Reliability Panel AEMC

TEMPLATE FOR GENERATOR COMPLIANCE PROGRAMS

[~~27~~ June 2015~~2~~]

Inquiries

Reliability Panel
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

E: panel@aemc.gov.au
T: (02) 8296 7800
F: (02) 8296 7899

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About the AEMC

The AEMC reports to t~~T~~he Council of Australian Governments (COAG)~~,~~ through the COAG Energy Council.~~its Ministerial Council on Energy (MCE), established the Australian Energy Market Commission (AEMC) in July 2005.~~ We have~~The AEMC has~~ two ~~principal~~ functions. We make and amend the national electricity~~,~~ ~~and~~ gas and energy retail rules~~,~~ and ~~we~~ conduct independent reviews for~~of~~ the COAG Energy Council.~~energy markets for the MCE.~~

About the AEMC Reliability Panel ~~(Panel)~~

The AEMC Reliability Panel (Panel) is a specialist body within the AEMC and comprises industry and consumer representatives. It is responsible for monitoring, reviewing and reporting on reliability, security and safety of the national electricity system and advising the AEMC in respect of such matters. The Panel's responsibilities are specified in section 38 of the National Electricity Law.

[Please note: the PDF version of the template is the controlled document and is available on the AEMC Reliability Panel website.]

Contents

Purpose of~~Notes to~~ this document

Under the National Electricity Rules (Rules), the Reliability Panel (Panel) must determine, modify as necessary, and publish the template for generator compliance programs (template).[a] The Rules also require the Panel to conduct a review of the template at least every three years from the date the template is determined, and at such times as the Australian Energy Market Commission (AEMC) may request.[b] Following such a review, the Panel may amend the template in accordance with any recommendations that it makes in a report that is submitted to the AEMC.[c]

Under the Rules, the template must:[d]

- cover all performance standards; and
- define suitable testing and monitoring regimes for each performance standard so that a registered participant can select a regime that complies with its obligations as set out in the Rules for its plant.

Registered participants have performance standards obligations requiring that their plant meets or exceed applicable performance standards and that their plant does not materially adversely affect power system security.[e] In that regard, a registered participant who controls or operates plant to which a performance standard applies, must institute and maintain a compliance program which:[f]

- is consistent with the template;
- includes procedures to monitor the performance of the plant in a manner that is consistent with good electricity industry practice;
- is modified to be consistent with any amendments made under clause 8.8.3(ba) of the Rules to the template, by no later than 6 months after amendments to the template are published, or by a date determined by the Panel; and
- provides reasonable assurance of ongoing compliance with each applicable performance standard.

The purpose of this document is to provide assistance and clarity to registered participants, particularly Generators, to develop performance standards compliance programs that include monitoring procedures, that they consider to be consistent with good electricity industry practice. It is also intended to assist the Australian Energy Regulator (AER) with the enforcement and monitoring of the Generators' compliance with the technical requirements under the Rules. Effective compliance with performance standards contributes to the delivery of reliable and secure electricity to customers in the National Electricity Market (NEM).

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a Rules clause 8.8.1(a)(2b). The Panel must determine the template in accordance with clause 8.8.3 of the Rules.

b Rules clause 8.8.3(ba).

c Rules clause 8.8.3(j).

d Rules clause 4.15(ca).

e Rules clause 4.15(a).

f Rules clause 4.15(b) and (c).

This document is structured as follows:

- Chapter 1 presents:
  - the ten compliance principles;
  - a general overview of the compliance framework;
  - information on continuous plant monitoring;
  - general information on dry-storage generators; and
- Chapter 2 presents:
  - a detailed table for developing generator compliance programs.

Further information on the template can be obtained by either emailing the Panel secretariat (telephone (02) 8296 7800, or email panel@aemc.gov.au), or by accessing previously published Panel reports for past reviews of the template from the Panel's website (www.aemc.gov.au).

~~Compliance with technical standards is crucial to ensuring power system security in the National Electricity Market (NEM). Ensuring high levels of compliance with effective standards is fundamental to the safe and reliable operation of the power system within the power system's technical envelope. If this were not the case, the risk of a major power system incident would materially increase.[g]~~

~~Clause 8.8.1(a)(2b) of the National Electricity Rules (Rules) includes requirements for the Reliability Panel (Panel) to develop a template for generator compliance programs (template) based on a public consultation process. The template seeks to define "good electricity industry practice" in the management of generator plant performance and adherence to standards (but does not of itself fully define nor guarantee good electricity industry practice), and hence provides certainty for Generators as to what is required of their compliance programs. Generators must develop and maintain compliance programs in line with the template.~~

~~Clause 8.8.3(ba) of the Rules also provides an ongoing role for the Panel including an obligation to review the template at least every three years or as the AEMC directs. The regular reviews of the template will ensure its consistency with the Rules and provide a continual improvement focus.~~

~~The Panel undertook an extensive consultation process in developing the initial template.[h] This process included:~~

- ~~forming an ad-hoc Working Group under the direction of Panel to assist in the development of the template. The Working Group was chaired by a member of the Panel and had representation from the National Generators Forum (NGF), the Clean Energy Council, Transmission Network Service Providers, the Australian Energy Regulator (AER) and the Australian Energy Market Operator (AEMO).~~

~~[g] Final Report of the AEMC Review of Enforcement of and Compliance with Technical Standards (dated 1 September 2006), p.4.~~

~~[h] In November 2008, the Commission provided terms of reference to the Panel requiring it to conduct this review as required under clause 8.8.3 of the Rules.~~

~~Members of the Working Group have contributed their extensive experience to the development task;~~

- ~~giving notice to all Registered Participants of the Panel's review to develop the template in accordance to clause 8.8.3(d) of the Rules and publishing an Issues Paper on 22 January 2009. Submissions closed on 6 March 2009;~~

- ~~publishing a Draft Report on 8 May 2009. Submissions closed on 19 June 2009; and~~

- ~~holding a meeting which was open to all Registered Participants on its draft template at the office of the AEMC on 12 June 2009.~~

~~On 31 July 2009, the Panel submitted to the AEMC its Final Report on the template for generator compliance programs for publication in accordance with clause 8.8.3(j) of the Rules. The Panel, for the reasons as set out in Chapter 2 of the Final Report, has determined that the template consist of the table of compliance measures and explanatory material set out in Chapters 3 and 4 of the Final Report. These chapters of the Final Report have therefore had minor reformatting and renumbering to constitute this template. For further details on the Panel's development and determination of the initial template, refer to the Final Report.~~

~~In September 2011, the AEMC provided terms of reference to the Panel to undertake the first of the three yearly reviews of the template. The review process included consultation with stakeholders on an issues paper and a draft report. A public meeting was held on 16 May 2012 via teleconference where participants discussed the template and potential amendments. The review did not identify material issues with the template. Minor amendments were made to clarify existing provisions in the template and to make minor improvements to the template's ease of use. Details of the Panel's considerations are set out in the final report on this review.[i]~~

~~Generators are required to institute and maintain a compliance program consistent with this template (and other relevant requirements under the Rules).[j] Such a program must be instituted as soon as reasonably practicable but, in accordance with clause 4.15(b) of the Rules, no later than:~~

~~(1) 6 months after the day that AEMO gives notice to the Registered Participant of registration of the performance standard under rule 4.14(n); or~~

~~(2) 6 months after the day on which the relevant plant commences operation.~~

~~Participants are required to modify their compliance programs in accordance with the Panel's amended template by no later than six months after the amendments are~~

~~[i] AEMC Reliability Panel, Final Report, Review of the template for generator compliance programs, 27 June 2012.~~

~~[j] Refer to clause 4.15(c) of the Rules.~~

~~published.[k] The nature of the amendments is minor and the Panel considers the amendments will not have significant operational impacts on participants.~~

