provided the observed performance of the Generation System matches the predicted performance of the Generation System, using the Generation System Model.</li> </ul>
A12.9.2.2, A12.9.3.2	<ul style="list-style-type: none"> <li>Provision of applicable Control System and/or Protection scheme settings to confirm the Generating System can remain in Continuous Uninterrupted Operation for any of the specified disturbances, provided it is not an event that would disconnect the Generating unit by design.</li> <li>For each occurrence of multiple disturbances, provision of Disturbance Data showing the Generating System remained in Continuous Uninterrupted Operation for any of the specified disturbances, provided it is not an event that would disconnect the Generating unit by design.</li> </ul>
A12.9.2.3, A12.9.3.3	<ul style="list-style-type: none"> <li>Provision of applicable Control System and/or Protection scheme settings to confirm that the Generating System can remain in Continuous Uninterrupted Operation for a series of up to 15 disturbances within any 5 minute period.</li> <li>For each occurrence of multiple disturbances, Disturbance Data shows the Generating System can remain in Continuous Uninterrupted Operation for a series of up to 15 disturbances within any 5 minute period.</li> </ul>
A12.9.2.4(a), A12.9.2.5(a), A12.9.2.6, A12.9.3.4(a), A12.9.3.5(a), A12.9.3.6	<ul style="list-style-type: none"> <li>For each occurrence of multiple disturbances, Disturbance Data shows reactive current level pre-disturbance during a fault and post-disturbance, and that the reactive current response during a fault meets the specified level.</li> </ul>

Appendix 12 clauses	Verification of compliance
A12.9.2.4(b)	<ul style="list-style-type: none"> <li>For each occurrence of multiple disturbances, Disturbance Data shows voltage level at Connection Point or another agreed location returns to the range for Continuous Uninterrupted Operation following clearance of the fault.</li> </ul>
A12.9.2.4(c), A12.9.2.5(b), A12.9.3.4(a), A12.9.3.4(b), A12.9.3.5(b)	<ul style="list-style-type: none"> <li>For each occurrence of multiple disturbances, Disturbance Data shows the Active Power level pre-disturbance and post-disturbance, and provides confirmation that the Active Power level at the Connection Point or another agreed location returns to specified level within the required time, following fault clearance.</li> </ul>
A12.9.2.7, A12.9.3.7, A12.9.3.8	<ul style="list-style-type: none"> <li>For each occurrence of multiple disturbances, Disturbance Data shows reactive current response has a Rise Time and Settling Time during a fault that are within the specified range and the response following fault clearance is Adequately Damped.</li> <li>Confirmation that the Rise Time and Settling Time have been provided as part of Generator Performance Standard, and the Rise Time and Settling Time are still valid.</li> </ul>
A12.9.2.8(a)	<ul style="list-style-type: none"> <li>Provision of Active Power versus Reactive Power Generator Capability Chart at specified over-voltage range, to demonstrate that there is sufficient current to maintain Rated Maximum Apparent power at the specified over-voltage range.</li> </ul>
A12.9.2.8(b)	<ul style="list-style-type: none"> <li>Provision of Active Power versus Reactive Power Generator Capability Chart at specified under-voltage range, to demonstrate that Maximum Continuous Current is available at the specified under-voltage range.</li> </ul>
A12.9.4.1	<ul style="list-style-type: none"> <li>Not applicable.<sup>6</sup></li> </ul>

<sup>6</sup> For each disconnection of a Generating System or a Load, investigation by a Network Operator or AEMO concludes that it is not caused by the relevant Generating System.

## D.9 Disturbance Ride Through for Partial Load Rejection

**Table 14 Suggested compliance verification for clause A12.10 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.10.2.1, A12.10.3.1	<ul style="list-style-type: none"> <li>Evidence from investigation of every disconnection of a Generating System is provided to confirm that the disconnection is not caused by overspeed protection or other relevant protection, which has operated as a result of a load rejection event, provided the reduction in Active Power requirement is within the specified range.</li> <li>Details of applicable protection system settings (such as over speed protection, reverse power protection) are provided to confirm the intended ride-through capability in the event of sudden Active Power reduction requirement.</li> <li>Test Data demonstrates that the Generating System and each of its operating Units remain connected following a sudden reduction in Active Power requirement, provided the reduction is within the specified range.</li> </ul>

