Reliability Panel
AEMC

REVIEW

Reliability Panel AEMC

DRAFT REPORT

Review of the Operational Arrangements for the Reliability Standard

30 October 2009

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About the AEMC

The Council of Australian Governments, through its Ministerial Council on Energy, established the Australian Energy Market Commission (AEMC) in July 2005 to be the Rule maker for national energy markets. The AEMC is currently responsible for Rules and policy advice covering the National Electricity Market and elements of the natural gas markets. It is a statutory authority. Its key responsibilities are to consider Rule change proposals, conduct energy market reviews and provide policy advice to the Ministerial Council on Energy as requested, or on AEMC initiative.

About the AEMC Reliability Panel

The Panel is a specialist body within the AEMC and comprises industry and consumer representatives. It is responsible for monitoring, reviewing and reporting on the safety, security and reliability 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.

Disclaimer

The views and recommendations set out in this document are those of the Reliability Panel and are not necessarily those of the AEMC.

Reliability Panel Members

Chairman

Ian C Woodward, Commissioner, Australian Energy Market Commission

Other AEMC Reliability Panel Members

Gavin Dufty, Manager Policy and Research, St Vincent de Paul Society, Victoria

Hugh Gleeson, Chief Executive Officer, United Energy

Mark Grenning, Chief Advisor Energy, Rio Tinto

Gordon Jardine, Chief Executive, Powerlink

Tim O'Grady, Head of Public Policy, Origin Energy

Stephen Orr, Commercial Director, International Power Australia

Brian Spalding, Executive General Manager Operations, AEMO

Contents

Abbreviations and Glossary

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
CPT	Cumulative price threshold
CRR	Comprehensive Reliability Review
DSP	Demand side participation
EAAP	Energy Adequacy Assessment Projection
ESOO	Electricity Statement of Opportunities
FODWG	Forced Outage Data Working Group
FOR	Forced outage rate
LOR	Lack of Reserve (see clause 4.8.4(b), (c) and (d) of the Rules)
LRC	Low Reserve Condition (see clause 4.8.4(a) of the Rules)
MCE	Ministerial Council on Energy
MD	Maximum demand
MPC	Market price cap
MRL	Minimum Reserve Level
MW	Megawatt
NEL	National Electricity Law
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NEO	National electricity objective
NTS	National Transmission Statement
NSP	Network Service Provider
Panel	AEMC Reliability Panel
PASA	Projected Assessment of System Adequacy
PDF	Probability distribution function
POE	Probability of Exceedence (defined in the SOO glossary)
Regulations	National Electricity Regulations
RERT	Reliability and Emergency Reserve Trader (see Rule 3.20)
RERT Guidelines	Guidelines developed under clause 3.20.8 of the Rules
RERT Procedures	Procedures developed under clause 3.20.7(e) of the Rules
Rules	National Electricity Rules
USE	Unserved energy
VoLL	Value of Lost Load

Executive Summary

In December 2007 the AEMC Reliability Panel (Panel) completed its Comprehensive Reliability Review (CRR)[1] of reliability in the National Electricity Market (NEM). The CRR contained a number of recommendations including that it should:

- undertake a formal consultation under the Rules for the "Guidelines for management of electricity supply shortfall events" which were issued by the Panel in 1998;
- request AEMO[2] to conduct a review of the level of short term reserves that should be used in the short term PASA; and
- establish a taskforce to look specifically at the methodology and process for calculating Minimum Reserve Levels (MRLs), especially where the MRLs are applied across more than one jurisdiction.[3]

On 29 and 30 January 2009 there were reliability incidents in Victoria and South Australia that resulted in involuntary load shedding.[4] Following these events the Ministerial Council on Energy (MCE) stated that it would request the AEMC to "review energy market frameworks in light of the impact on electricity supplies of the extreme heat wave of 29-31 January 2009".[5]

On 3 March 2009 the AEMC issued the Panel with Terms of Reference for the "Review of the operational arrangements of the reliability settings and Reliability standard and settings review".[6] The Panel was requested to review the operationalisation of the Reliability Standard including:

- the methodology and process used by AEMO for calculating the minimum reserve levels (MRLs), especially where the MRLs apply across more than one jurisdiction;
- the MRLs and associated arrangements and standards to be used in the short-term reserve assessment of reliability;

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1 The Panel's Comprehensive Reliability Review was completed in December 2007. Information about the CRR is available on the AEMC website at http://www.aemc.gov.au/Market-Reviews/Completed/Comprehensive-Reliability-Review.html

2 At the time the Panel published the CRR, NEMMCO was the entity responsible for the operation of the national electricity market and national electricity system. From the 1 July 2009 this responsibility was taken over by AEMO.

3 Page xvi of the CRR.

4 On the evening of 30 January there was also a system security incident that resulted in involuntarily load shedding. In addition there were also a number of distribution system failures interrupting customers.

5 Ministerial Council on Energy, *Communiqué*, Canberra, 6 February 2009.

6 The AEMC's terms of reference for the Panel are available at http://www.aemc.gov.au/Market-Reviews/Open/Review-of-Operationalisation-of-the-Reliability-Standards.html

- the current "Guidelines for management of electricity supply shortfall events" (sometimes referred to as 'share the pain' guidelines) that were issued by the Panel in September 1998;

- the need for and possible design of a short-term version of the reliability and emergency reserve trader (RERT) that could be used in a critical emergency;

- whether the wording of the standard as published by the Panel in the CRR could be clarified to give better guidance to AEMO as to how to operationalise the standard; and

- whether the Rules should be amended to clarify the requirement for market participants to inform AEMO, via dispatch bids or offers, of their actual capability under the prevailing or forecast temperature conditions.

The AEMC requested that the Panel aim to complete its review into the operationalisation of the Reliability Standard by the end of December 2009.

The Panel intends that the recommendations of this "Review of the Operational Arrangements for the Reliability Standard" should take effect as soon as practical after the completion of the review.

Issues Paper

On 26 June 2009, the Panel published an Issues Paper in relation to the operational arrangements for the Reliability Standards. The Issues Paper:

- described the Reliability Standard;

- described the operational arrangements currently in place to implement the standard; and

- sought stakeholders comments on aspects of the current operational arrangements, including specific issues that were identified previously.

The Panel held a Stakeholder Forum on the Issues Paper on 13 July 2009. The forum included a presentation from AEMO on its methodology for calculating MRLs and on the short-term reserve arrangements.

Submissions on the Issues Paper were due on 31 July 2009. The Panel received submissions from the National Generators Forum (NGF), the Major Energy Users (MEU) and the Victorian Distribution Businesses.

The Reliability Standard and its Operational Arrangements

Under the Reliability Standard the NEM should aim to achieve an expected unserved energy (USE) of no more than 0.002% in each financial year, each region and in the NEM as a whole. Compliance with the Reliability Standard is measured over the most recent ten financial years. This has several implications to the operationalisation of the Standard:

- there is not a direct link between the real time operation of the spot market, which operates using a dispatch interval of five minutes and a trading interval of thirty minutes, and the Reliability Standard, which is a long-term probabilistic measure of performance;

- the levels of reserve capacity in the NEM are determined at a given point in time of interest while the adequacy of these reserves is measured annually and averaged over ten years; and

- the amount of USE in any given year is likely to be zero, based on historical observations and market simulations (for a given scenario of generator outages), but any single reliability incident may result in a relatively large amount of involuntary load shedding.