~~All enquiries on this template should be addressed to the Reliability Panel Secretariat on (02) 8296 7800.~~

~~[k] Clause 4.15(c)(3) of the rules provides a default timeframe of 6 months, but also enables the Panel to establish an alternative timeframe for participants to implement changes to the template. The Panel did not propose alternative timing for implementation due to the minor nature of the amendments.~~

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1 Supporting information for~~Principles and guidelines for~~ compliance programs

1.1 Introduction

This chapter presents material that may be considered useful by registered participants in terms of helping to inform their compliance programs.~~outlines the principles the AEMC Reliability Panel (Panel) adopted in developing the template for generator compliance programs (template). The documenting of these principles should be a guide to future revision and development of the template. In addition, generators should consider these principles in applying the template to their compliance programs.~~

~~The chapter also provides guidance to assist Generators develop their own compliance programs. Compliance programs must be consistent with the template and include procedures to monitor the performance of plant in a manner that is consistent with good electricity industry practice. The Panel considered that good practice requires Generators to refine the template within an appropriate compliance management setting to their specific plant characteristics.~~

1.2 Compliance principles

The Panel used the following compliance principles in developing its template. ~~These are recommended to be used as a guide in future reviews of the template.~~ These principles should also be considered by generators in developing and modifying their compliance programs.

Principle 1: Where plant system performance may be variable with time, as for example with plant protection, control and alarm (PCA) systems, *Generators* are accountable for managing the functionality and integrity of systems and settings in accordance with the performance standards compliance program.

Principle 2: The corollary of the Principle #1 is that where plant parameters are not subject to variability with time, the compliance regime should be restricted to confirmation that the plant continues to perform as intended with repeat testing when there are reasonable grounds to believe that the plant performance may have changed.

Principle 3: The materiality of the issue must be considered when contemplating a compliance testing regime.

Principle 4: A *Generator's* active use and implementation of a compliance program that is consistent with the approved template and the Generator's compliance management framework will provide a reasonable assurance of compliance with the Generator's registered performance standards.

Principle 5: The template must therefore support the development of compliance programs which represent "good electricity industry practice". The

template should specify the objectives and outcomes to be achieved by the testing or monitoring, and an appropriate test interval. The *Generator* should exercise diligence and good electrical industry practice to determine the detailed methods and procedures to be employed for its plant.

Principle 6: The compliance testing regime must be efficient, and reflect an equitable balance between risk management and the risk created by the test regime itself.

Principle 7: Where appropriate, analysis of performance during an event or disturbance could be used to demonstrate compliance in lieu of a performance test.

Principle 8: Where compliance to a performance standard cannot be directly tested, the compliance program should include a range of other compliance testing methods to provide reasonable assurance that the performance standard continues to be met.

Principle 9: When developing a compliance program and operating under that program, a *Generator* can only be reasonably held accountable for the compliance of its plant to its registered performance standards and to equipment settings approved or provided by AEMO and/or the transmission network service provider (TNSP).

Principle 10: Compliance programs should be reviewed and updated periodically.

1.3 General overview of the compliance framework~~The nature of the template and its application~~

It is important to recognise that the template is only one element of the broader compliance framework.

The Panel recognises that the template cannot be a prescriptive list of compliance choices. Such an approach would not be efficient, nor representative of good electricity industry practice. The approach taken is to support a flexible application of the template with appropriate controls. The Panel, therefore, designed the template on the basis that it forms part of a Generator's overall compliance management process.

Provided below is a general overview of the compliance framework. However, registered participants are advised to seek their own independent professional advice as to the compliance framework that is specific to their individual circumstances and how it will be applied.

Generally speaking, the compliance framework should be viewed in the context of the connection arrangements that allow the Generator to connect to the electricity network. Under the Rules, a Generator must plan and design its facilities and ensure that they are operated to comply with the performance standards applicable to those facilities, its connection agreement which is applicable to those facilities, and the

system standards.[12] Except in cases where a Generator's facilities meet all aspects of the 'automatic access standards', performance standards are generally negotiated and form part of a Generator's connection agreement with the relevant network service provider.[13]

Following the receipt of a proposed negotiated access standard, the relevant network service provider is required to consult with AEMO with regard to the proposed negotiated access standard.[14] AEMO then establishes and maintains a register of the performance standards that is applicable for that particular plant, as advised by the relevant network service provider or Generator.[15]

Under the Rules, a Generator is required to comply with the performance standards applicable to its facilities.[16] That is, it is required to comply with those standards that are set out in its connection agreement. A Generator is also required to develop and maintain a performance standards compliance program that is consistent with the template.[17] Such a program must be developed as soon as reasonably practical, but no later than:

- six months after the day that AEMO gives notice to the registered participant of registration of the performance standards; or
- six months after the day on which the relevant plant commences operation.[18]

A Generator is also required to modify its compliance program to be consistent with any amendments made to the template by the Panel, by no later than 6 months after amendments to the template are published, or by a date determined by the Panel.[19]

The AER is responsible for auditing a Generator's compliance with its compliance program and for investigating breaches, or possible breaches, of its performance standards. A Generator is required to maintain compliance program records and other prescribed records[20] for seven years, and if requested, deliver such records to the AER within five business days or other specified period.[21]

12 Rules clause 5.2.5(a).

13 The automatic access standards, minimum access standards and performance criteria required for the connection of generators are set out in Rules schedule 5.2. These form the basis for specific performance standards that are registered with AEMO.

14 Rules clause 5.3.4A.

15 Rules clause 4.14(n).

16 Rules clauses 5.2.1(b)(2) and 5.2.5(a)(1).

17 Rules clause 4.15(c).

18 Rules clause 4.15(b).

19 Rules clause 4.15(c)(3).

20 Relating to tests to demonstrate compliance with connection requirements under clause 5.7.3 of the Rules.

21 Rules clause 4.15(e).

A Generator is also required to immediately notify AEMO if its plant is breaching a performance standard or is likely to breach.[22] It must also notify AEMO and the relevant network service provider when the plant has returned to compliance with the relevant performance standard.[23] AEMO forwards a copy of all non-compliance notices to the AER and the relevant network service provider.

Further details of the compliance framework for Generator performance standards are provided in the AER's Generator Performance Standards, Information Booklet, published in August 2013.[24]

~~A clear objective of the template is to provide clarity to all parties as to what constitutes good electricity industry practice with respect to technical standards compliance. The work of the Panel in developing the template and most submissions on the Panel's development of the template, however, highlight the difficulty of establishing a single template for the diverse range of plant in the NEM. The submission by PacificHydro reinforces this point stating that:[25]~~

~~"The requirement to develop and mandate a template creates a significant challenge. Such a template must be broad enough to cover the various technologies; allow for different types of connection points; and avoid being overly prescriptive, as this in itself could design in compliance failure for generators."~~

~~Considering the principles under which the template is to be developed and in light of:~~

- ~~the variety of technology of generating plant in the NEM;~~
- ~~the different ages and sizes of that plant;~~
- ~~the plant specific attributes of the generating plant and its potential impacts on the network; and~~
- ~~the differing technical standards (or registered performance standards) to which they must comply,~~

~~the Panel recognised that the template cannot be a prescriptive list of compliance choices. Such an approach would not be efficient nor representative of good electricity industry practice.~~

~~The approach taken is to support a flexible application of the template with appropriate controls. The Panel therefore designed the template on the basis that it forms part of a Generator's overall compliance management process. This is~~

22 Rules clause 4.15(f).

23 Rules clause 4.15(h).

24 www.aer.gov.au/node/21331

~~25 PacificHydro submission on the Issues Paper (AEMC Reliability Panel 2009, Template for Generator Compliance Programs, Issues Paper, 22 January 2009, Sydney), 9 March 2009, p.1.~~

~~consistent with the NGF submission which envisioned a role for the template within a "quality assurance framework".[26]~~

~~It is also broadly consistent with the proposals by PacificHydro. PacificHydro suggested that the Australian Standard for Compliance Programs (AS 3806-2006) should be used as a starting point and it should be assumed that companies are using AS 3806 already in their compliance systems.[27] PacificHydro argued that the specific technical principles should not be contrary to, nor overwrite, any of the principles contained in AS 3806.[28]~~

~~The following section outlines the nature of such a framework and the following chapter provides a table to assist Generators in developing their compliance programs.~~

1.4 Continuous plant monitoring~~The framework for the development of a compliance program~~

Where plant is normally running (that is, not "peaking plant" that rarely operates), continuous plant monitoring could have a number of benefits over periodic testing, or if used in conjunction with periodic testing. Benefits are likely to accrue not only in relation to demonstrating compliance with technical performance standards, but also in providing information to plant owners about the ongoing performance of their plant.

