



# **AUSTRALIAN ENERGY MARKET COMMISSION**

## **AEMC RELIABILITY PANEL**

### **TASMANIAN RELIABILITY AND FREQUENCY STANDARDS**

#### **DETERMINATION**

**28 May 2006**

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## Reliability Panel members

The Panel's members represent all sectors of the electricity industry. As of 1 January 2006, the Panel comprises the following members:

Ian Woodward	Chairman (AEMC Commissioner)
Jeff Dimery	General Manager Victoria, AGL (market customers)
Mark Grenning	General Manager Energy, Comalco Aluminium
Les Hosking	Managing Director and CEO, NEMMCO
Gordon Jardine	Chief Executive, Powerlink (TNSPs)
George Maltabarow	Managing Director, EnergyAustralia (DNSPs)
Stephen Orr	Commercial Director, International Power Australia (generators)
Jim Wellsmore	Senior Policy Officer, Public Interest Advocacy Centre (end use customers)
Geoff Willis	CEO, HydroTasmania.

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# Executive Summary

This document presents the final determination of the Australian Energy Market Commission (AEMC) Reliability Panel (Panel) in relation to the reliability and frequency operating standards that will apply in Tasmania. The reliability standard is a measure of the amount of electricity supply that should normally be available to meet customer demand. The frequency standards define the range of allowable frequencies that the power system must operate within in order to supply electricity under a variety of conditions.

Under the National Electricity Rules (Rules), the Panel has the role of determining those standards for the National Electricity Market (NEM). Tasmania joined the NEM in 2005 and, under clause 9.49 of the Rules, the Panel has a specific responsibility to determine the standards in relation to Tasmania by 29 May 2006.

In assessing the standards for Tasmania, the Panel is mindful of the potential benefits of there being uniform standards across all parts of the NEM. However, clause 9.49.4 provides that the Panel must also take into account the specific circumstances and previous experience within Tasmania when assessing an appropriate set of frequency standards.

In this determination the Panel has adopted the most recent standards for reliability and frequency in Tasmania set by the Tasmanian Reliability and Network Planning Panel (TRNPP). The TRNPP determined the reliability standard in November 2005 and the frequency standards in March 2006<sup>1</sup>. The frequency standards set by the TRNPP will apply until 29 May 2007. The reliability standard applied until 29 April 2006 when Basslink, the electricity interconnector between Tasmania and the rest of the NEM, was commissioned. The Panel's frequency standards apply from 30 May 2007 onwards and the reliability standards will apply from the publication of this determination onwards.

In making its determination, the Panel sought advice from NEMMCO as required by the Rules. NEMMCO noted that the Tasmanian reliability standard set out in the TRNPP's November 2005 determination was generally consistent with the NEM standard (0.002% unserved energy). It also noted that a full alignment of the Tasmanian frequency standards with the mainland standards was likely to remain impractical for the foreseeable future. However, it recommended considering a number of incremental changes to the frequency standards subject to assessing the economic merits of doing so. In this regard, the Panel also notes a submission made during the TRNPP's consultation processes that sought an assessment of the costs and benefits of fully aligning the Tasmanian frequency standards with the national standards.

The Panel considers that the following phased approach to determining the Tasmanian reliability and frequency standards is appropriate. The Panel has:

- adopted the Tasmanian reliability standard set out in the TRNPP's November 2005 determination (reproduced in Appendix A) as the standard that will apply in Tasmania from

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<sup>1</sup> The TRNPP determinations are available on the website of the Office of the Tasmanian Energy Regulator located at <http://www.otter.tas.gov.au>. The TRNPP's frequency standards determination was originally published on 14 February 2006 to apply from 20 February 2006. The TRNPP published a revised version of its determination on 2 March 2006. The (National) Panel understands that this version rectified minor error and inconsistencies and that those changes did not affect the date from which the standards applied (20 February 2006). For clarity, references to the TRNPP's determination are to the revised version.

the publication of this determination. In doing so, the Panel notes that the TRNPP's Tasmanian standard is generally consistent with the existing national reliability standard;

- adopted the current Tasmanian frequency standards set out in the TRNPP's March 2006 determination (reproduced in Appendix B) as the standards that will apply in Tasmania from 30 May 2007; and
- proposes to consider the opportunities for further alignment of the Tasmanian frequency standards with the NEM standards in an additional review to commence within approximately twelve months. That review will include a full cost benefit analysis of any proposed changes, will benefit from experience of the Tasmanian market once Basslink has commenced operation, is expected to draw on work to be undertaken by NEMMCO in relation to the Tasmanian automated frequency management schemes and will be conducted according to the principles under the Rules that apply to the current review.