## D.10 Disturbance Ride Through for Quality of Supply

**Table 15 Suggested compliance verification for clause A12.11 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.11.2.1, A12.11.3.1	<ul style="list-style-type: none"> <li>Evidence from investigation of every disconnection of a Generating System is provided to confirm that the disconnection is not caused by power-quality protection (voltage fluctuation, harmonic voltage distortion and voltage unbalance) conditions at the Connection Point, while all power quality quantities are within specified values.</li> </ul>

## D.11 Quality of Electricity Generated

**Table 16 Suggested compliance verification for clause A12.12 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.12.1.1	<ul style="list-style-type: none"> <li>Demonstration that the derived voltage imbalance produced by the Generating System at the Connection Point, must not be greater than the limits determined by the Network Operator.</li> </ul>
A12.12.2.1(a), A12.12.3.1(a)	<ul style="list-style-type: none"> <li>Demonstration that the derived voltage fluctuation produced by the Generating System at the Connection Point, must not be greater than the specified limits.</li> </ul>

Appendix 12 clauses	Verification of compliance
A12.12.2.1(b), A12.12.3.1(b)	<ul style="list-style-type: none"> <li>Demonstration that the derived harmonic voltage distortion produced by the Generating System at the Connection Point, must not be greater than the specified limits.</li> <li>Where the specified limits are in the form of harmonic current distortion, demonstration that the derived harmonic current distortion produced by the Generation System at the Connection Point, must not be greater than the specified limits.</li> </ul>
A12.12.4.1	<ul style="list-style-type: none"> <li>Not applicable.</li> </ul>

## D.12 Generation Protection Systems

**Table 17 Suggested compliance verification for clause A12.13 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.13.2.1, A12.13.3.1	<ul style="list-style-type: none"> <li>Details of applicable protection settings have been provided to confirm faults will be cleared within the specified time.</li> <li>Disturbance Data providing confirmation of faults cleared within specified time.</li> </ul>
A12.13.2.1, A12.13.3.2	<ul style="list-style-type: none"> <li>Confirmation of availability and continual functionality of the redundant Protection schemes.</li> <li>Provision of applicable protection settings of the redundant Protection schemes to confirm faults will be cleared within the prescribed times.</li> </ul>
A12.13.2.1, A12.13.3.3	<ul style="list-style-type: none"> <li>Confirmation of availability and continual functionality of the anti-islanding protection.</li> <li>Using Disturbance Data, provision of confirmation of correct anti-islanding protection operation preventing the Generating System from supplying an isolated portion of the SWIS when it is not secure to do so.</li> <li>Verify the applied settings in accordance with the relevant documented guidelines.</li> </ul>
A12.13.2.1, A12.13.3.4	<ul style="list-style-type: none"> <li>Confirmation of availability and continual functionality of the relevant Protection Schemes necessary to disconnect the Generating System under abnormal conditions.</li> <li>Using Disturbance Data, provision of confirmation demonstrating correct operation of relevant Protection schemes to disconnect Generating System under abnormal conditions.</li> <li>Confirmation of the applicable settings as specified in Appendix 12 of the WEM Rules.</li> </ul>
A12.13.2.1, A12.13.3.5	<ul style="list-style-type: none"> <li>Provision of the applicable Protection Scheme settings to the Network Operator and AEMO.</li> </ul>

## D.13 Remote Monitoring Requirements

**Table 18 Suggested compliance verification for clause A12.14 of the WEM Rules**

Appendix 12 clauses	Verification of compliance
A12.14.2.1, A12.14.3.1	<ul style="list-style-type: none"> <li>Confirmation of the availability and continual functionality of the Remote Monitoring Equipment.</li> </ul>
A12.14.2.1, A12.14.3.2	<ul style="list-style-type: none"> <li>All relevant requirements in Communication Standard are listed and evidence of conformance of the Remote Monitoring Equipment with the Communication Standard and other specified requirements is provided.</li> </ul>
A12.14.2.1, A12.14.3.3	<ul style="list-style-type: none"> <li>Confirmation of the availability and continual functionality of the specified signals and such other information required by the Network operator AEMO in relation to the Remote Monitoring Equipment.</li> </ul>
A12.14.2.1, A12.14.3.4	<ul style="list-style-type: none"> <li>Confirmation of the availability and continual functionality of Remote Monitoring Equipment at all times, subject to Outages as agreed with AEMO.</li> </ul>