In the NEM the Reliability Standard is operationalised through:

- the spot price envelope is designed to signal sufficient investment to meet demand, where the envelope is defined by the reliability settings, which consists of the level of the market price cap (MPC)[7], the market floor price and the cumulative price threshold (CPT) ;

- the calculation of MRLs that provide AEMO with an operational indicator as to whether each NEM region is expected to meet the Reliability Standard;

- providing the market with projections of whether there are sufficient reserves (the level of supply in excess of demand) in each region over time frames from real time to ten years;

- market intervention by AEMO, where allowed by the Rules, in the form of direction powers and the RERT; and

- assessment of the energy adequacy of generation to meet demand via the drought studies which will be replaced by the Energy Adequacy Assessment Projection (EAAP) process from March 2010.[8]

Methodology for Calculating MRLs

AEMO uses time sequential Monte Carlo simulation techniques to calculate the MRLs that are required to achieve the Reliability Standard. These simulations model the operation of the NEM including:

- network power transfer capability as defined by system normal network constraint equations;

- both typical[9] and one in ten year maximum demand conditions; and

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7 The MPC was previously known as the Value of Lost Load (VoLL).

8 The EAAP is defined in Rule 3.7C and is discussed in section 2.4.2 of this Issues Paper.

- planned and random unplanned outages of generating units and interconnector capability.

An overview of AEMO's methodology to calculate the MRLs is provided in the Electricity Statement Of Opportunities (ESOO).[10] A more detailed description is provided in its 2006 MRL assessment.[11] The Panel sought stakeholders' views on the methodology.

The Panel's draft recommendations are that AEMO:

- consider an extreme weather and a 90% POE maximum demand scenario in addition to the 10% and 50% POE maximum demand scenarios it currently considers;

- considers developing the ability to use dynamic joint regional reserve requirements, where reserves can be shared between regions, as this would improve the quality of the information provided by medium-term PASA; and

- continue to use the existing process of using MRLs in medium-term PASA as the primary method for assessing reliability in the medium-term, but use the EAAP to inform the medium-term PASA results, particularly when AEMO considers intervening using the RERT.

The Panel is not recommending any specific changes to AEMO's approach to load diversity or the modelling wind generator output.

Short-term Reserve Assessment of Reliability

As indicated in the CRR, the Panel wrote to NEMMCO on 29 January 2008 requesting that it conduct a review of the factors that affect the short-term assessment of reliability. On 21 October 2008 NEMMCO provided its report, which was prepared with the assistance of ROAM Consulting[12], to the Panel. NEMMCO's report is published as an accompanying document to this Issues Paper.

The NEMMCO report:

- summarises the current practice for short term reliability assessment;

- sets out the relationship between MRLs and the Reliability Standard;

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9 Typical maximum demand conditions are the conditions that occur at the time of maximum demand in a year that is not unusually hot or unusually mild, as denoted by the 50% probability of exceedence (POE) maximum demand projections in the SOO.

10 Section 5.2.1 of the 2009 AEMO ESOO.

11 "Minimum Reserve Level Recalculation 2006", available on the AEMO website.

12 "Assessment of Short-Term Reliability" prepared by NEMMCO with the assistance of ROAM Consulting, published by the Panel as an accompanying document to this Issues Paper.

- provides an indication of the impact of reduced uncertainties regarding generator availability and load forecasts on the assessment of reserve adequacy in the short term time-frame;

- provides a limited review of overseas practice regarding assessment of reliability; and

- presents options for alternative intervention triggers to maintain reliability in the short term time-frame.

The Panel sought stakeholders' views on the short-term reserve arrangements and is seeking further information from AEMO and ROAM on options for the way forward. This will include considering specific options for the form of the short term intervention trigger and a proposed work program. The Panel will report on this as part of its final report for this review.

Guidelines for Management of Electricity Supply Shortfall Events

The current guidelines[13] that govern the "management of electricity supply shortfall events", otherwise known as the 'share the pain' guidelines were developed by the National Electricity Code Administrator (NECA) Reliability Panel in September 1998 and have remained unchanged since.[14]

TRUenergy proposed amendments to these guidelines in its submissions to the Panel's CRR.[15] TRUenergy considered that its amendments would better reflect 'equitable load shedding' for South Australia and Victoria. A description of TRUenergy's proposal is provided in Chapter 5 of this Issues Paper. In addition, AEMO proposed clarifications to the guidelines in the context of current market arrangements.

The Panel's draft recommendation is to amend the guidelines to reflect the changes proposed by AEMO but is not intending to make the changes proposed by TRUenergy.

The Panel anticipates that any amendments to the guidelines for management of electricity supply shortfall events would be adopted by 31 December 2009 and, consequently, could affect load shedding arrangements for the summer of 09/10 should an electricity supply shortfall event occur. The Panel notes that any changes to these guidelines could also affect future MRL determinations that are undertaken by AEMO.

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13 Appendix B contains a copy of the current guidelines that govern the management of electricity supply shortfall events.

14 The obligations and responsibilities of the Reliability Panel under NECA were transferred to the AEMC Reliability Panel at the commencement of the NEL.

15 Submissions to the CRR are available at http://www.aemc.gov.au/Market-Reviews/Completed/Comprehensive-Reliability-Review.html

Short-notice RERT for Critical Emergencies

Following the involuntarily load shedding events on 29 and 30 January 2009 in Victoria and South Australia, the MCE stated that the AEMC is to "review energy market frameworks in light of the impact on electricity supplies of the extreme heat wave of 29-31 January 2009".[16]

Therefore, the Panel investigated the operation of the current RERT with the objective of developing improvements that would facilitate AEMO contracting for reserves at short notice and that could be implemented for the summer of 2009/10. In particular, the Panel is proposing to increase the flexibility of the existing RERT arrangements by:

- clarifying that AEMO may operate a RERT panel;
- proposing a short-term process for when AEMO needs to enter into reserve contracts with short notice; and
- proposing that AEMO may use contracted reserves during system security events, to the extent that this is practical.

The Panel prepared an Exposure Draft of a Rule change proposal and interim amendments of the RERT Guidelines that it believes would implement these policy objectives. The Panel published the Exposure Draft[17] for consultation on 1 May 2009 to seek stakeholders' comments on:

- the policy contained in the Exposure Draft; and
- the proposed implementation of this policy in the Exposure Draft Rule and associated Exposure Draft of interim amendments for the RERT Guidelines.

Submissions on the Exposure Draft closed on Friday 29 May 2009 and the Panel received submissions from Ergon Energy, Energy Response, NEMMCO, the National Generators Forum (NGF), Origin Energy and the South Australian Government.

The Panel considered the views of stakeholders and submitted an amended Rule change proposal to the AEMC on 11 August 2009 as an urgent Rule. At that time, the Panel considered that this Rule needed to be expedited and include provisions for interim amendments to the RERT Guidelines and Procedures so that the short-notice RERT could be in place by September 2009 to allow AEMO several months before the 2009/10 summer to form a RERT panel.

16 Ministerial Council on Energy, 18th *Communiqué*, Canberra, 6 February 2009.

17 Further information on the Panel's Exposure Draft is available from the AEMC website at http://www.aemc.gov.au/Market-Reviews/Open/Review-of-Operationalisation-of-the-Reliability-Standards.html

On 15 October 2009 the AEMC published its determination on the Panel's Rule change proposal.[18] The AEMC determined to make the proposed Rule, with some minor drafting revisions. The Rule took effect from 15 October 2009.

Clarification of the Reliability Standard

The current definition of the Reliability Standard was developed by the Panel through stakeholder consultation and was published as part of the CRR.[19] The Reliability Standard is also reproduced in Appendix D of this Issues Paper. Since the publication of the CRR in December 2007:

- a number of power system incidents, including the involuntary load shedding incidents on 29 and 30 January 2009, have been assessed against the Reliability Standard; and
- AEMO has commenced a process to recalculate the medium term MRLs that are expected to apply before summer 2010/11.