The issue of reliability of supply across the NEM as a whole is being addressed by the Panel in its Comprehensive Reliability Review<sup>2</sup>. That review is due to be completed by 31 March 2007. The Panel notes that the consultation and analysis to be undertaken as part of that review may have a bearing on the Tasmanian reliability standard.

The Panel published its draft determination for consultation on 24 March 2006. Submissions closed on 26 April 2006 and the Panel held a hearing open to NEM registered participants in Hobart on Friday 21 April, 2006, in relation to the Panel's draft determination.

The Panel received submissions from the TRNPP, the Tasmanian Department of Infrastructure, Energy & Resources, Hydro Tasmania and Aurora Energy. The Panel has considered the submissions, and the matters discussed at the hearing in Hobart, when finalising this determination on the Tasmanian reliability and frequency standards.

In addition, each of the submissions received by the Panel raised issues that relate to performing the future review of the Tasmanian frequency standards. The Panel notes these issues and will take them into account when undertaking that review.

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<sup>2</sup> Further information in relation to the Comprehensive Reliability Review appears on the AEMC's website located at <http://www.aemc.gov.au>.

# 1 Background

Under clause 8.8.1(a)(2) of the National Electricity Rules (Rules), the Reliability Panel (the Panel) of the Australian Energy Market Commission (AEMC) is required to determine the reliability and power system frequency standards for the National Electricity Market (NEM). Tasmania joined the NEM in 2005 and, under clause 9.49.3 of the Rules, the Panel is required to determine reliability and frequency standards for Tasmania by 29 May 2006.

The purpose of the reliability standard is to make explicit the level of supply reliability that the power system is normally expected to deliver. The reliability standard has historically been expressed as a level of unserved energy (USE) for customer loads. The current national reliability standard is 0.002% USE<sup>3</sup>.

The purpose of the frequency standards is to define the range of allowable frequencies for the electricity power system under different conditions, including normal operation and various contingencies. Generator, network and end-user equipment must be capable of operating within the range of frequencies defined by the standards, while NEMMCO is responsible for procuring sufficient ancillary services to maintain the frequency within the ranges defined by the standard.

The reliability standard determined by the Panel takes effect from the later of the date this determination is published and the interconnection date (Rules clause 9.49.1(b)). Basslink was commissioned on, and the interconnection date therefore became, 29 April 2006<sup>4</sup>. The Panel's determination on the Tasmanian reliability standard therefore takes effect from the publication of this document. The Tasmanian frequency standards determined by the Panel will apply from 30 May 2007. In making its determination in relation to frequency standards, the Panel is required under clause 9.49.4 of the Rules to have regard to the existing standards as determined by the Tasmanian Reliability and Network Planning Panel (TRNPP).

Under the Tasmanian Code, the TRNPP was responsible for determining the Tasmanian reliability standard that applied until the interconnection date. The TRNPP published that standard in November 2005. The TRNPP also has responsibility for determining the frequency standards that will apply until 29 May 2007. The TRNPP published revised standards on 2 March 2006<sup>5</sup> and intends to perform one more review of the standards prior to 29 May 2007.

This review is also being conducted against the background of a request by the AEMC to the Panel to undertake, in a comprehensive and integrated process, several reviews relating to the key NEM reliability standards and parameters<sup>6</sup>. That comprehensive reliability review has commenced with the Panel's release of an Issues Paper for

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<sup>3</sup> Reliability Panel, *Determination on reserve trader and direction guidelines* (June 1998).

<sup>4</sup> Further information on the commissioning of Basslink is available on the National Grid website located at <http://www.nationalgrid.com.au/>.

<sup>5</sup> The TRNPP's determinations are available on the website of the Office of the Tasmanian Energy Regulator located at <http://www.otter.tas.gov.au>. The TRNPP's frequency standards determination was originally published on 14 February 2006 to apply from 20 February 2006. The TRNPP published a revised version of its determination on 2 March 2006. The Panel understands that this version rectified minor inconsistencies and that those changes did not affect the date from which the standards applied (20 February 2006). For clarity, references to the TRNPP's determination are to the revised version.

<sup>6</sup> Further information in relation to the comprehensive reliability review appears on the AEMC's website located at <http://www.aemc.gov.au/>.

consultation on 11 May 2006. The Panel's final report is due by 31 March 2007. A key objective of that review is to provide market participants with transparency and certainty in relation to the NEM arrangements for reliability over the medium-term.