Continuous plant monitoring is increasingly becoming a more affordable option than it has been in the past. AEMO has advised the Panel that the adoption of affordable continuous plant monitoring options is increasingly an outcome of the connection negotiation process for new plants.[29]

Generators could also consider whether continuous high speed monitoring could be considered in lieu of staged testing in some instances where staged tests cannot be implemented, such as for response to system disturbances.

For a number of performance standards in Table 1 in Chapter 2 of this document, continuous plant monitoring has been included as an option for a suitable monitoring and testing methodology. Where continuous plant monitoring has not been included in the table, Generators should also consider the suitability of applying continuous plant monitoring as a monitoring and testing methodology in these other situations.

~~The Panel recognised that the Rules requires Generators to implement compliance programs that are consistent with the template but not a carbon copy of the template.~~

~~26 NGF submission on the Issues Paper (AEMC Reliability Panel 2009, Template for Generator Compliance Programs, Issues Paper, 22 January 2009, Sydney), 6 March 2009, p.1.~~

~~27 PacificHydro submission on the Issues Paper (AEMC Reliability Panel 2009, Template for Generator Compliance Programs, Issues Paper, 22 January 2009, Sydney), 9 March 2009, Pp.1-2.~~

~~28 PacificHydro submission on the Issues Paper (AEMC Reliability Panel 2009, Template for Generator Compliance Programs, Issues Paper, 22 January 2009, Sydney), 9 March 2009, Pp.1-2.~~

29 AEMO submission, 16 December 2014, p.2.

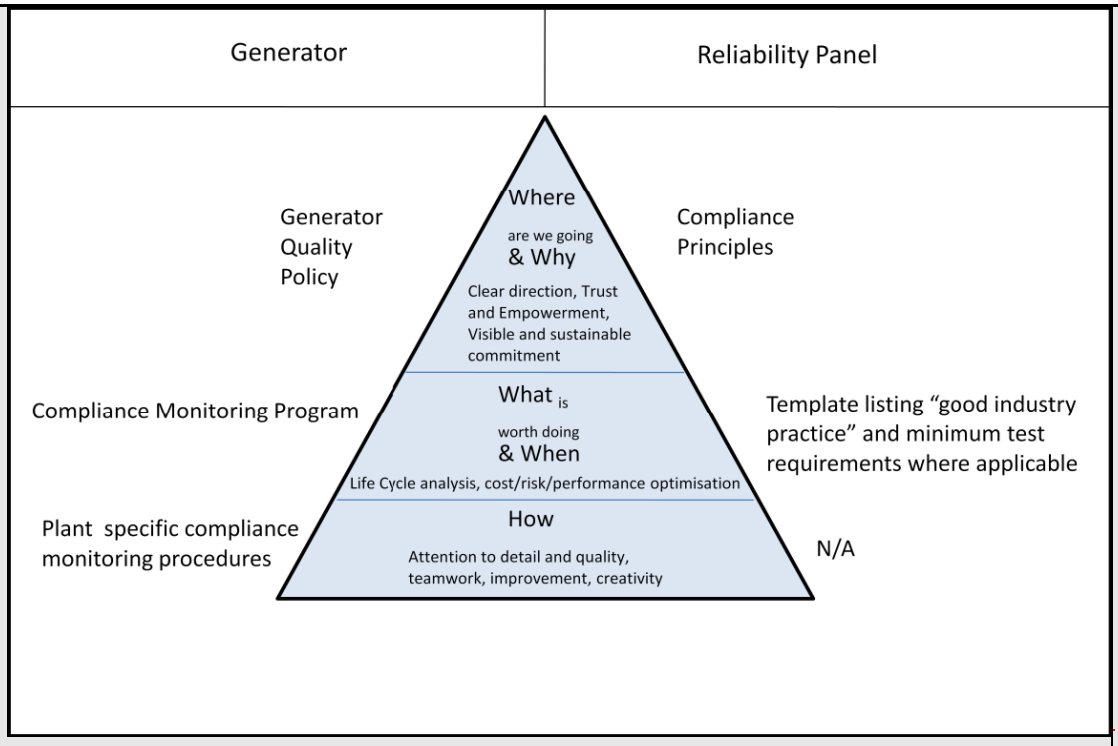
~~The template is not an exhaustive document and is intended to assist Generators to design its own compliance programs. It is recognised that as each Generator may have its own particular requirements for their plant, the Generator is responsible for developing its own compliance program. The development of the compliance program and its ongoing application must, however, be within an appropriate framework.~~

~~In its submission[30], AEMO (formerly NEMMCO) proposed that the framework for compliance programs be further clarified in the form of a "multi-faceted approach".~~

~~The figure below summarises AEMO's proposed approach and the following extract from their submission[31] describes the proposal in more detail.~~

~~30 AEMO submission on the Issues Paper (AEMC Reliability Panel 2009, Template for Generator Compliance Programs, Issues Paper, 22 January 2009, Sydney), 6 March 2009, p.5.~~

~~31 AEMO submission on the Issues Paper (AEMC Reliability Panel 2009, Template for Generator Compliance Programs, Issues Paper, 22 January 2009, Sydney), 6 March 2009, Pp.5-6.~~



~~"The figure indicates a tiered approach. Documentation to be put in place by the Reliability Panel is indicated on the right hand side of the triangle, while the documentation the generators will need to have in place in response to this is indicated to the left.~~

~~The compliance principles that the Panel now asks the generators to follow will be based on internationally recognised quality management system principles such as can be found in the ISO9000, 9001 and 9004 set of standards. This set of compliance principles will need to be followed in the establishment, implementation and maintenance of the Generator Compliance Program. The concept of the suitability of testing and monitoring regimes for each performance standard as per Rule 4.15(ca) is therefore taken to a higher level. Generators will have to show that their processes are well managed and that there are sufficient supporting systems in place with regards to resourcing for, execution and review of all the processes supporting the achievement of performance standard targets.~~

~~At the next level the Reliability Panel will be responsible for putting a more detailed template in place. This template will indicate which tests and monitoring techniques constitute good electricity industry practice for each performance standard area for different technologies.~~

~~At the top tier on the generator side there is a quality management policy that will have to show:~~

- ~~the processes needed for the establishment, implementation and maintenance of the Generator Compliance Program~~
- ~~the sequence and interaction of these processes,~~

- the determination of criteria and methods needed to ensure that both the operation and control of these processes are effective,
- the availability of resources and information necessary to support the operation and monitoring of these processes,
- that these processes are monitored, measured and analysed, and
- actions necessary to achieve planned results and continual improvement of these processes are implemented.