In its Issues Paper, the Panel sought stakeholders' views on a number of clarifications to the wording of the Reliability Standard that are not intended to change the policy decisions made by the Panel as part of the CRR.

Obligations on market participants to inform AEMO of their actual capability under the prevailing or forecast temperature conditions

The Panel is consulting with the AER on whether the Rules should be amended to clarify the requirement for market participants to inform AEMO of their actual capability under the prevailing or forecast temperature conditions, including extreme weather conditions.

Reliability Standard and Setting Review

In addition this review, the Panel was also requested to commence a separate review of the Reliability Standard and settings by 30 April 2010.[20] This review will

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18 The AEMC's determination is available at http://www.aemc.gov.au/Electricity/Rule-changes/Open/Improved-RERT-Flexibility-and-Short-notice-Reserve-Contracts.html

19 "NEM Reliability Standard – Generation and Bulk Supply – December 2007" is contained in Appendix D of the CRR, December 2007, and is available from the AEMC website at http://www.aemc.gov.au/Market-Reviews/Completed/Comprehensive-Reliability-Review.html

20 The requirement was included in the Rules on 28 May 2009 as part of the National Electricity Amendment (NEM Reliability Settings: VoLL, CPT and Future Reliability Review) Rule 2009 No. 13. Information on this amendment is available on the AEMC website at http://www.aemc.gov.au/Electricity/Rule-changes/Completed/NEM-Reliability-Settings-VoLL-CPT-and-Future-Reliability-Review.html

determine the Reliability Standard for the NEM that will apply from 1 July 2012 and recommend the reliability settings[21] that should apply from this date.

The Panel encourages stakeholders to consider the issues raised in the Reliability Standard and Settings Review when preparing their submissions to this review.

AEMC Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events

The MCE requested the AEMC to, in the context of extreme weather events such as droughts, heat-waves, storms, floods and bushfires:

- examine the current arrangements for maintaining the security and reliability of supply to end users of electricity and provide a risk assessment of the capability of those arrangements to maintain adequate, secure and reliable supplies;
- provide advice on the effectiveness of, and options for, cost-effective improvements to current security and reliability arrangements; and
- if appropriate, identify any cost-effective changes to the market frameworks that may be available to mitigate the frequency and severity of threats to the security and reliability of the power system.[22]

On 14 August 2009, the MCE revised the terms of reference to require the AEMC to submit a second interim report providing specific advice on the reliability standard and the market mechanisms to achieve that standard.[23]

The Panel is also currently addressing some of these issues and will assist the AEMC undertake the review for the MCE. In particular:

- in this review the Panel is commenting on the interpretation of the Reliability Standard as a mean which is not to be exceeded over a number of years (see section 2.1), and
- in the Panel's Reliability Standard and Settings Review it is considering the future specification and interpretation of the Reliability Standard, and the price reliability trade-off.

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21 The reliability settings are the level of the Market Price Cap (MPC) , the market floor price and the Cumulative Price Threshold (CPT) which define the spot price envelope within which the wholesale spot market seeks to balance supply and demand.

22 AEMC Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events, Terms of Reference provided by the MCE and available at http://www.aemc.gov.au/Media/docs/MCE%20Request%20for%20Advice%20and%20Terms%20of%20Reference-8c6f5d2a-04eb-4894-ac01-94521af310d0-0.pdf

23 The revised Terms of Reference provided by the MCE are available at http://www.aemc.gov.au/Media/docs/MCE%20Request%20for%20Advice%20and%20Terms%20of%20Reference%20-%20Revised-20062b2f-1e57-4270-be5c-f7d67598121d-0.PDF

Submissions on the Draft Report

The Panel is seeking stakeholder submissions to this Issues Paper by Friday 27 November 2009.

1 Introduction

1.1 Context of this Review

1.1.1 Comprehensive Reliability Review

In December 2007 the AEMC Reliability Panel (Panel) completed its Comprehensive Reliability Review (CRR)[24] of the National Electricity Market (NEM) Reliability Standard and the associated mechanisms. In the CRR the Panel made a number of recommendations including that it should:

- undertake a formal consultation under the Rules for the 'Guidelines for management of electricity supply shortfall events' which was issued by the Panel in 1998;
- request NEMMCO to conduct a review of the level of short term reserves that should be used in the short-term projected assessment of system adequacy (PASA); and
- establish a taskforce to look specifically at the methodology and process for calculating minimum reserve levels (MRLs), especially where the MRLs are applied across more than one jurisdiction.

In January 2008 the Panel requested that NEMMCO provide it with advice in relation to level of short term reserves that should be used in the short term PASA. NEMMCO provided its advice to the Panel in October 2008. NEMMCO's advice is discussed further in Chapter 4.

1.1.2 Load shedding events in January 2009

On 29 and 30 January 2009 there were reliability incidents in Victoria and South Australia that resulted in involuntary load shedding.[25] Following these events the MCE stated that it would request the AEMC to "review energy market frameworks in light of the impact on electricity supplies of the extreme heat wave of 29-31 January 2009".[26]

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24 The Panel's Comprehensive Reliability Review was completed in December 2007. Information about the CRR is available on the AEMC website at http://www.aemc.gov.au/Market-Reviews/Completed/Comprehensive-Reliability-Review.html

25 On the evening of 30 January there was also a system security incident that resulted in involuntarily load shedding. In addition there were also a number of distribution system failures interrupting customers.

26 Ministerial Council on Energy, 18th *Communiqué*, Canberra, 6 February 2009.

1.1.3 AEMC Terms of Reference

On 3 March 2009 the AEMC issued the Panel with Terms of Reference for the "Review of the operational arrangements of the reliability settings and Reliability standard and settings review".[27] The Panel was requested to review the operationalisation of the Reliability Standard including:

- the methodology and process used by NEMMCO [28] for calculating the MRLs, especially where the MRLs apply across more than one jurisdiction;
- the MRLs and associated arrangements and standards to be used in the short-term reserve assessment of reliability;
- the current "Guidelines for management of electricity supply shortfall events" (sometimes referred to as 'share the pain' guidelines) that were issued by the Panel in September 1998;
- the need for and possible design of a short-term version of the RERT that could be used in a critical emergency;
- whether the wording of the standard as published by the Panel in the CRR could be clarified to give better guidance to NEMMCO as to how to operationalise the Reliability Standard; and
- whether the Rules should be amended to clarify the requirement for market participants to inform NEMMCO, via dispatch bids or offers, of their actual capability under the prevailing or forecast temperature conditions.

The AEMC requested that the Panel aim to complete its review into the operationalisation of the Reliability Standard by the end of December 2009.

In addition, the Panel is also requested to commence a Reliability Standard and Settings Review as proposed by the Panel in its Rule change proposal "NEM Reliability Settings: VoLL, CPT and Future Reliability Review".[29] Under clause 3.9.3A of the Rules, the Panel is required to complete this review by 30 April 2010, and conduct the review every two years after that. The Panel is performing the Reliability Standard and Settings Review as a separate review with the project reference code "REL0034".

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27 The AEMC's Terms of Reference for the Panel are available at http://www.aemc.gov.au/Market-Reviews/Open/Review-of-Operationalisation-of-the-Reliability-Standards.html

28 At the time the Issues Paper was published NEMMCO was the NEM market operator; however, from the 1 July 2009, the market operator became AEMO.