The Panel published its draft determination on the Tasmanian reliability and frequency standards for consultation on 24 March 2006. Submissions closed on 26 April 2006 and the Panel held a meeting open to NEM registered participants in relation to the draft determination in Hobart on Friday 21 April, 2006.

The Panel received submissions from the TRNPP, the Tasmanian Department of Infrastructure, Energy & Resources, Hydro Tasmania and Aurora Energy. The Panel considered the submissions, and the discussions at the meeting in Hobart, when finalising this determination on the Tasmanian reliability and frequency standards.

## 2 Tasmanian Derogations under the Rules

Under clause 8.8.1(a)(2) of the Rules the Panel is required to:

review and, on the advice of NEMMCO, determine the *power system security and reliability standards*.

In addition under clause 9.49.3, which forms part of the jurisdictional derogations for Tasmania, the Panel is required by 29 May 2006 to:

determine *power system security and reliability standards* under clause 8.8 that, in so far as they apply in respect of Tasmania, reflect the principles set out in clause 9.49.4

Clause 9.49.4 provides that:

In determining and amending *power system security and reliability standards* the *Reliability Panel* must ensure that, in so far as they apply in respect of Tasmania, those standards reflect the following principles:

- (a) in so far as they relate to *frequency*, such standards must be made having regard to the following:
  - (1) any existing standards in relation to those matters;
  - (2) the costs and benefits of any change proposed to those existing standards; and
  - (3) the size and characteristics of the separate systems that make up the power system;
- (b) where the network or networks located in a particular area or region in Tasmania is or are only connected to other areas or regions by means of an asynchronous link, the power system security and reliability standards, in so far as they relate to frequency, may incorporate different standards for the first area or region to those applying elsewhere in the power system; and
- (c) the power system security and reliability standards, in so far as they relate to frequency, must allow less stringent standards for the frequency of a network or networks located in a particular area or region in Tasmania when that area or region is isolated from the remainder of the power system.



## 3 Tasmanian Reliability Standard

### 3.1 TRNPP Determination of Reliability Standard

The Tasmanian reliability standard determined by the TRNPP was unchanged from previous determinations. The standard is reproduced in Appendix A and requires:

- sufficient contingency reserve to meet the frequency standards for the most critical single contingency event;
- short and medium-term capacity reserve equal to the size of the largest single event that may lead to loss of generating capability and could therefore be a generating unit or an element of transmission; and
- unserved energy resulting from the failure of generating equipment is not to be more than 0.002% per annum (the 0.002% USE standard).

### 3.2 Panel Review of Tasmanian Reliability Standard

In making its determination the Panel is required to seek advice from NEMMCO<sup>7</sup>. In its advice to the Panel, NEMMCO stated that, pending quantitative analysis, it expected that the capacity reserve margin necessary to achieve the 0.002% USE reliability standard determined by the TRNPP would be less than the size of the largest generating unit in Tasmania. Thus, in practice, the TRNPP's requirement that the capacity reserve margin equal the size of the largest Tasmanian generating unit should meet that reliability standard. NEMMCO also considered that the level of reserves in Tasmania will generally exceed the size of the largest unit as most generation is hydro electric and capable of starting rapidly.

The Panel has reviewed the TRNPP's determination and notes that:

- the level of standard for unserved energy is identical to the Panel's standard for the remainder of the NEM;
- the TRNPP determination has been the subject of recent consultation and no objections to the standard were raised by parties to the TRNPP process;
- while the TRNPP's determination that capacity reserves should equal the size of the largest single contingency reflects the approach taken at the start of the NEM, the capacity reserve requirements for the mainland regions have been reassessed by NEMMCO to take into account the opportunities for reserve sharing;
- NEMMCO has advised that it is currently recalculating capacity reserve margins in each region of the NEM, including Tasmania; and
- the Panel has commenced a comprehensive review of arrangements for reliability in the NEM including the national reliability standard.

In its draft determination the Panel adopted the Tasmanian reliability standard as set out in the TRNPP's November 2005 determination as the standard that will apply in

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<sup>7</sup> Rules 8.8.1(a)(2). NEMMCO's advice appears on the AEMC's website.

Tasmania. The submissions received by the Panel on its draft determination supported the decision to do so. Therefore, the Panel's final determination is to adopt that standard.

Under the Tasmanian derogation (Rules clause 9.49), the Panel is required to make its determination by 29 May 2006. The reliability standard so determined takes effect from the later of the date this determination is published and the interconnection date (Rules clause 9.49.1(b)). Basslink was commissioned on, and the interconnection date therefore became, 29 April 2006. The Panel's determination on the Tasmanian reliability standard therefore takes effect from the publication of this document.