The resulting Generator Performance Standard Compliance Plan will then consist of a document detailing the systems and processes in place to ensure the generators ability to consistently meet regulatory requirements. The compliance program should stipulate how the processes are managed in terms of issues such as records and document control, handling of non-conformances and management review. The design and implementation of a generator's specific compliance program will be influenced by varying needs, particular technologies, the products provided, the processes employed and be manageable irrespective of the size and structure of the organisation. The plan should also include an assessment plan that stipulates the specified monitoring and test procedures including required frequency of testing. At the bottom of the tier on the generator side there should be a set of compliance monitoring procedures for each test the compliance program prescribes. These will include step by step instructions including the following:

- input and output requirements (for example specifications, resources and records to be kept),
- activities within the processes,
- verification and validation of processes and products,
- analysis of the process including dependability,
- identification, assessment and mitigation of risk,
- corrective and preventive actions,
- opportunities and actions for process improvement, and
- control of changes to processes and products."

The Panel decided not to mandate a particular management approach or standard, knowing that different organisations have their own approaches or are certified to various standards. However, in the context of developing the template, the Panel considered that AEMO's general proposal in clarifying the compliance program framework will assist it in determining the scope of the template and avoid duplicating other processes within the framework.

1.5 Dry stored generators~~The need for documentation within the overall compliance arrangements~~

The term "dry stored" is used to identify the status of a generation facility that is not in a state of readiness to allow it to be dispatched in the NEM, but remains physically intact, and, after a period of restoration, would be capable of being returned to service. Similar terminology used to refer to this state includes "care and maintenance" or "mothballing".

The Rules require all generating facilities, including dry stored Generators, to develop and maintain compliance programs that are consistent with the template.[32] While the Rules do not prohibit a Generator from entering a period of "dry storage" and maintaining registration throughout, ongoing registration with AEMO obliges the Generator to retain compliance with the Rules.

When a generating plant is being prepared for a significant period of dry storage, a Generator should consider whether the plant's existing compliance program for performance standards is appropriate. There are a range of factors that a Generator should consider before implementing any amendment to its existing compliance program for the plant in question, some of which may include:[33]

- The period of time likely to elapse before the facility might be returned to service, and how the Generator would communicate any return to service arrangements to AEMO;
- How the Generator would inform AEMO of the status of the facility and the facility's expected time to return to service after a period of storage;
- When the Generator is preparing its dry stored plant for a return to service, any required testing that can be conducted off-line should occur prior to the plant's return to service. For example, this may include any steps that are considered necessary to verify plant changes that may have occurred during and after the period of storage, or where there has been a change to a performance standard. The Generator should also consider how and when it will advise AEMO of its plans to bring the plant back into service. The Generator should also keep all compliance related information up to date.
- If compliance testing is due, but the Generator has not been able to verify its compliance with all standards prior to re-synchronisation with the power system, then all residual verifications should be carried out as soon as practicable following re-synchronisation. For example, this may include making prior arrangements for the necessary tests to be carried out without avoidable delay after synchronisation in order to minimise risk to other power system users, and for the timing and results of tests to be independently verifiable at a later time. Consideration should also be given to whether certain

32 Rules clause 4.15(c).

33 These suggested range of factors have been based on information contained in the AEMO document, *Guidance for Dry-Stored Generators* (version 1, published 9 August 2013), as referenced in AEMO's submission to the Issues Paper for this review.

tests need to be advised to AEMO and/or the relevant network service provider(s).

~~While the Panel did not intend to mandate a particular management approach, any appropriate management would have a number of characteristics. One of those would be to record and document decisions. In addition to being necessary for proper management control, documentation will be necessary within the broader NEM compliance arrangements.~~

~~The overall compliance arrangements in the Rules and the NEL rely on participation of Generators, AEMO and the AER. For the framework of compliance programs to function effectively, in addition to the Panel's role in developing and reviewing the template, it was anticipated by the AEMC in its final Rule determination that:[34]~~

- ~~Registered Participants (Generators) will institute and maintain generator compliance programs based on the template;~~
- ~~the AER will regularly conduct spot audits of selected Generators' compliance programs as part of its compliance monitoring activities; and~~
- ~~Generators will engage with external auditors to independently audit their compliance programs to determine whether they are required to amend their compliance programs and amend if required.~~

~~34 AEMC 2008, Performance Standard Compliance of Generators, Rule Determination (23 October 2008, Sydney), p.v.~~

2 Table for developing generator compliance programs

2.1 Introduction

~~A t~~Table 1, included at the end of this chapter, has been provided to assist Generators to develop their own compliance programs ('the table') ~~is provided at the end of this chapter~~. The following material provides explanatory notes to this table and defines important terms used in its development. Generators should read this explanatory material before referring to the table as it provides important context for the application of the table's provisions.

The terms defined in section 2.~~98~~ of this chapter and underlined in the table, are only intended to be used for the purposes of the template. Italicised terms are defined in Chapter 10 of the Rules.

2.2 Applying the table

The t~~T~~able ~~2.9~~ provides a series of options for G~~g~~enerators to assist in developing compliance programs. It is not a prescriptive list of tests and methodologies to demonstrate compliance. The template has been designed on the basis that it is one of a number of resources that should be consulted in implementing and modifying a G~~g~~enerator's overall compliance management process.

The template is not designed to take the place of alternative advice. Generators should consider the ~~ten~~compliance principles, set out in Chapter 1 of this document, most of which illustrate that G~~g~~enerators will need to exercise judgement in how best to apply the template to meet their compliance requirements.

2.3 Pre-existing compliance

The table is designed on the assumption that any analysis undertaken at the time of connection and subsequent commissioning tests conducted by the Generator have established the plant's compliance with its performance standards. This is also assumed for older plant that were connected in accordance with older versions of the Rules or Code. As a result, a Generator's connection agreements for older plant may, in some cases, specify the testing and monitoring requirements~~is~~, which may be ~~in some cases,~~ based on the need to maintain compliance with older versions of the Rules or Code that applied at the time when such connection agreements were established.

2.4 Power system security

The AEMO power system security responsibilities are provided under clause 4.3.1 of the Rules. The Generator needs to take care that its compliance testing regime does not jeopardise power system security. Otherwise, under clause 4.8.1 of the Rules, the Generator must promptly advise AEMO or a relevant System Operator at the time that the Generator becomes aware, of any circumstance which could be expected to adversely affect the secure operation of the power system or any equipment owned or under the control of the Generator or a network service provider (NSP). Nothing in the table seeks to override these responsibilities and all testing should be devised and undertaken recognising the need to maintain power system security.

2.5 Performance standards

The Panel has sought to take into account all the relevant versions of the performance standards that may apply to a particular Generator. ~~–~~However, Generators should be aware in developing their compliance programs that the particular requirements under a performance standard may have changed over time. There may also have been changes in the version of the Rules~~ and Code~~, clause numbering and title in some places. ~~-~~At the time that this template was last updated, version 6~~9~~49 of the Rules was the latest version. ~~–~~Reference to version 6~~9~~49 of the Rules in the table should be taken to mean the latest version of the Rules unless there have been changes to the particular provision in the table. ~~-~~Until the template is next updated, Generators should base their compliance programs in regard to any such matters on other information in the template, the application of their management program and good electricity industry practice.

2.6 Compliance methods

The table lists a number of different compliance methods for the applicable performance standards. ~~-~~These different methods can be selected by the Generator to suit its specific plant characteristics. ~~-~~The method or methods on which a particular plant's compliance program is based should be selected within the broader compliance management framework of the Generator, and should include consideration of all relevant factors including:

- the technology of the plant, including whether its performance is likely to drift or degrade over a particular timeframe;
- experience with the particular generation technology, including manufacturer's advice;
- the connection point arrangement; and
- an assessment of the risk and costs of different testing methods, including consideration of the relative size of the plant.