29 The AEMC's final determination on the "NEM Reliability Settings: VoLL, CPT and Future Reliability Review" Rule change was published on 28 May 2009, available on the AEMC website at http://www.aemc.gov.au/Electricity/Rule-changes/Completed/NEM-Reliability-Settings-VoLL-CPT-and-Future-Reliability-Review.html

1.1.4 Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events

The MCE requested the AEMC to, in the context of extreme weather events such as droughts, heat-waves, storms, floods and bushfires:

- examine the current arrangements for maintaining the security and reliability of supply to end users of electricity and provide a risk assessment of the capability of those arrangements to maintain adequate, secure and reliable supplies;
- provide advice on the effectiveness of, and options for, cost-effective improvements to current security and reliability arrangements; and
- if appropriate, identify any cost-effective changes to the market frameworks that may be available to mitigate the frequency and severity of threats to the security and reliability of the power system.[30]

On 14 August 2009, the MCE revised the terms of reference to require the AEMC to submit a second interim report providing specific advice on the reliability standard and the market mechanisms to achieve that standard.[31]

The Panel is also currently addressing some of these issues and will assist the AEMC undertake the review for the MCE. In particular:

- in this review the Panel is commenting on the interpretation of the Reliability Standard as a mean which is not to be exceeded over a number of years (see section 2.1), and
- in the Panel's Reliability Standard and Settings Review it is considering the future specification and interpretation of the Reliability Standard, and the price reliability trade-off.

1.2 Overview of the Issues Paper

Chapter 2 defines the NEM Reliability Standard and provides a summary of the AEMO processes to operationalise the Reliability Standard.

Chapter 3 discusses the methodology and process used by AEMO for calculating the MRLs, especially where the MRLs apply across more than one jurisdiction.

Chapter 4 discusses the MRLs and associated arrangements and standards to be used in the short-term reserve assessment of reliability.

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30 AEMC Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events, Terms of Reference provided by the MCE and available at http://www.aemc.gov.au/Media/docs/MCE%20Request%20for%20Advice%20and%20Terms%20of%20Reference-8c6f5d2a-04eb-4894-ac01-94521af310d0-0.pdf

31 The revised Terms of Reference provided by the MCE are available at http://www.aemc.gov.au/Media/docs/MCE%20Request%20for%20Advice%20and%20Terms%20of%20Reference%20-%20Revised-20062b2f-1e57-4270-be5c-f7d67598121d-0.PDF

Chapter 5 discusses the current "Guidelines for management of electricity supply shortfall events" (sometimes referred to as 'share the pain' guidelines) that were issued by the Panel in September 1998.

Chapter 6 discusses the need and possible design of a short-term version of the RERT that could be used in a critical emergency.

Chapter 7 discusses whether the drafting of the Reliability Standard as published by the Panel in the CRR could be clarified to give better guidance to AEMO as to how to operationalise the Standard.

The Panel is consulting with AEMO and the AER on whether the Rules should be amended to clarify the requirement for market participants to inform AEMO of their actual capability under the prevailing or forecast temperature conditions. The Panel is also seeking stakeholders' comments on this issue.

1.3 Consultation process

This review is likely to have important implications for NEM stakeholders, including generators, network service providers (NSPs), AEMO and the AER. The Panel plans to involve stakeholders by seeking initial comments and submissions on each of its draft decisions and holding a meeting during this review.

The following key dates outline the completed and intended Rules consultation process leading up to the delivery of the Panel's Final Report to the AEMC.

Date	Milestone
Publication of Issues Paper	26 June 2009
Public Forum	13 July 2009
Close of submissions on Issues Paper	31 July 2009
Publication of Draft Report	23 October 2009
Close of submissions on Interim Report	27 November 2009
Publication of Final Report	18 December 2009

1.4 Comments on the Issues Paper

The Panel held a Stakeholder Forum in the AEMC offices on 13 July 2009. The presentation given at the forum are available on the AEMC's website.

Submissions on the Issues Paper closed on 31 July 2009. The Panel received submissions from:

- The National Generators Forum (NGF);
- The Major Energy Users (MEU); and
- The Victorian Distribution Businesses (joint submission).

The submissions are available on the AEMC's website.

1.5 Submissions to the Draft Report

The Panel invites initial comments from interested parties in response to the Issues Paper by close of business on Friday 27 November 2009. Submissions may be sent electronically or by mail in accordance with the following requirements.

Lodging a submission electronically

Submissions must be lodged online through the AEMC's homepage using the link entitled "online lodgement". The email must cite the project reference code "REL0035". The submission must be on letterhead (if submitted on behalf of an organisation), signed and dated. The submission must be in PDF format, and must also be forwarded to the Panel via ordinary mail.

Upon receipt of the electronic version of the submission either via email or online lodgement, the Panel will issue a confirmation email. If this confirmation email is not received within 3 business days, it is the submitter's responsibility to ensure successful delivery of the submission has occurred.

Lodging a submission by mail

The submission must be on letterhead (if an organisation), signed and dated by the respondent. The submission should be sent by mail to:

The Reliability Panel

Australian Energy Market Commission

PO Box A2449

Sydney South NSW 1235

or by fax: (02) 8296 7899.

The envelope must be clearly marked with the project reference code: "REL0035".

Except in circumstances where the submission has been submitted electronically, upon receipt of the hardcopy submission the Panel will issue a confirmation letter. If this confirmation letter is not received within three business days, it is the submitter's responsibility to ensure successful delivery of the submission has occurred.

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2 Reliability Standard and its Operational Arrangements

2.1 The Reliability Standard

2.1.1 Definition of reliability in the NEM

Reliability in the NEM is a measure of the adequacy of the electricity generating systems and networks to meet the demand of consumers. Reliability depends on:

- whether there is sufficient generation available to a given region of the NEM to meet the consumer demand in that region; and
- the availability and adequacy of the transmission and distribution networks.

The focus of this review of reliability is on the former; that is, whether there is sufficient generation available to a region. The reliability of the transmission networks is, therefore, only considered to the extent that the size and availability of interconnectors affects the generation that is available from neighbouring regions to meet the demand of consumers in a given region.

The Reliability Standard was determined by the Panel as part of its CRR[32] and is reproduced in Appendix D of this Issues Paper.

2.1.2 Reliability Standard – form of the Standard

The form of the Reliability Standard is the method by which reliability is measured. The NEM Reliability Standard is an output-based measure expressed in terms of 'maximum permissible unserved energy (USE)'. This form of standard is also an expression of risk – the maximum allowable level of electricity at risk of not being supplied to consumers in any region.

The Panel considered a range of alternative measures of reliability in section 4.2 of its final CRR report.

2.1.3 Reliability Standard – level of the Standard

The level of the Reliability Standard specifies how much USE is acceptable as a percentage of annual demand. The level is currently set at a maximum of 0.002% of USE per annum over the long term.[33]

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[32] The Reliability Standard for Generation and Bulk Transmission is contained in Appendix D of the Final Comprehensive Reliability Review (CRR) report, which is available on the AEMC website at http://www.aemc.gov.au/Market-Reviews/Completed/Comprehensive-Reliability-Review.html

[33] Compliance with the Reliability Standard is measured over a ten year period.

The Panel considered the level of the Reliability Standard in section 4.3 of its final CRR report.

2.1.4 Reliability Standard – scope of the Standard

The scope of the Reliability Standard defines what does and does not count towards the NEM's reliability performance. In terms of the electricity supply chain, the Standard currently includes generation and bulk transmission capacity. The Standard excludes transmission and distribution networks that do not impact on interregional transfer capability. In terms of events, the Standard currently excludes power system security incidents[34] and exogenous incidents such as industrial action and terrorism.