The Panel also notes that the issue of reliability of supply across the NEM as a whole, including the most appropriate mechanism for translating reliability standards into reserve levels, will be addressed in its comprehensive reliability review. That review is due to be completed by 31 March 2007. The Panel notes that the consultation and analysis to be undertaken as part of that review may have a bearing on the Tasmanian reliability standard.

## 4 Tasmanian Frequency Standards

### 4.1 TRNPP Determination of Tasmanian Frequency Standards

The frequency standards determined by the TRNPP are set out in Appendix B.

In reaching its determination, the TRNPP conducted two rounds of consultation with interested stakeholders, the first in October 2005 and the second in January 2006. The changes from the previously applicable frequency standards, and the reasons for them noted by the TRNPP, are as follows:

- amendment of the definition of “load event” to include those events where the Basslink interconnector is taken in and out of service or where power flows on the link are being reversed. This change recognises an expected impact of operation with Basslink in service and was made in response to concern about the level of frequency regulating ancillary services that would be necessary in those circumstances;
- the stabilisation and recovery time for a load event has been increased from 5 to 10 minutes for the Tasmanian power system and islands within it. This change was made in response to a submission received during the TRNPP’s consultation relating to restrictions on a large customer’s operations due the recovery time in the previous frequency standards;
- the definition of a “generation event” has been amended to include the loss of a dedicated transmission line directly connecting a generating unit to the power system. This change corrected an anomaly in the previous standards whereby different standards applied depending on whether generation input to the main network was interrupted as a result of failure of the generating unit or the dedicated transmission line;
- references to the National Electricity Code have been replaced with references to the National Electricity Rules; and
- the term “market network service provider” in the definition of a load event has been replaced with the term “high voltage direct current interconnector” as the relevant Basslink characteristics relate to its use of high voltage direct current technology, rather than its operation as a market network service provider.

The Panel notes that, during the TRNPP’s first round of consultation, a market participant stated that it preferred that the Tasmanian frequency standards be aligned with the standards applying in the remainder of the NEM<sup>8</sup>. That participant submitted that doing so would reduce the costs of constructing thermal and gas turbine generating plant in Tasmania and requested that the TRNPP undertake a robust cost-benefit analysis to assess the potential impact of any changes from the existing standards. The TRNPP did not alter the Tasmanian frequency standards in this regard but noted that a cost-benefit analysis would be required prior to making such a significant change. The TRNPP noted that an appropriate period of operational experience following the commissioning of Basslink would be necessary before a cost benefit assessment could

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<sup>8</sup> Submission reproduced at p 30 of the TRNPP’s determination.

be meaningfully undertaken. The TRNPP supported the (National) Panel undertaking such a review at an appropriate time in the light of that operational experience.

## 4.2 Panel Review of Tasmanian Frequency Standards

The frequency standards determined by the TRNPP form the existing standards that the (National) Panel must take into account in making its own determination.

The Panel notes that, by virtue of the consultation conducted by the TRNPP, stakeholders have recently had an opportunity to make submissions in relation to the appropriate frequency standards for Tasmania. A number of matters were raised by stakeholders as part of the TRNPP process. The Panel understands that, with the exception of the preference expressed by one market participant that there be a full alignment of the Tasmanian frequency standards with the national standards, the proposals made by stakeholders were addressed by the TRNPP in its determination.

In its advice to the Panel, NEMMCO advised that it did not anticipate that the full amount of additional frequency control ancillary services that would be required if the frequency standards were fully aligned with the national standards would readily be available in Tasmania under all operating conditions. It therefore questioned the practicality of a full alignment occurring in the foreseeable future. However, NEMMCO noted the potential for making a number of incremental changes to the frequency standards subject to:

- undertaking an assessment of the economic merits of doing so; and
- after carrying out a review of the Tasmanian under frequency load shedding scheme (UFLSS) and over frequency generator shedding scheme (OFGSS)<sup>9</sup> in order to confirm the technical feasibility of the changes.

The incremental changes that NEMMCO identified as provisionally feasible are:

- tightening the minimum allowable frequency for a generation event from “47.5 Hertz (Hz)” to “48 Hz”;
- tighten the allowable frequency band for a network event from “47.5 Hz to 53 Hz” to “48 Hz to 52 Hz”;
- tighten the allowable frequency band for a multiple contingency event from “46 Hz to 55 Hz” to “46.5 Hz to 53.5 Hz”;
- relaxing the minimum allowable frequency for a load, generator or network event in an “electrical island” from “47.5 Hz” to “47 Hz”; and
- tighten the allowable frequency band for a multiple contingency event in an “electrical island” from “46 Hz to 60 Hz” to “46.5 Hz to 54 Hz”.