2.7 Frequency of tests

In the table, the~~re is a~~ column titled, "Suggested frequency of testing", ~~. This column~~ indicates the suggested cycle of recurrent tests for a particular method. ~~-~~The actual frequency of testing on which a particular plant's compliance program is based should be determined within the broader compliance management framework of the Generator, and should include consideration of all relevant factors including:

- the technology of the plant specific to that performance standard;
- experience with the particular generation technology;
- manufacturer's advice with respect to the particular model;[42] and

[42] This could include considering any specific requirements related to the minimum number of operational hours required prior to undertaking 'major inspections'.

- an assessment of the frequency required to provide reasonable assurance of compliance.

The frequency may also be managed within the broader framework to integrate NEM compliance testing with safety and other compliance programs and the overall asset management program for the plant.[43] -The actual frequency of testing may be described in terms of the:

- elapsed time;
- plant operating hours;
- MWhrs generated; or
- number of plant starts

between testing.

2.8 Basis for compliance assessment

In the table, there~~re is a~~ column titled, "Basis for compliance assessment", indicates the type of measure required as the benchmark for a particular method. -The specific measure for the acceptance or otherwise of test results should be developed by the Generator when applying the template to develop their compliance program. ~~This column indicates the type of measure required as the benchmark for a particular method.~~

2.9 Defined terms

In the design of the template, it was decided that certain terms used in the table should be defined to aid clarity and assist Generators in using the template to develop their specific compliance programs:

plant change means when the replacement of components or equipment or the refurbishment or change of system takes place and that the relevant *Generator* considers that event may affect the plant's capability to meet the particular *performance standard*. An appropriate process needs to be established under the *Generator's* compliance management framework to ensure all changes to plant are noted and appropriately reviewed as to whether they constitute a plant change event in respect to each *performance standard*.

relevant sub-system means any subcomponents which contribute to a *generating system* achieving its capability to meet the particular *performance standard* (e.g. excitation systems, connection equipment including associated reactive plant, auxiliary power supplies, protection relays, circuit breakers, etc.). -An appropriate process needs to be established under the *Generator's* compliance management framework to identify what sub-systems are relevant to achieving and maintaining the plant's performance with respect to each *performance standard*.

[43] Generators may need to consider whether plant that is less often employed should be subject to more rigorous compliance testing to ensure that it would operate when required.

Appropriate testing for relevant sub-systems needs to be devised taking into account:

- the technology of the particular sub-system, including whether its performance is likely to drift or degrade over a particular timeframe;
- experience with the particular generation technology;
- manufacturer's advice with respect to the particular model; and
- an assessment of the frequency required to provide reasonable assurance of compliance.

routine testing may require testing and calibration of equipment.

type testing means testing, on a regular basis, a reasonable sample of plant within a larger population of plant of the identical type and model.

monitoring means active routine monitoring of the system to ensure ongoing compliance and not just mere logging. –All monitoring should include quantitative analysis to confirm plant performance against:

- past performance;
- known performance characteristics; or
- plant performance models.

This definition should not be confused with *monitoring equipment* as defined in the Rules.

plant trip for the purposes of this template means the trip of a *generating unit* or a *generating system*, or when a *generating system* consists of more than ten identical units, the trip of a significant number of those units or of critical ancillary plant.

Table 12.9 Table to assist development of generator compliance programs

This table is intended as a guide to Gg~~g~~enerators that is one of a number of potential resources for developing and modifying compliance programs. It is not an exhaustive list of tests and methodologies. Generators should consider the ~~ten~~ compliance principles set out in Chapter 1 of the document~~template~~ when applying this table. Chapters 1 and 2 of thise document~~template~~ provide important context for the application of this table and emphasis~~z~~e that Gg~~g~~enerators should exercise their own judgement in determining how best to apply the template to meet their compliance requirements.

Performance Standard/Rules/Code Provision	**Suitable testing and monitoring methodology**[37]	**Suggested frequency of testing**[38]	**Notes**	**Basis for compliance assessment**
Reactive Power Capability (as required under S5.2.5.1 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[39]	Method 1 (of 5): At rated power output, adjust the reactive power at the connection point to specified levels	Every 3 years and after plant change	Directly Measurable. Applies to synchronous and conventional plant, ~~and~~ entire wind farms and solar farms	Be capable of achieving reactive power requirements of the performance standard
	Method 2 (of 5): Exercise the over and under excitation limits at as close to rated power output as practical	Every 3 years and after plant change	Directly Measurable. Applies to synchronous and conventional plant	Be capable of achieving reactive power requirements of the performance standard

37 Where there is more than one method provided, only **one** method is required to be used.

38 See section 2.7 of the template for more information on the factors to be considered when determining the actual frequency.

39 This provision was amended in the Code on 9 August 2001 and on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	**Suitable testing and monitoring methodology[37]**	**Suggested frequency of testing[38]**	**Notes**	**Basis for compliance assessment**
Reactive Power Capability (as required under S5.2.5.1 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[40]	Method 3 (of 5): Step testing of AVR limiters	Every 3 years and after plant change	Applies to conventional plant	Be capable of achieving reactive power requirements of the performance standard
	Method 4 (of 5): (a) Capability will be tested by component: and	Testing of ancillary plant and type testing of sample turbines/solar installation following plant change	Applies to wind farms plant and solar farms	Be capable of achieving performance standard
	(b) Capability will be monitored using SCADA under normal wind and solar farm operation.	Annual review of a selection of events		Consistency with plant characteristics
	Method 5 (of 5): Routine testing of relevant sub-systems	As appropriate to the technology of the relevant sub-system	Applicable to a wide range of generating plant and systems	Consistency with plant characteristics

40 This provision was amended in the Code on 9 August 2001 and on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
Power Factor Requirements (as required under S5.3.5 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)	Method 1 (of 1): Direct measurement and calculation of power factor when not generating	Every 3 years and following plant change	Only applies where there is a circuit breaker, allowing auxiliary supply to be drawn through the main connection point	Power factor within allowable range / specification
Quality of Electricity Generated (as required under S5.2.5.2 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[41]	Method 1 (of 2): (a) Direct measurements using power quality meters to derive: i. voltage fluctuation levels; ii. voltage balance; and iii. harmonics, flicker and negative phase sequence voltage; and	Following plant change	Performance of generator and its contribution to power quality needs to be separated from the contribution of others	Achieve performance standard or demonstrate consistency with plant characteristics used in determining original compliance

41 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
Quality of Electricity Generated (as required under S5.2.5.2 in versions 1-~~69~~49 of the Rules, the initial Code, and all amended versions of the Code)[42]	(b) Routine testing of any relevant sub-systems.	As appropriate to the technology of the relevant sub-system	Important when power quality at the connection point is dependent on ancillary plant of power electronic control systems	As above
	Method 2 (of 2): (a) Monitoring in-service performance through use of Power Quality Monitors; and	Routine monitoring Specific review every 3 years and following plant change		Monitors set against the performance standard are not raising alarms. Consistency with plant characteristics (no deterioration).
	(b) Testing and/or calibration of any relevant sub-systems.	As appropriate to the technology of the relevant sub-system	Important when power quality at the connection point is dependent on ancillary plant of power electronic control systems	Consistency with plant characteristics.
Response to Frequency	Method 1 (of 4):			