The Panel considered the scope of the Reliability Standard in section 4.4 of its final CRR report.

2.1.5 Reliability Standard – measuring compliance with the standard

Compliance with the Reliability Standard should be measured over the long-term using a moving average of the actual observed levels of annual USE for the most recent ten financial years. Operationally, AEMO[35] should aim to achieve the Reliability Standard in each financial year, for each region and for the NEM as a whole.

This has several implications to the operationalisation of the standard:

- the NEM spot market operates using a dispatch interval of five minutes and a trading interval of thirty minutes, so there is not a straightforward link between the Reliability Standard and the real time operation of the spot market;
- the levels of reserve capacity in the NEM are determined at a given point of time of interest while the adequacy of these reserves is measured annually and averaged over ten years; and
- the amount of USE in any given year is likely to be zero, based on historical observations and market simulations, but any single reliability incident may result in a relatively large amount of involuntary load shedding.

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34 AEMO is required to operate the power system in a secure state such that if a single credible contingency occurs, such as the loss of a transmission line, loss of a generating unit or generating system, the system will continue to operate in a satisfactory manner. A power system security incident is said to occur if a non-credible contingency occurs or multiple contingencies occur. A major power system security event is often associated with involuntary disconnection of customer load by emergency control schemes or instructions from AEMO.

35 At the time the Issues Paper was published NEMMCO was the NEM market operator; however, from the 1 July 2009, the market operator became AEMO.

2.2 Market mechanisms to implement the Reliability Standard

The NEM uses an energy only market framework whereby all generation, and consumption, is valued at the spot price for that trading interval. That is, the spot price is the sole income to a generator[36] and provides price signals for the timing, form and location of investment in new generation, as well as demand side responses.

Therefore, the level of the market price cap (MPC)[37], the market floor price and the cumulative price threshold (CPT) arrangements define the spot price envelope within which the wholesale spot market seeks to balance supply and demand. The spot price envelope also seeks to deliver capacity to meet the NEM Reliability Standard with the aim of avoiding unmanageable risks for market participants.

The MPC is currently set at $10,000/MWh.[38] The market price floor is currently set at -$1,000/MWh. The level of the MPC is very important because it provides the key signal for supply and demand-side investment and usage. If the level of the MPC is set too high, consumers (either via their retailers or trading directly in the market themselves) and other market participants (including generators) can be exposed to excessive financial risks during periods of price volatility. If the level is set too low then there may be insufficient incentives to invest in new generation capacity and the Reliability Standard may not be met in the future.

The CPT is designed to limit participants' exposure to protracted stress in the wholesale spot market. It is currently set at $150,000.[39] The CPT is an explicit risk management mechanism whereby, if the sum of the trading interval spot prices over a rolling seven day period total or exceed this threshold, then AEMO must impose an administered price cap such that spot market prices do not exceed $300/MWh[40] until the sustained high prices fall away.[41]

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36 While it is true that the only source of income for a generating unit is from the spot prices in the NEM, most market participants enter into financial contracts with other participants to hedge their revenues or costs against the volatility of the spot prices.

37 The MPC was previously know as the Value of Lost Load (VoLL).

38 From the 1 July 2010 the level of the MPC is scheduled to increase to $12,5000/MWh as part of the *National Electricity Amendment (NEM Reliability Settings: VoLL, CPT and Future Reliability Review) Rule 2009 No. 13*, available at http://www.aemc.gov.au/Electricity/Rule-changes/Completed/NEM-Reliability-Settings-VoLL-CPT-and-Future-Reliability-Review.html

39 From the 1 July 2010 the level of the CPT is scheduled to increase to $187,500/MWh as part of the *National Electricity Amendment (NEM Reliability Settings: VoLL, CPT and Future Reliability Review) Rule 2009 No. 13*, available at http://www.aemc.gov.au/Electricity/Rule-changes/Completed/NEM-Reliability-Settings-VoLL-CPT-and-Future-Reliability-Review.html

40 "*Determination of Schedule for the Administered Price Cap*", AEMC, 20 May 2008, available on the AEMC website at http://www.aemc.gov.au/Market-Reviews/Completed/Determination-of-Schedule-for-the-Administered-Price-Cap.html

41 Clause 3.14.2 of the Rules defines the arrangements for application and removal of the administered price cap.

Under the current Rules[42], by 30 April every second year (starting in 2010) the Panel is required to conduct a review of Reliability Standards and Settings, which is the subject of another related review[43]. Under this review the Panel will, through stakeholder consultation and market analysis, make:

- a determination on the Reliability Standard; and
- recommendations for the levels of the MPC, the market floor price and the CPT to apply from 1 July 2012.

2.3 Minimum Reserve Levels (MRLs)

2.3.1 Need for a continuous criteria for system adequacy

As discussed above, the Reliability Standard is defined as a level of annual USE that is targeted every year and measured over ten years. However, to determine whether the NEM is likely to meet the Standard, operational and planning decisions are made on a continuous basis. To allow these continuous decisions to be made, it is necessary to convert the 0.002% USE standard into an equivalent MRL, such that, it is expected that the Reliability Standard will be met if the reserves in a given region exceed the MRL for that region. That is:

> "The minimum reserve levels provide AEMO with an operational indicator as to whether each NEM region is expected to meet the Reliability Standard. When a region's reserve margin falls below the minimum reserve level, AEMO may intervene in the market to maintain power system reliability."[44]

2.3.2 Calculating the MRLs

The MRL is defined in terms of the minimum level of installed generating capacity and interconnector support in excess of the 10% probability of exceedence (POE) maximum demand[45] in each region of the NEM required to achieve 0.002% expected USE in all regions simultaneously over a financial year.

While the Panel has specified the Reliability Standard, AEMO is responsible for determining the MRLs that would be expected, if achieved, to deliver the Reliability Standard. AEMO uses time sequential Monte Carlo simulation of the operation of the NEM to determine the MRLs that would be expected to deliver USE that is no worse than the 0.002% in each region over the medium to long-term. In particular, the Monte Carlo simulation represents the varying load over the financial year,

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42 "*NEM Reliability Settings: VoLL, CPT and Future Reliability*", 28 May 2009, available at http://www.aemc.gov.au/Electricity/Rule-changes/Completed/NEM-Reliability-Settings-VoLL-CPT-and-Future-Reliability-Review.html

43 The Panel's Reliability Settings and Standards Review has the reference code of REL0024.

44 Section 5.2 of the 2009 AEMO ESOO.

45 The definition of POE is provided in section 3.2.2 of this Issues Paper.

generator maintenance and random forced generator outages, and the transfer capability of the bulk transmission system.

More information on the methodology used by AEMO to determine the MRLs is provided in Chapter 3 of this report. The Panel is seeking stakeholders' views on AEMO's methodology to calculate the MRLs and their application in the AEMO market systems.

2.3.3 Statistical nature of the USE

Like real events in the actual power system, the distribution of USE for each different Monte Carlo scenario is random with some simulated years having more than 0.002% USE, while others have no USE over the simulated year. Therefore, even if more reserves are available than the MRLs determined by AEMO, there is no guarantee that the actual USE will not exceed 0.002% for any given region in any given year. However, on average, the level of USE is expected to be no worse than 0.002% USE.