Under clause 9.49.4(a)(2) of the Rules, the Panel is required to have regard to the principle that the costs and benefits of any proposed change to the Tasmanian

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<sup>9</sup> The two schemes are, respectively, designed to disconnect customer load if the power system frequency becomes too low and disconnect generators if the frequency becomes too high. The UFLSS is currently in operation and the TRNPP indicated that the OFGSS is expected to be commissioned in early April.

frequency standards are taken into account in making its determination. The Panel notes that, in principle, narrowing the range of allowable frequencies would be likely to reduce the costs of future generation assets. It may also result in lower costs to particular customers. However, the Panel agrees with NEMMCO that narrowing the frequency range would require additional ancillary services and notes that the quantum, and associated costs and benefits, of acquiring those services have yet to be assessed by any party.

The Panel considers that a phased approach to determining the Tasmanian frequency standards is appropriate in the circumstances. In its draft determination the Panel proposed to:

- adopt the current Tasmanian frequency standards set out in the TRNPP's March 2006 determination as the standards that will apply in Tasmania from 30 May 2007 (summarised in Tables 1 and 2 below and reproduced in full in Appendix B); and
- consider the opportunities for further alignment of the Tasmanian frequency standards with the NEM standards in an additional review to be undertaken within the next twelve months.

That additional review:

- will include a cost benefit analysis of any proposed changes;
- will, as noted by NEMMCO in its advice, benefit from a period of experience of the Tasmanian market once Basslink has commenced operation as well as an updated NEMMCO Statement of Opportunities and Annual National Transmission Statement;
- is expected to draw on work to be undertaken by NEMMCO in relation to the Tasmanian OFGSS and UFLSS; and
- will be conducted according to the principles under the Rules that apply to the current review.

The submissions received by the Panel supported its draft determination.

In its submission the TRNPP suggested that the cost-benefit analysis (CBA) should be performed within twelve months. Hydro Tasmania suggested that, prior to performing the CBA, at least twelve months of Basslink operational experience would be needed to include a full annual cycle of weather and system conditions, which was the overwhelming view of the participants at the hearing. The Panel agrees that a robust analysis is required and will consider commencing that review in approximately twelve months from the publication of this determination. In conducting that review, the Panel will seek updated advice from NEMMCO.

The TRNPP also advised that under the Tasmanian Electricity Code it is required to review the Tasmanian frequency standard annually. It therefore intends to perform one more review prior to 30 May 2007 when the Reliability Panel's current determination on the frequency standards that apply in Tasmania takes effect (Rules clause 9.49.1).

Each of the submissions received by the Panel raised issues that relate to performing the future review of the Tasmanian frequency standards, including exploring:

- relaxing the load event frequency band if there sufficient FCAS savings; and
- the benefits of asymmetrical frequency bands.

The Panel notes these issues and, on the basis that all parties who made submissions support conducting a CBA in approximately twelve months time, will take these matters into account when undertaking that review.

The Panel's determination in relation to the Tasmanian frequency standards is therefore to:

- adopt the frequency standard as determined by the TRNPP; and
- commence a CBA to assess the potential to align the Tasmanian frequency standards with those in the remainder of the NEM in approximately 12 months.

Table 1 presents the frequency standards determined by the Panel other than in relation to "electrical islands". Islands occur where one part of the power system is isolated from the rest of the system. Table 2 presents the frequency standards that will apply in respect of those electrical islands and are to take effect from the commissioning of the proposed Tasmanian OFGSS.

Table 1: Determination as to the Tasmanian frequency standards

CONDITION	CONTAINMENT	STABILISATION	RECOVERY
Accumulated time error	15 seconds		
No contingency event or load event	49.75 to 50.25 Hz, 49.85 to 50.15 Hz 99% of the time	49.85 to 50.15 Hz within 5 minutes	
Load event	49.0 to 51.0 Hz	49.85 to 50.15 Hz within 10 minutes	
Generation event	47.5 to 51.0 Hz	49.85 to 50.15 Hz within 5 minutes	
Network event	47.5 to 53.0 Hz	49.0 to 51.0 Hz within 1 minute	49.85 to 50.15 Hz within 5 minutes
Separation event	46 to 55 Hz	47.5 to 51.0 Hz within 2 minutes	49.85 to 50.15 Hz within 10 minutes
Multiple contingency event	46 to 55 Hz	47.5 to 51.0 Hz within 2 minutes	49.85 to 50.15 Hz within 10 minutes