42 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	**Suitable testing and monitoring methodology[37]**	**Suggested frequency of testing[38]**	**Notes**	**Basis for compliance assessment**
Disturbances (as required under S5.2.5.3 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[43]	(a) Investigating plant trips that occur during significant frequency disturbances; and	On every event		Achieve performance standard
	(b) Routine testing and/or calibration of relevant sub-systems including: i. testing of control system and/or protection system response to disturbances by the injection of simulated frequency / speed control signals; and ii. Routine tests of electrical / mechanical over speed devices.	As appropriate to the technology of the relevant sub-system		As above
Response to Frequency Disturbances (as required under S5.2.5.3 in	Method 2 (of 4): (a) Investigating system performance using high	Every event where the plant trips and	Appropriate to use where high speed	Consistency of operation with plant models used

43 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	**Suitable testing and monitoring methodology[37]**	**Suggested frequency of testing[38]**	**Notes**	**Basis for compliance assessment**
versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[44]	speed data recorders; and	disturbances where the frequency moves out of the *operational frequency tolerance band*	monitors are available and models have been used in establishing compliance	to establish initial compliance if the models are available; OR consistency with past performance only if the models are not available or sufficiently sophisticated.
	(b) Routine testing and/or calibration of relevant sub-systems including: i. testing of control system and/or protection system response to disturbances by the injection of simulated frequency / speed control signals; and ii. Routine tests of electrical / mechanical over speed devices.	As appropriate to the technology of the relevant sub-system		As above

44 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
Response to Frequency Disturbances (as required under S5.2.5.3 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[45]	Method 3 (of 4): (a) Verify the modelled performance of a sample of turbines/solar inverter units;	Following plant change, which may include control system setting or protection system setting change	Only applicable to small asynchronous generators with digital controls that are aggregated and that do not materially differ in terms of their design and settings	Operation over the frequency range specified and agreed in the Generator Performance Standard
	(b) Verify the performance by testing response to an introduced disturbance;	Type testing and verification every 10 years	Each unit is not material and performance slippage is unlikely	Consistent with the performance standard registered at the connection point
	(c) Continuous monitoring (high speed) of performance at the connection point; and		Appropriate to use where high speed monitors are available and models have been used in establishing compliance	Operation over the frequency range specified and agreed in the Generator Performance Standard
Response to Frequency Disturbances (as required under S5.2.5.3 in	(d) Routine testing and/or calibration of relevant sub-systems including:	As appropriate to the technology of the relevant sub-system		As above

45 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[46]	i. testing of control system response to disturbances by the injection of simulated frequency / speed control signals; and ii. Routine tests of electrical / mechanical over speed devices.			
	Method 4 (of 4): (a) Performance of relevant sub-systems will be monitored using the following systems under normal machine operation: digital protection relays; other data-logging equipment as required; and	Every 3 years and after plant change		Achieve performance standard
	(b) Routine testing and/or calibration and validation of relevant sub-system performance including:	As appropriate to the technology of the relevant sub-system		As above

46 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
	i. electrical protection; and ii. turbine protection.			
Response to Voltage Disturbances (as required under: S5.2.5.4 in versions 13-~~6949~~ and S5.2.5.3 in versions 1-12 of the Rules ; and S5.2.5.3 in the initial Code, and all amended versions of the Code)[47]	Method 1 (of 3): (a) Investigating plant trips that occur during significant voltage disturbances; and	On every event		Achieve performance standard
	(b) Routine testing and/or calibration of relevant sub-systems including: i. AVR systems; ii. Auxiliary power systems; and iii. Protection relays.	As appropriate to the technology of the relevant sub-system		Consistency with plant characteristics
Response to Voltage Disturbances (as required under: S5.2.5.4 in versions 13-~~6949~~ and S5.2.5.3 in versions 1-12 of the Rules; and S5.2.5.3 in the initial	Method 2 (of 3): (a) Continuous high speed monitoring; and	On every event where the plant trips or on at least one major voltage disturbance every 3	Appropriate to use where high speed monitors are available and models have been used in establishing	Consistency of operation with plant models used to establish initial compliance if the models are available; OR

47 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	**Suitable testing and monitoring methodology[37]**	**Suggested frequency of testing[38]**	**Notes**	**Basis for compliance assessment**
Code, and all amended versions of the Code)[48]		years	compliance	consistency with past performance only if the models are not available
	(b) Routine testing and/or calibration of relevant sub-systems including: i. AVR systems; ii. Auxiliary power systems; and iii. Protection relays.	As appropriate to the technology of the relevant sub-system	Where possible, testing of auxiliary power systems should include simulated disturbance testing	As above
	Method 3 (of 3): (a) With the generator out of service, test the ability of nominated 415 V drives to sustain a specified voltage interruption; and	Every 4 years and after plant change	Applies only to 415 V drives	Successful ride through of system voltage disturbances, as per the agreed performance standard
	(b) In-service monitoring and investigation of any occurrence of a plant trip which may have been associated with a system	On every event	This type of monitoring will be acceptable only if high speed monitoring is not	As above

48 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
	voltage disturbance.		available	
Response to Disturbances following Contingency Events (as required under S5.2.5.5 in versions 13-6949 of the Rules)[49]	Method 1 (of 3): Direct testing by instigating a network trip	Following plant changes	Preferred method where possible and where risks can be managed	Achieve performance standard
	Method 2 (of 3): (a) Investigate plant trips that occur during or immediately following major system events; and	On every event		Achieve performance standard
Response to Disturbances following Contingency Events (as required under S5.2.5.5 in versions 13-6949 of the Rules)[50]	(b) Routine monitoring and testing and/or calibration of relevant sub-systems including suitable testing to confirm circuit breaker operating times.	As appropriate to the technology of the relevant sub-system		As above

49 This provision was amended in version 13 of the Rules.

50 This provision was amended in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
	Method 3 (of 3): (a) Continuous monitoring using high speed recorders; and	On disturbances when the plant trips or at least one major event every 3 years	Appropriate to use where high speed monitors are available and models have been used in establishing compliance	Consistency of operation with plant models used to establish initial compliance if the models are available; OR consistency with past performance only if the models are not available
	(b) Routine monitoring and testing and/or calibration of relevant sub-systems.	As appropriate to the technology of the relevant sub-system		As above
Quality of Electricity Generated and Continuous Uninterrupted Operation (as required under S5.2.5.6 in versions 13-6949 of the Rules)[51]	Method 1 (of 2): (a) Direct measurements using power quality meters to test: i. voltage fluctuation levels; ii. voltage balance ; and iii. harmonics, flicker and negative phase sequence voltage prior to	Following plant changes		Achieve performance standard and ensure protection settings are consistent with the performance standard.

51 This provision was amended in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
	synchronisation and to ensure protection settings align to the performance standard;			
	(b) Investigating plant trips to ensure the trip is not caused by power-quality protection (harmonics or voltage unbalance); and	Following each event		Achieve performance standard.
	(c) Routine monitoring and testing and/or calibration of any relevant sub-systems.	As appropriate to the technology of the relevant sub-system		As above
Quality of Electricity Generated and Continuous Uninterrupted Operation (as required under S5.2.5.6 in versions 13-6949 of the Rules)[52]	Method 2 (of 2): Monitoring in-service performance using appropriate metering	On disturbances when the plant trips including at least one major event every 3 years	Appropriate to use where suitable metering is available	Consistency of operation with plant performance specifications
Partial Load Rejection (as required under: S5.2.5.7 in versions 13-6949 and S5.2.5.4	Method 1 (of 3): (a) Measure response of the generator to system over-	On every event where high	Directly measurable	Achieve performance standard

52 This provision was amended in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
in versions 1-12 of the Rules ; and S5.2.5.4 of the initial Code, and all amended versions of the Code)[53]	frequency and analyse the unit performance; and	frequency moves out of the operational frequency tolerance band or every five years (whichever is more frequent) and after plant change as appropriate to the technology of the relevant sub-system		
	(b) Investigation of plant trips.	On every event		As above
Partial Load Rejection (as required under: S5.2.5.7 in versions 13-6949 and S5.2.5.4 in versions 1-12 of the Rules; and S5.2.5.4 of the initial Code, and all amended versions of the Code)[54]	Method 2 (of 3): (a) Routine testing and/or calibration of relevant sub-systems including: i. Analytical simulation of generator, auxiliary systems and critical protections; and	As appropriate to the technology of the relevant sub-system		Simulation demonstrates ride through of load rejection event specified in Performance Standard.