2.4 Provision of Market Information

2.4.1 Purpose of the provision of market information

An important aspect of the operationalisation of the Reliability Standard is the provision of information to market participants and other stakeholders. Therefore, under the Rules AEMO operates a number of processes, over a range of time horizons, to inform the market of the current and projected levels of available reserves in relation to the MRLs. The purposes of these processes are to:

- inform market participants of periods of low reserves, which are expected to correspond to periods of high prices, in order to elicit a market response; and
- determine whether the available reserves are likely to be sufficient to meet the Reliability Standard and, where appropriate and allowed under the Rules, whether intervention is required to increase the available reserves.

2.4.2 AEMO processes for the provision of market information

The processes operated by AEMO for the provision of market information operate over a range of timeframes and include the following:

- Electricity Statement of Opportunities (ESOO) – capacity availability over ten years;
- medium-term PASA – capacity availability over two years;
- short-term PASA – capacity availability over one week;
- pre-dispatch – capacity availability and price over the next two days; and

- Energy Adequacy Assessment Projection (EAAP) – energy availability over two years.

Electricity Statement of Opportunities

The ESOO is prepared annually by AEMO and provides a ten year projection of the supply demand balance for both summer and winter maximum demand conditions. The ESOO includes projections of:

- the maximum summer and winter demands under different temperature and economic growth conditions;
- the available installed generation in each region;
- the available demand side response during periods of high demand; and
- the inter-regional transfer capability of the NEM transmission network.

Periods of low projected reserves in the ESOO indicate likely periods of high prices and, therefore, are expected to encourage investment in additional capacity in the associated regions.

Medium-term PASA

The medium-term PASA process calculates projected available reserves on a daily basis over the upcoming two year period. The medium-term PASA results are updated weekly and are based on the availability information provided by market participants such as generators.

The outputs of the medium-term PASA process are the reserve levels in each region. AEMO issues low reserve condition (LRC)[46] notices when it considers that the medium-term capacity reserves for the period being assessed have fallen below the MRLs required to meet the Reliability Standard.

Periods of low projected reserves in medium-term PASA indicate likely periods of high prices and, therefore, are expected to encourage market participants such as generators to make their capacity available by rescheduling maintenance. It is generally assumed that an investment decision in new generation capacity would not be affected by the medium-term PASA results as the lead time for such new generation capacity is likely to exceed the two year projection.

Short-term PASA

The short-term PASA process calculates projected available reserves on a trading interval basis over the upcoming week. The short-term PASA results are updated

[46] The requirements for LRC notices are described in clause 4.8.4(a) of the Rules.

every two hours and are based on the availability information provided by market participants such as generators.

The outputs of the short-term PASA process are the reserve levels in each region. AEMO issues:

- LRC notices when it considers the short-term capacity reserves for the period being assessed have fallen below MRLs; and
- lack of reserve (LOR) notices when it considers that the short-term capacity reserves for the period being assessed have fallen below that necessary to withstand one or two contingencies. [47]

The objective of the short-term PASA process is to determine whether intervention by AEMO is required in order to maintain reliability and security.

Chapter 4 of this Issues Paper provides further description of the short-term PASA process. In addition, the chapter includes a discussion on advice from AEMO on the reliability triggers used in short-term PASA.

Pre-dispatch

The pre-dispatch process calculates projected market outcomes on a trading interval basis from the next trading interval to the final trading interval of the day for which all dispatch bids and offers have been received. The objectives of the predispatch process are to:

- provide market participants with projections of spot prices and expected dispatch schedules to assist them to determine when to commit their generating units; and
- allow AEMO to issue LRC and LOR notices that also assist market participants' decision making.

Energy Adequacy Assessment Projection (EAAP)

The EAAP[48] is an information gathering and dissemination mechanism that was introduced to enable the market to forecast and respond to projected times where there may be energy constraints that would affect reliability. An example of such an energy constraint would be a drought that limits the generation from hydro generating units and thermal generating units that rely on cooling water from inland reservoirs.

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[47] The requirements for LOR1, LOR2 and LOR3 notices are described in paragraphs 4.8.4(b), (c) and (d) of the Rules. A further description of the LOR notices is also provided in Chapter 4 of this Issues Paper.

[48] Rule 3.7C describes the requirements for the EAAP. In addition, NEMMCO is developing EAAP Guidelines and more information is available at http://www.nemmco.com.au/powersystemops/408-0001.html

AEMO is required to publish the first EAAP by 31 March 2010 and publish subsequent EAAPs every three months thereafter. The EAAP will provide projected levels of USE for each region for a two year period with a monthly resolution.

The purpose of the EAAP results will be to inform stakeholders, including market participants, of periods of low energy availability. It is anticipated that periods of energy scarcity, and hence projected high energy prices, will solicit a market response such as rescheduling maintenance or reallocating scarce resources such as water for cooling or hydro generation.

Currently AEMO produces quarterly drought reports which study the potential impact of drought on the generating capacity of both hydroelectric and coal-fired plants operating in the NEM. The quarterly drought reports will be replaced by the EAAP from March 2010.

2.5 Intervention

The reliability safety net refers to AEMO's powers to intervene in the market to address potential shortfalls of supply against the NEM Reliability Standard. The Rules only allow AEMO to exercise these powers when it considers that there:

- has been a failure of the market to deliver sufficient reserves; or
- is a risk to the secure and safe operation of the NEM power system.

AEMO can intervene in the market either by:

- issuing directions or instructions under clause 4.8.9 of the Rules; or
- procuring additional reserves using the reliability and emergency reserve trader (RERT).

2.5.1 Directions and Instructions

Under clause 4.8.9 of the Rules:

> *AEMO* may require a *Registered Participant* to do any act or thing if *AEMO* is satisfied that it is necessary to do so to maintain or reestablish the *power system* to a *secure operating state,* a *satisfactory operating state,* or a *reliable operating state*.

Directions or instructions in relation to reliability are most likely to be:

- a direction to a generator to increase its output to the extent that this is physically possible and safe to do so; or
- an instructions to disconnect load during periods of low reserves if this is necessary to maintain the secure operation of the NEM power system.

2.5.2 Current RERT arrangements

Since the commencement of the NEM, AEMO has had the power to contract for additional reserve capacity (known as reserve trading) when it considers that the market has failed to deliver sufficient reserves to meet the MRLs and hence it is likely that the Reliability Standard will not be met. However, AEMO has only been able to exercise this power a few months prior to a projected shortfall of reserves to ensure that possible market responses have been exhausted.

In its final report of the CRR the Panel recommended redesigning the reserve trader arrangements as the RERT. Therefore, the Panel submitted a Rule change proposal to the AEMC that, amongst other things, established the RERT. The RERT was incorporated into the Rules on 26 June 2008.[49] In summary, under the RERT AEMO:

- monitors the medium-term PASA, and any other relevant information, to determine periods where the reserves are projected to be less than the MRL for that region;
- can procure contracted reserves up to nine months in advance of a projected shortfall of reserves;
- can dispatch[50] or activate[51] these contracted reserves if it is necessary in order to maintain a reliable operating state;
- should operate the RERT in a manner with the least distortionary impact on the operation of the energy only market; and
- should aim to maximise the cost effectiveness of reserve contracts.

The RERT has a sunset of 30 June 2012 and the Panel must review the ongoing operation of the RERT by 30 June 2011. Further discussion on reserve trading and the RERT is provided in Chapter 6 of this Issues Paper.

2.5.3 Short-notice RERT

As discussed in Chapter 1, the AEMC Terms of Reference includes a requirement on the Panel to review the need for and possible design of a short-term version of the RERT that could be used in a critical emergency.

Chapter 6 of this Issues Paper examines the Panel's proposed amendments to the RERT for situations where there is a little as three hours notice of a projected reserve shortfall.