Table 2: Determination as to the frequency standards for islands within Tasmania

CONDITION	CONTAINMENT	STABILISATION AND RECOVERY	
No contingency event, or load event	49.0 to 51.0 Hz		
Generation event or network event	47.5 to 53.0 Hz (Note)	49.0 to 51.0 Hz within 5 minutes	
Load event	47.5 to 53.0 Hz (Note)	49.0 to 51.0 Hz within 10 minutes	
The separation event that formed the island	46 to 60 Hz	47.5 to 53.0 Hz within 2 minutes	49.0 to 51.0 Hz within 10 minutes
Multiple contingency event including a further separation event	46 to 60 Hz	47.5 to 53.0 Hz within 2 minutes	49.0 to 51.0 Hz within 10 minutes

**Note** Where it is not feasible to schedule sufficient frequency control ancillary services to limit frequency excursions to within this range, operation of the UFLSS or OFGSS is acceptable on the occurrence of a further contingency event.

## 5 Conclusion

The Panel considers that a phased approach to determining the Tasmanian reliability and frequency standards is appropriate. The Panel's determination is therefore to:

- adopt the Tasmanian reliability standard set out in the TRNPP's November 2005 determination (reproduced in Appendix A) as the standard that will apply in Tasmania from the date of publication of this determination. In doing so, the Panel notes that the Tasmanian standard is generally consistent with the current national reliability standard;
- adopt the current Tasmanian frequency standards set out in the TRNPP's March 2006 determination (reproduced in Appendix B) as the standards that will apply in Tasmania from 30 May 2007; and
- consider the opportunities for further alignment of the Tasmanian frequency standards with the NEM standards in an additional review to be undertaken within the next twelve months. That review will include a full cost benefit analysis of any proposed changes, will benefit from experience of the Tasmanian market once Basslink has commenced operation, is expected to draw on work to be undertaken by NEMMCO in relation to the Tasmanian automated frequency management schemes, and will be conducted according to the principles under the Rules that apply to the current review.

The issue of reliability of supply across the NEM as a whole is being addressed by the Panel in its Comprehensive Reliability Review. That review is due to be completed by 31 March 2007. The Panel notes that the consultation and analysis to be undertaken as part of that review may have a bearing on the Tasmanian reliability standard.



# Appendix A: Tasmanian Reliability Standard

The reliability standard is as follows:

## **Contingency capacity reserve standard**

Not expressly set, taking into account the processes NEMMCO has in place to acquire and schedule sufficient ancillary services to cover the critical single credible contingency events to meet frequency standards.

## **Short and medium term capacity reserve standard**

The short and medium term capacity reserve standard is the size of the most critical single credible contingency event possible on the Tasmanian Power System. This could be due to either the disconnection of one operating generating unit or the disconnection of one major item of transmission plant.

## **Unserved energy standard**

Unserved energy resulting from the failure of generating equipment is not to be more than 0.002 per cent per annum.

# Appendix B: Tasmanian Frequency Standards

## Part A Summary of the Standards

The *frequency operating standards* set out in Part B are summarised in the following tables for convenience. To the extent of any inconsistency between these tables and Part B below, Part B prevails.

The following table applies to any part of the Tasmanian *power system*, other than an *island*:

CONDITION	CONTAINMENT	STABILISATION	RECOVERY
Accumulated time error	15 seconds		
No contingency event or load event	49.75 to 50.25 Hz, 49.85 to 50.15 Hz 99% of the time	49.85 to 50.15 Hz within 5 minutes	
Load event	49.0 to 51.0 Hz	49.85 to 50.15 Hz within 10 minutes	
Generation event	47.5 to 51.0 Hz	49.85 to 50.15 Hz within 5 minutes	
Network event	47.5 to 53.0 Hz	49.0 to 51.0 Hz within 1 minute	49.85 to 50.15 Hz within 5 minutes
Separation event	46 to 55 Hz	47.5 to 51.0 Hz within 2 minutes	49.85 to 50.15 Hz within 10 minutes
Multiple contingency event	46 to 55 Hz	47.5 to 51.0 Hz within 2 minutes	49.85 to 50.15 Hz within 10 minutes

The following table applies to an *island* within the Tasmanian *power system*, with effect from the date of OFGSS commissioning:

CONDITION	CONTAINMENT	STABILISATION AND RECOVERY	
No contingency event, or load event	49.0 to 51.0 Hz		
Generation event or network event	47.5 to 53.0 Hz (Note)	49.0 to 51.0 Hz within 5 minutes	
Load event	47.5 to 53.0 Hz (Note)	49.0 to 51.0 Hz within 10 minutes	
The separation event that formed the island	46 to 60 Hz	47.5 to 53.0 Hz within 2 minutes	49.0 to 51.0 Hz within 10 minutes
Multiple contingency event including a further separation event	46 to 60 Hz	47.5 to 53.0 Hz within 2 minutes	49.0 to 51.0 Hz within 10 minutes

**Note** Where it is not feasible to schedule sufficient frequency control ancillary service to limit frequency excursions to within this range, operation of the UFLSS or OFGSS is acceptable on the occurrence of a further contingency event.