53 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

54 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
	ii. Secondary injection testing of critical protection systems; and			
	(b) Assess any plant trip for relationship to load rejection event.	On every event	Type Test permissible where multiple units are involved	Operation over the conditions specified and agreed in the Generator Performance Standard.
	Method 3 (of 3): (a) Response to partial load rejection to be assessed by in-service performance; and	On every event or every 10 years (whichever is more frequent) as appropriate to the technology of the relevant sub-system		Achieve performance standard.
	(b) Test for correct operation of turbine overspeed trips.	Every 4 years and after plant change	Overspeed protection checked off-line after major overhauls	That turbine trip operates to within acceptable tolerance of nominal trip setting for overspeed protection.
Protection from Power System Disturbances (as required under S5.2.5.8 in	Method 1 (of 3): (a) Continuous monitoring using high speed recorders;		Appropriate to use where high speed	Consistency of operation with plant models used

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[55]			monitors are available and models have been used in establishing compliance This may not be relevant where alarms are incorporated into the design of the recorder	to establish initial compliance if the models are available; OR consistency with past performance if the models are not available.
	(b) Routine testing and/or calibration of relevant sub-systems including applicable protection relays; and	As appropriate to the technology of the relevant sub-system		That protection system operated in accordance with design and the Performance Standard.
	(c) Investigate unit electrical protection trips.	On every event		As above
Protection from Power System Disturbances (as required under S5.2.5.8 in versions 1-6949 of the Rules, the initial Code, and all	Method 2 (of 3): (a) Routine testing and/or calibration of relevant sub-systems including: i. Injection of simulated	As appropriate to the technology of the relevant sub-system		Achieve performance standard

55 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
amended versions of the Code)[56]	signals (secondary injection) to demonstrate correct operation of the protection; and ii. Repair or recalibrate protection relays as required; and			
	(b) Investigate plant trips.	On every event		As above
Protection from Power System Disturbances (as required under S5.2.5.8 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[57]	Method 3 (of 3): (a) Performance is monitored, in-service; and	At each major overhaul; and/or every 5 years by routine functional testing of unit electrical protection systems and verification of database registered	Applicable for wind farms Changes to turbine control parameters will be controlled such that the performance of the generating system and generating units	Performance is confirmed by the generating system remaining synchronised during power system disturbance conditions where required under a provision of the Rules.

56 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

57 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
		protection settings to occur annually	is not compromised in relation to the generator performance standard Appropriate to use where data is available	
	(b) Routine testing and/or calibration of relevant sub-systems including testing by secondary injection all protection system relays, between the generating unit terminals but within the generating system.	As appropriate to the technology of the relevant sub-system		Performance will be assessed against the performance standard requirements.
Protection Systems that Impact on Power System Security (as required under S5.2.5.9 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the	Method 1 (of 3): (a) Routine testing and/or calibration of protection systems including: i. CB opening times; and ii. Protection relay injection testing; and	As appropriate to the technology of the protection system At least every 5 years and after plant	Directly measurable	Achieve performance standard

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
Code)[58]		change		
	(b) Confirmation from fault recorder records of actual performance.	Every plant trip		As above
Protection Systems that Impact on Power System Security (as required under S5.2.5.9 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[59]	Method 2 (of 3): (a) Routine testing and/or calibration of relevant sub-systems including: i. protection system testing by secondary injection; ii. checking of circuit breaker opening times; iii. redundancy of primary protection systems; and iv. timing of trip signal issued by the breaker fail protection system; and	As appropriate to the technology of the relevant sub-system At least every 5 years and after plant change ~~On every event~~		That all protection relays operate satisfactorily and to within design tolerance of setting value.
	(b) Assessment of protection system performance in the	On every event		That protection system is operated in accordance

58 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

59 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
	event of protection system operation.			with design and the Performance Standard.
Protection Systems that Impact on Power System Security (as required under S5.2.5.9 in versions 1-~~6949~~ of the Rules, the initial Code, and all amended versions of the Code)[60]	Method 3 (of 3): (a) Performance is monitored, in-service, where data is available;	At each major overhaul; and/or every 5 years by routine functional testing of unit electrical protection systems and verification of database registered protection settings to occur annually	Changes to turbine control parameters will be controlled such that the performance of the generating system and generating units is not compromised in relation to the Generator Performance Standard	Performance is confirmed by assessing operation of protection systems against the requirements of the standard when a generating unit trips as a result of fault occurring between the generating unit stator and the connection point.
	(b) Relevant testing and or/calibration of any relevant sub-systems including protection system relays shall be tested by secondary injection; and	As appropriate to the technology of the relevant sub-system		Performance will be assessed against the performance standard requirements following a unit trip as a result of a relevant system event in which the unit should have remained

60 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
				synchronised.
	(c) Verification of database registered protection settings to occur in conjunction with injection testing.	Every 5 years		As above
Asynchronous Operation of Synchronous Generating Units / Protection to Trip Plant for Unstable Operation (as required under S5.2.5.10 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[61]	Method 1 (of 1): (a) Routine testing and/or calibration of relevant sub-systems including protection system testing by secondary injection; and	As appropriate to the technology of the relevant sub-system At least every 5 years and after plant change		That all protection relays operate satisfactorily and to within design tolerance of setting value.
	(b) Assessment of protection system performance in the event of protection system operation or of asynchronous	On every event		That protection system is operated in accordance with design and the Performance Standard.

61 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
	operation.			
Frequency Control / Frequency Responsiveness and/or Governor Stability and Governor System (as required under: S5.2.5.11 in versions 1-6949 of the Rules; S5.2.5.11 and S5.2.6.4 in the initial Code, and all amended versions of the Code before 27 March 2003; and S5.2.5.11 of all amended versions of the Code from 27 March 2003 onwards)[62]	Method 1 (of 4): Monitor in-service performance using high speed frequency data	After every major frequency excursion	Appropriate to use where high speed monitors are available and models have been used in establishing compliance or when plant has no capability of responding to frequency deviations ie asynchronous machines	Consistency of operation with plant models used to establish initial compliance if the models are available; OR consistency with past performance only if the models are not available
	Method 2 (of 4): Assessment of governor system performance during events involving significant variation to system frequency	On every event	Assessment takes into account inertial response, overall governor droop setting etc	That governor system response is within the tolerance specified by the Performance Standards
	Method 3 (of 4): (a) Analytical simulation of turbine and governor	Type Test permissible where		Achieve performance standard

62 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
Frequency Control / Frequency Responsiveness and/or Governor Stability and Governor System (as required under: S5.2.5.11 in versions 1-6949 of the Rules; S5.2.5.11 and S5.2.6.4 in the initial Code, and all amended versions of the Code before 27 March 2003; and S5.2.5.11 of all amended versions of the Code from 27 March 2003 onwards)[63]	systems; and	multiple units are involved		
	(b) Assess generator response to disturbances using high speed recording data.	On every event where the frequency moves out of the operational tolerance band or at least every four years and after plant change		Consistency of operation with plant models used to establish initial compliance if the models are available; OR consistency with past performance only if the models are not available
	Method 4 (of 4): (a) Step response test of the governor to test damping and droop characteristics; and	Every 4 years and after plant change		Plant performance complies with the Generator Performance Standard
	(b) Routine calibration tests.	Every 4 years		As above