## D.14 Remote Control Requirements

**Table 19 Suggested compliance verification for clause A12.15 of the WEM Rules**

Appendix 12 clauses	Suggested compliance verification
A12.15.2.1, A12.5.3.1	<ul style="list-style-type: none"> <li>Confirmation of the availability and continual functionality of the Remote Control Equipment, where required to be installed by the Network Operator or AEMO.</li> </ul>
A12.15.2.1, A12.5.3.2	<ul style="list-style-type: none"> <li>All relevant requirements in Communication Standard are listed and evidence of conformance of the Remote Control Equipment with the Communication Standard and other specified requirements is provided.</li> </ul>
A12.15.2.1, A12.5.3.3	<ul style="list-style-type: none"> <li>Confirmation of the availability and continual functionality of the Remote Control Equipment at all times, subject to Outages as agreed with AEMO.</li> </ul>

## D.15 Communications Equipment Requirements

**Table 20 Suggested compliance verification for clause A12.16 of the WEM Rules**

Appendix 12 clauses	Suggested compliance verification
A12.16.2.1, A12.16.3.1	<ul style="list-style-type: none"> <li>Confirmation of the availability and continual functionality of the communication links between the Remote Monitoring Equipment and Remote Communications Equipment installed at a Generating Unit to a communications interface at the relevant Power Station and in a location acceptable to the Network Operator, including any redundancies.</li> </ul>

Appendix 12 clauses	Suggested compliance verification
A12.16.2.1, A12.16.3.2	<ul style="list-style-type: none"> <li>Confirmation of the availability and continual functionality of a speech communication channel by means of which routine and emergency control telephone calls may be established between the operator of the Generation System and AEMO or the Network Operator (as applicable).</li> </ul>
A12.16.2.1, A12.16.3.3	<ul style="list-style-type: none"> <li>All relevant requirements in Communication Standard are listed and evidence of conformance with all requirements is provided.</li> </ul>
A12.16.2.1, A12.16.3.4	<ul style="list-style-type: none"> <li>Confirmation of sole-purpose connection for operational communications.</li> </ul>
A12.16.2.1, A12.16.3.5	<ul style="list-style-type: none"> <li>Confirmation of the availability and continual functionality of the communication paths to any applicable Remote Monitoring Equipment or Remote Communication Equipment, including any redundancies and subject to Outages as agreed by AEMO.</li> </ul>
A12.16.2.1, A12.16.3.6	<ul style="list-style-type: none"> <li>Description and confirmation that the Primary Speech Communication Channel, including speed and clarity of speech transmission, is in good working order.</li> </ul>
A12.16.2.1, A12.16.3.3	<ul style="list-style-type: none"> <li>All relevant requirements in Communication Standard are listed and evidence of conformance with all requirements is provided.</li> </ul>

## D.16 Generation System Model

**Table 21 Suggested compliance verification for clause A12.17 of the WEM Rules**

Appendix 12 clauses	Suggested compliance verification
A12.17.2.1, A12.17.3.1	<ul style="list-style-type: none"> <li>Confirmation of validity of all provided modelling data.</li> </ul>
A12.17.2.1, A12.17.3.2	<ul style="list-style-type: none"> <li>Overlays of simulated and real-life performances and demonstration that modelling data is sufficient to enable the Network Operator or AEMO to predict the output of the Generation System under all power system conditions, to within the required range, in accordance with WEM Procedure: Generator Model Submission and Maintenance.</li> </ul>
A12.17.2.1, A12.17.3.3	<ul style="list-style-type: none"> <li>Overlays of simulated and real-life performances and demonstration that observed performance of the Generation System matches the predicted performance of the Generation System, using the Generation System Model, as assessed by the Network Operator or AEMO, to within the required range, in accordance with WEM Procedure: Generator Model Submission and Maintenance.</li> </ul>
A12.17.2.1, A12.17.3.4	<ul style="list-style-type: none"> <li>Confirmation of provision of updates to the Generation System Model in order to meet the requirements of the Technical Requirement in this paragraph D.16 of this Procedure in accordance with the timeframes specified in the WEM Procedure made under clause 3A.4.2 of the WEM Rules.</li> </ul>