## Part B The Frequency Standards

For the purposes of the *Rules*, the *frequency operating standards*, forming part of the *power system security and reliability standards*, that apply in Tasmania are:

- (a) except in an island, the accumulated time error should not exceed 15 seconds;
- (b) except as a result of a contingency or a load event, system frequency should not exceed the applicable normal operating frequency excursion band and should not exceed the applicable normal operating frequency band for more than five minutes on any occasion and for not more than 1% of the time over any 30 day period;
- (c) as a result of a generation event, system frequency should not exceed the applicable generation change band and should not exceed the applicable normal operating frequency band for more than five minutes;
- (d) as a result of a load event, system frequency should not exceed the load change band and should not exceed the applicable normal operating frequency band for more than 10 minutes;
- (e) as a result of any network event, system frequency should not exceed the applicable operational frequency tolerance band and should not exceed the applicable load change band for more than one minute or the applicable normal operating frequency band for more than five minutes.
- (f) as a result of any separation event, system frequency should not exceed the applicable island separation band and should not exceed the applicable load change band for more than two minutes or the applicable normal operating frequency band for more than 10 minutes.
- (g) as a result of any multiple contingency event, system frequency should not exceed the applicable extreme frequency excursion tolerance limits and should not exceed the applicable load change band for more than two minutes while there is no contingency event or the applicable normal operating frequency band for more than 10 minutes while there is no contingency event.

## Part C Application of Rules Terms

For the purposes of these *frequency operating standards* and the *Rules*, a term shown in Column 1 of the following table has the corresponding range shown in Column 3 of the table for an *island* and has the corresponding range shown in Column 2 of the Table otherwise.

Column 1	Column 2	Column 3
Term	Normal range (Hz)	Island range (Hz)
Normal operating frequency band	49.85 to 50.15	49.0 to 51.0
Normal operating frequency excursion band	49.75 to 50.25	49.0 to 51.0
Operational frequency tolerance band	47.5 to 53.0	47.5 to 53.0
Extreme frequency excursion tolerance limits	46.0 to 55.0	46.0 to 60.0

## Part D Definitions

Words and phrases shown in *italics* in this document have the meaning given to the in the following table:

Term	Reference	Meaning
Accumulated time error		means, in respect of a measurement of system frequency that NEMMCO uses for controlling system frequency, the integral over time of the difference between 20 milliseconds and the inverse of that system frequency, starting from a time published by NEMMCO
Rules		means National Electricity Rules
Connection point	Glossary - NER	The agreed point of supply established between Network Service Provider(s) and another Registered Participant, Non-Registered Customer or franchise customer.
Contingency event	Clause 4.2.3(a) – NER	A “contingency event” means an event affecting the power system which NEMMCO expects would be likely to involve the failure or removal from operational service of a generating unit or transmission element.
Credible contingency event	Clause 4.2.3(b), Schedule 5.1 – NER	A “credible contingency event” means a contingency event the occurrence of which NEMMCO considers to be reasonably possible in the surrounding circumstances including the technical envelope. Without limitation, examples of credible contingency events are likely to include:  the unexpected automatic or manual disconnection of, or the unplanned reduction in capacity of, one operating generating unit; or  the unexpected disconnection of one major item of transmission plant (e.g. transmission line, transformer or reactive plant) other than as a result of a three phase electrical fault anywhere on the power system.
Extreme frequency excursion tolerance limits	Glossary - NER	In relation to the frequency of the power system, means the limits so described and specified in the power system security and reliability standards.
Generating unit	Glossary - NER	The actual generator of electricity and all the related