63 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
Stability / Impact on Network Capability (as required under S5.2.5.12 in versions 1-~~6949~~ of the Rules, and all amended versions of the Code from 27 March 2003 onwards)[64]	Method 1 (of 1): (a) Monitor in-service performance for relevant performance characteristics not otherwise tested; and	Following plant changes	Generator can only be held responsible for ensuring the performance of their generating system as it contributes to meeting this standard	Consistency of operation with plant models used to establish initial compliance if the models are available; OR consistency with past performance if the models are not available
	(b) Routine monitoring and testing and/or calibration of relevant sub-systems including suitable testing to confirm power system stabiliser performance (if relevant).	As appropriate to the technology of the relevant sub-system		As above
Voltage and Reactive Power Control / Excitation Control System (as required under: S5.2.5.13 in versions 1-~~6949~~ of the Rules; S5.2.5.13 and S5.2.6.5 in the initial Code, and all	Method 1 (of 3): (a) Transfer function measurements and step response tests with the unit unsynchronised and at full load; and	Every 4 years and after plant change		Consistency of operation with plant models used to establish initial compliance if the models are available; OR consistency with past

64 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
amended versions of the Code before 27 March 2003; and S5.2.5.13 of all amended versions of the Code from 27 March 2003 onwards)[65]				performance if the models are not available
	(b) Assess the stability of limiter operation; and	Every 4 years and after plant change		As above
	(c) Monitoring in-service performance or undertake transfer function measurements.	On every event or every 4 years		As above
Voltage and Reactive Power Control / Excitation Control System (as required under: S5.2.5.13 in versions 1-6949 of the Rules; S5.2.5.13 and S5.2.6.5 in the initial Code, and all amended versions of the Code before 27 March 2003; and S5.2.5.13 of all amended versions of the Code from 27 March 2003 onwards)[66]	Method 2 (of 3): (a) AVR step response tests; and	Every 4 years and after plant change		Consistency of operation with plant models used to establish initial compliance if the models are available; OR consistency with past performance if the models are not available
	(b) AVR step response test of OEL and UEL operation; and	Every 4 years and after plant change		As above

65 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

66 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
Voltage and Reactive Power Control / Excitation Control System (as required under: S5.2.5.13 in versions 1-6949 of the Rules; S5.2.5.13 and S5.2.6.5 in the initial Code, and all amended versions of the Code before 27 March 2003; and S5.2.5.13 of all amended versions of the Code from 27 March 2003 onwards)[67]	(c) AVR and PSS transfer function measurements over required frequency range.	Every 4 years and after plant change		As above
	Method 3 (of 3): Performance of relevant sub-systems will be monitored using the following systems: digital protection relays; other data-logging equipment as required	As appropriate to the technology of the relevant sub-system	Applicable for Wind Farms Changes to turbine control parameters will be controlled such that the performance of the generating system and generating units is not compromised in relation to the Generator Performance Standard	Consistency of operation with plant models used to establish initial compliance if the models are available; OR consistency with past performance if the models are not available

67 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
Active Power Control (as required under S5.2.5.14 in versions 13-69 of the Rules)[68]	Method 1 (of 2): One-off installation	Following plant change		Achieve performance standard
	Method 2 (of 2): Monitor non-compliance with dispatch market systems	After major event		Achieve performance standard
Remote Monitoring (as required under S5.2.6.1 in versions 1-6949 of the Rules, the initial Code, and all amended versions of the Code)[69]	Method 1 (of 2): (a) Calibration of Transducers; and	Following plant change and every 5 years		Confirmation at each end of the communications system by both parties
	(b) Verification of the accuracy of transmitted data.	Following plant change and every 5 years		As above
	Method 2 (of 2): (a) SCADA monitored values and farm panel metering will be routinely checked; and	Every 5 years	Applicable for Wind and Solar Farms	Achieve performance standard
	(b) The calibration of transducers	At each major outage		As above

68 This provision was amended in version 13 of the Rules.

69 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
	and Wind and Solar Farms panel metering will be checked.	or once every 5 years		
Communications Equipment (as required under: S5.2.6.2 in versions 13-6949 and S5.2.6.3 in versions 1-12 of the Rules ; and S5.2.6.3 of the initial Code, and all amended versions of the Code)[70]	Method 1 (of 1): (a) Confirmation of the availability of communication links, including any backup links with AEMO; and	Annual and after plant change		Achieve performance standard
	(b) Testing of relevant sub-systems including any power backup or UPS system.	As appropriate to the technology of the relevant sub-system		As above
Power Station Auxiliary Transformers / Supplies (as required under: S5.2.7 in versions 13-6949 and S5.2.8 in versions 1-12 of the Rules ; and S5.2.8 of the initial Code, and all amended versions of the Code)[71]	Method 1 (of 2): (a) Metering of active and reactive power at the auxiliary supply connection point; and	Every 4 years and after plant change	Only applicable when auxiliary supplies are taken from some other point different to generator connection point	Power factor, quality of supply and protection and control requirements within allowable range / specification
Power Station Auxiliary			Access Standards must be established	

70 This provision was amended in version 13 of the Rules.

71 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
Transformers / Supplies (as required under: S5.2.7 in versions 13-6949 and S5.2.8 in versions 1-12 of the Rules ; and S5.2.8 of the initial Code, and all amended versions of the Code)[72]			under clause S5.3.5	
	(b) Testing and/or calibration of any relevant sub-systems including capacitor banks and circuit breakers.	As appropriate to the technology of the relevant sub-system		Performance to specification
	Method 2 (of 2): Performance will be monitored as part of condition monitoring and maintenance routines		This standard only applies to generating systems that takes auxiliary supplies from a separate supply. Unit auxiliary supplies on wind farms are taken from within connection point when units are on-line. Very small wind farm station service auxiliary load requirements are considered negligible under NEM CMP	Achieve performance standard

72 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
			requirements.	
Fault Level / Current (as required under: S5.2.8 in versions 13-~~6949~~ and S5.2.9 in versions 1-12 of the Rules ; and S5.2.9 in all amended versions of the Code from 27 March 2003 onwards)[73]	Method 1 (of 3): (a) Monitoring in-service performance during faults near the connection point; and	Review following any event		Calculation confirms current fault current contribution
	(b) Review and recalculation of fault levels; and	Following plant change		As above
	(c) Routine testing of any relevant sub-systems.	As appropriate to the technology of the relevant sub-system		As above
	Method 2 (of 3): (a) Modelling and simulation of plant characteristics to make sure the plant is capable of meeting agreed standards; and	Following plant change		Calculation confirms current fault current contribution
Fault Level / Current (as required under: S5.2.8 in versions 13-~~6949~~ and S5.2.9 in versions 1-12 of the Rules; and	(b) Monitoring of generator contribution on fault event.	Review following any event		As above
	Method 3 (of 3):			

73 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.

Performance Standard/Rules/Code Provision	Suitable testing and monitoring methodology[37]	Suggested frequency of testing[38]	Notes	Basis for compliance assessment
S5.2.9 in all amended versions of the Code from 27 March 2003 onwards)[74]	(a) Performance of relevant sub-systems will be monitored using the following systems: digital protection relays; other data-logging equipment as required; and	As appropriate to the technology of the relevant sub-system		Achieve performance standard.
	(b) Where recorded data is available, comparison to be made of measured fault currents and computer simulations; and	Following a fault		Consistency of operation with plant models used to establish initial compliance if the models are available; OR consistency with past performance if the models are not available.
	(c) Review and recalculation of fault levels.	Following plant change		As above

74 This provision was amended in the Code on 27 March 2003, and in version 13 of the Rules.