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49 *National Electricity Market amendment (NEM Reliability Settings: Information, Safety Net and Directions) Rule 2008 No. 6*. is available at http://www.aemc.gov.au/Electricity/Rule-changes/Completed/NEM-Reliability-Settings-VoLL-CPT-and-Future-Reliability-Review.html

50 Reserves in relation to a scheduled generating unit, scheduled network service or scheduled load are said to be dispatched if they are used to maintain a reliable operating state.

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51 Reserves in an unscheduled generating unit or load are said to be activated if they are used to maintain a reliable operating state.

3 Methodology for Calculating the Minimum Reserve Levels

3.1 Context of the review

The Terms of Reference from the AEMC for this review requires the Panel to review the methodology and process used by NEMMCO[52] for calculating the MRLs, especially where the MRLs apply across more than one jurisdiction.

A review of the methodology and process used to calculate the MRLs was foreshadowed by the Panel in its CRR where it indicated its intention to establish a taskforce to review the methodology and process for calculating the MRLs.[53] The need to review this issue was also highlighted following the load shedding events that occurred on 29 and 30 January 2009.

3.2 Reliability, the Reserve Margin and the MRLs

3.2.1 Factors that affect the reliability of a region

The expected amount of USE in a given region for a given year, and hence the reliability as measured against the Reliability Standard, is dependent on a number of factors including:

- the level of generation available to a region;[54]
- the reliability of the generating units in the region, normally measured by the forced outage rate (FOR);
- the relative size of the generating units;[55]
- energy limitations impacting the available generation, including lack of water and fuel supply issues;
- the additional capacity that is available via interconnectors;
- the peak demand in the region;

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52 On 1 July 2009 NEMMCO ceased to exist and its functions were transferred to AEMO.

53 In the Executive Summary of the CRR Final Report the Panel stated that "the Panel should establish a taskforce to look specifically at the methodology and process for calculating Minimum Reserve Levels (MRLs), especially where the MRLs are applied across more than one jurisdiction. This taskforce will comprise of NEMMCO, industry and jurisdictional representation and would be chaired by a member of the Panel. It is intended that this recommendation also be undertaken in 2008."

54 The available generation needs to be on the same basis as the peak demand, including both scheduled and semi-scheduled generating units.

55 A small number of large generating units will generally produce a lower level of reliability because the impact of a single forced outage is much higher than for smaller generating units.

- the "peakiness" of the load; that is, whether the demand is near its annual peak much of the time;
- the demand side response at the time of the peak demand;
- network limitations impacting the ability of generation and interconnectors to supply the regional demand; and
- the impact of extreme weather conditions on the capability of transmission equipment and generating units.

3.2.2 Reserve margin

For typical generating units with typical forced outage rates, the impact of the factors identified in section 3.2.1 can be summarised as the level of generation capacity available to a region less the peak demand, that is, the reserves in a region.

The reserve margin in a region is defined as the difference between the allocated installed capacity (taking into account generation within the region and the capacity available from other regions through interconnectors) and the scheduled demand and committed demand side participation (DSP). [56] This can be expressed as:

$$\text{Reserve Level}_A = \sum\text{Available Generation} + \sum\text{I/C Support} + \sum\text{DSP} - \text{10\% POE Demand}$$

where:

- Available Generation is the level of installed available scheduled generating capacity that is physically located within the region;
- I/C Support is the level of additional supply provided to a region from surplus generation in adjoining regions through transmission interconnectors;
- I/C Support must be simultaneously feasible when assessing reserve levels across the NEM, meaning that it will be a negative number for the exporting region;
- DSP is demand side participation or dispatchable loads, which effectively reduce the demand at times of high price and a low reserve margin; and
- 10% POE Demand[57] is the forecast peak scheduled demand expected under the very hot[58] weather conditions that are expected once in ten years.

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56 Page 5-3 of the 2009 AEMO ESOO.

57 The NEMMCO "2008 Energy and Demand Projections Summary Report", which is available on the AEMO website, defines the percentage probability of exceedence (POE) as:
"The probability, as a percentage, that a maximum demand (MD) level will be met or exceeded (for example, due to weather conditions) in a particular period of time.
For example, for a 10% POE MD for any given season, there is a 10% probability that the corresponding 10% POE projected MD level will be met or exceeded. This means that 10% POE

Both the Available Generation and the 10% POE Demand need to be on the same basis. The output of scheduled and semi-scheduled generating units are treated as part of the Available Generation while the output of non-scheduled generating units are treated as an offset to the demand.

Scheduled and semi-scheduled demand

Following the introduction of the semi-scheduled generation class for intermittent generating units[59], such as wind farms, the medium-term PASA now assesses reserves by comparing the capacity of scheduled and semi-scheduled generation against the demand expected to be supplied by this group of generation (referred to as scheduled and semi-scheduled demand).

The AEMO 2009 SOO explains the process for calculating scheduled and semi-scheduled demand in more detail but, in short, it is no longer correct to just refer to scheduled demand or scheduled generation when discussing the reserve assessment performed by AEMO. The scheduled and semi-scheduled demand is calculated as the forecast native demand less the forecast contribution from significant non-scheduled generation.

3.2.3 Minimum Reserve Levels

The greater the level of generation available in a region, and hence the larger the reserve margin for the region, the lower the expected level of USE.

The MRL is defined as the reserve margin, measured above the 10% POE scheduled and semi-schedule maximum demand (MD) conditions, that is required to meet the Reliability Standard. The MRLs provide AEMO with an operational indicator as to whether each NEM region is expected to meet the Reliability Standard. When a region's reserve margin falls below the MRL, AEMO may intervene in the market to maintain power system reliability.[60] Therefore, the MRLs need to be sufficiently large to minimise the risk of not meeting the Reliability Standard while not leading to excessive or unnecessary interventions.

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projected MD levels for a given season are expected to be met or exceeded, on average, 1 year in 10."

A more detailed definition is available is available in section 3.7.2 of the 2009 AEMO ESOO.

58 In the case of a winter peak demand the 10% POE peak demand corresponds to the very cold weather expected every ten years.

59 National Electricity Amendment (Central Dispatch and Integration of Wind and Other Intermittent Generation) Rule 2008 No. 2. available at http://www.aemc.gov.au/Electricity/Rule-changes/Completed/Central-Dispatch-and-Integration-of-Wind-and-Other-Intermittent-Generation.html

60 Section 5.2 of the 2009 AEMO ESOO.

3.2.4 Current MRLs used in the NEM

Since the start of the NEM, NEMMCO has periodically recalculated the MRL wherever it considered that there has been a material change to the structure of the NEM or to the input assumptions.

The current MRLs used in the NEM were calculated by NEMMCO in 2006. The primary objectives of this assessment were to: [61]

- review the impact of the Basslink interconnector on the regional minimum reserve levels for the mainland;
- review the impact of Kogan Creek Power Station on the regional minimum reserve levels;
- assess the impact of applying the generator forced outage data developed throughout the Forced Outage Data Working Group (FODWG) work (discussed in section 3.4.2 of this Issues Paper); and
- provide a recommendation for revised minimum reserve levels for the 2006-07 and 2007-08 financial years.

The MRL requirements and the associated net import limits were reviewed in November 2007 with the abolition of the Snowy Region. [62] This resulted in revised net import limits but no change to the MRLs.

The MRLs used in the 2009 ESOO were:[63]

61 Minimum Reserve Level Recalculation 2006, available on the AEMO website.

62 Translation of Minimum Reserve Levels Following Abolition of the Snowy Region, 17 October 2007, available on the AEMO website.