Term	Reference	Meaning
		equipment essential to its functioning as a single entity.
Generation	Glossary - NER	The production of electrical power by converting another form of energy in a generating unit.
Generation change band		means the frequency range of 47.5 to 53.0 Hz in respect of an island and the frequency range of 47.5 to 51.0 Hz otherwise.
Generation event		means a synchronisation of a generating unit of more than 50 MW or a credible contingency event in respect of either a single generating unit or a transmission element solely providing connection to a single generating unit, not arising from a network event, a separation event or a part of a multiple contingency event.
Interconnector	Glossary - NER	A transmission line or group of transmission lines that connects the transmission networks in adjacent regions.
Island		means a part of the Tasmanian <i>power system</i> that includes <i>scheduled generation, networks</i> and <i>load</i> for which all of its alternating current network connections with other parts of the <i>power system</i> have been disconnected
Island separation band		means the extreme frequency excursion tolerance limits
Load	Glossary - NER	A connection point or defined set of connection points at which electrical power is delivered to a person or to another network or the amount of electrical power delivered at a defined instant at a connection point, or aggregated over a defined set of connection points
Load change band		means the frequency range of 47.5 to 53.0 Hz in respect of an island and the frequency range of 49.0 to 51.0 Hz otherwise.
Load event		means an either an identifiable increase or decrease of more than 20 MW of customer load (whether at a connection point or otherwise), or a rapid change of flow by a high voltage direct current interconnector to or from 0 MW for the purpose of starting, stopping or reversing its power flow, not arising from a network event, a generation event, a separation event or a part of a multiple contingency event
Market network service provider	Glossary - NER	A Network Service Provider who has classified any of its network services as a market network service in accordance with Chapter 2 and who is also registered by NEMMCO as a Market Network Service Provider under Chapter 2.
Multiple contingency event		means either a contingency event other than a credible contingency event, a sequence of credible contingency events within a period of 5 minutes, or a further separation event in an island
National grid	Glossary - NER	The sum of all connected transmission and distribution systems within the participating jurisdictions

<b>Term</b>	<b>Reference</b>	<b>Meaning</b>
NEMMCO	Glossary - NER	National Electricity Market Management Company Limited A.C.N. 072 010 327.
Network	Glossary - NER	The apparatus, equipment, plant and buildings used to convey, and control the conveyance of, electricity to customers (whether wholesale or retail) excluding any connection assets. In relation to a Network Service Provider, a network owned, operated or controlled by that Network Service Provider
Network event		means a credible contingency event other than a generation event, a separation event or a part of a multiple contingency event
Normal operating frequency band	Glossary - NER	In relation to the frequency of the power system, means the range 49.9Hz to 50.1Hz or such other range so specified in the power system security and reliability standards.
Normal operating frequency excursion band	Glossary - NER	In relation to the frequency of the power system, means the range specified as being acceptable for infrequent and momentary excursions of frequency outside the normal operating frequency band, being the range of 49.75 Hz to 50.25 Hz or such other range so specified in the power system security and reliability standards.
Operational frequency tolerance band	Glossary - NER	The range of frequency within which the power system is to be operated to cater for the occurrence of a contingency event as specified in the power system security and reliability standards.
Power system	Glossary - NER	The electricity power system of the national grid including associated generation and transmission and distribution networks for the supply of electricity, operated as an integrated arrangement.
Power system security and reliability standards	Glossary - NER	The standards governing power system security and reliability of the power system which are approved by the Reliability Panel on the advice of NEMMCO. They may include but are not limited to standards for the frequency of the power system in operation, contingency capacity reserves (including guidelines for assessing requirements and utilisation), short term capacity reserves, medium term capacity reserves and system restart.
Publish	Glossary - NER	Make available to Registered Participants electronically.
Separation event		means a credible contingency event in relation to a transmission element that forms an island.
Synchronisation	Glossary - NER	The act of synchronising a generating unit or a scheduled network service to the power system.
System frequency		means the frequency of a part of the power system, including the frequency of an island.
Technical envelope	NER Clause 4.2.5	means the technical boundary limits of the power system for achieving and maintaining a secure operating state of the power system for a given demand and power system scenario.

Term	Reference	Meaning
Transmission line	Glossary NER	A power line that is part of a transmission network.
Transmission element	Glossary - NER	A single identifiable major component of a transmission system involving: (a) an individual transmission circuit or a phase of that circuit; (b) a major item of transmission plant necessary for the functioning of a particular transmission circuit or connection point (such as a transformer or a circuit breaker).
Transmission network	Glossary - NER	<p>A network within any participating jurisdiction operating at nominal voltages of 220 kV and above plus:</p> <p>any part of a network that operates at nominal voltages between 66 kV and 220 kV that operates in parallel to and provides support to the high voltage transmission network;</p> <p>any part of a network that operates at nominal voltages between 66 kV and 220 kV that is not referred to in paragraph (a) but is deemed by the AER to be part of the transmission network.</p>