63 Table 5.1 of the 2009 AEMO ESOO.

Region	Minimum Reserve Level (MW)
Queensland[1]	560 MW
New South Wales	-1430 MW
Victoria and South Australia [2]	615 MW
South Australia [1]	-50 MW
Tasmania	144 MW

Notes:

1. This is a local requirement. This means that the region must have sufficient available local scheduled and semi-schedule generation and local DSP to meet its 10% POE scheduled and semi-scheduled MD plus its minimum reserve level. For example, the -50 MW minimum reserve level in South Australia means that the South Australian region requires a minimum level of available local scheduled and semi-schedule generation plus DSP equal to its 10% POE scheduled and semi-schedule MD minus 50 MW.

2. The minimum reserve level for the combined Victorian and South Australian regions (615 MW), and the South Australia local requirement (-50 MW), must both be met.

AEMO ensures that the reserve margins calculated in its LRC calculations in short-term PASA, medium-term PASA, and in the supply-demand calculations in the SOO, are consistent with the MRLs by using net import limits that are simultaneously feasible, satisfy network constraints and allow for MDs to occur in each region simultaneously.[64]

3.3 Previous reviews of MRL methodology

The methodology that NEMMCO has used to calculate the MRLs has evolved since the NEM commenced in 1998. There have been the following two major reviews of this methodology: one by MMA[65] in 2002 and one by KEMA[66] in 2005.

MMA was engaged by the Panel to undertake an independent assessment of NEMMCO's calculations of the capacity reserves. The objective was to assess the overall methodology, in particular the adequacy of the input data, the modelling methodology and the suitability and applicability of the results for different time horizons and applications.

KEMA was engaged by NEMMCO to make an independent review of the data and approach used by NEMMCO. The key findings of the KEMA review were that:[67]

64 Further information on AEMO's use of net import limits is available in Chapter 5 of the 2009 ESOO.

65 "Assessment of NEMMCO's 2001 Calculation of Reserve Margins", McLennan Magasanik Associates Pty Ltd, 10 September 2002.

66 "Review of Methodology and Assumptions Used in NEMMCO 2003/04 Minimum Reserve Level Assessment", KEMA Consulting, 11 January 2005.

- NEMMCO's approach is as good as, or better than, typical international practice;

- the techniques used to determine reserve levels are more exhaustive than international practice;

- NEMMCO's treatment of transmission limitations is superior to international practice;

- the FOR data (supplied to NEMMCO) is much lower than international experience;

- NEMMCO's practice of using a conservative set of assumptions to deliver a 'safety margin' in the reserve level determination is more pessimistic than international practice, however, given the uncertainty in the FOR data, NEMMCO should continue this practice.

3.4 Methodology to Calculate the MRLs

3.4.1 Summary of the process to calculate MRLs

An overview of the process that NEMMCO has used to calculate the MRLs is provided in the SOO.[68] NEMMCO provided a more detailed description of the methodology as part of its 2006 MRL assessment.[69] In addition, the CRR provides commentary on NEMMCO's methodology.[70] This information is summarised below.

Determining the scheduled and semi-scheduled generation capacity required

The level of available scheduled and semi-scheduled generation capacity required in each region to meet the Reliability Standard is determined using market simulations that:

- model network power transfer capability as defined by system normal network constraint equations;

- consider 10% POE and 50% POE scheduled and semi-scheduled MD conditions and the demand diversity between regions; and

67 Section 5.3.2 of the 2005 NEMMCO SOO.

68 Section 5.4 of the 2009 AEMO ESOO.

69 Minimum Reserve Level Recalculation 2006, available on the AEMO website.

70 The CRR is available on the AEMC website.

- determine the available scheduled and semi-scheduled generation capacity for each region that will enable the Reliability Standard to be met in every region (for 10% and 50% POE weighted average conditions).

Determining the minimum reserve level

The MRL for each region is determined by comparing the available regional scheduled and semi-scheduled generation (taking into account committed DSP contributions and an assumed net regional import) with the reference demand level (10% POE scheduled and semi-scheduled MD). The assumed net regional imports are based on a set of regional interconnector power flows that:

- are simultaneously feasible;
- satisfy network constraint equations; and
- allow for 10% POE scheduled and semi-scheduled MDs occurring in each region simultaneously.

The selected set of assumed net regional imports is one of a number of sets that satisfy these conditions.

The MRL is calculated as the:

- available regional scheduled and semi-scheduled generation required to meet the Reliability Standard; plus
- the assumed net regional import[71]; plus
- the committed DSP in the region; minus
- the projected 10% POE scheduled and semi-scheduled MD.

Impact of interconnector power transfers

The interconnectors allow reserves to be shared between the regions such that spare generation capacity in one region can be shared across interconnectors, up to its capability. This can result in a regional scheduled and semi-scheduled generation requirement in a neighbouring region that is lower than its projected 10% POE MD, which can result in a negative MRL.

3.4.2 Treatment of generating unit forced outages

NEMMCO uses the time sequential Monte Carlo simulation methodology to calculate the MRLs. Under this approach, the forced outages of the NEM generating

71 Table 5.3 in the NEMMCO provides the assumed net regional imports used for the MRLs in the 2008 NEMMCO SOO.

units are modelled using random patterns of forced outages based on historical forced outage rates. It is therefore important that the historical outage information is collected from the various NEM generators on a consistent basis.

One of the main recommendations of the KEMA review was that NEMMCO review its forced outage data collection methodology. Accordingly NEMMCO formed the FODWG to identify potential improvements to this methodology. In September 2006 NEMMCO published the *Guidebook for Forced Outage Data Recording: Definitions and Assumptions.*[72]

AEMO continues to work with generators to gather updated information regarding generation reliability. Each year all generators are asked to provide AEMO with updated outage records which AEMO combines with previously provided data to produce revised Forced and Partial outage data used in reliability studies and market simulations.[73]

3.5 Key Issues for stakeholder comment

In its Issues Paper, the Panel sought comments on all aspects of the methodology that NEMMCO uses to calculate the MRLs and its application. However, the Panel sought some specific comments on the following issues identified in this section.

3.5.1 Weighting of 10% POE and 50% POE simulations

Under NEMMCO's methodology, the expected USE outcomes are calculated from 10% POE and 50% POE demand simulation results by applying the following weighting methodology developed by NEMMCO specifically for the purpose of calculating the MRLs:

- USE results from the 10% POE and 50% POE demand cases define an USE distribution versus demand;[74]
- temperature data and temperature/demand correlations are used to determine a Probability Distribution Function (PDF) for the peak demand in each region;
- the expected (weighted) USE outcome is determined by combining the USE distribution and the peak demand PDF.

Further details about the approach used by NEMMCO for weighting the 10% POE and 50% POE demand cases is available in NEMMCO's 2006 determination of the MRLs.[75]

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72 The FODWG "Guidebook for Forced Outage Data Recording: Definitions and Assumptions" is available on the AEMO website.

73 Further information on the process of gathering generator forced outage data is available in section A.8.1 of the NTS Consultation Report, which is available on the AEMO website.

74 The 90% POE forecast outcome is assumed to be equal to the 50% POE demand outcome for the purposes of estimating the USE.

In its Issues Paper the Panel sought stakeholder views on whether:

- it is sufficient to consider only the 10% POE and 50% POE demand conditions, or whether additional demand conditions should be considered when calculating the most appropriate MRLs; and
- an appropriate weighting methodology is being used.

In its submission to the Panel's Issues Paper, the NGF consider that AEMO should also consider 90% POE maximum demand scenarios in addition to the 10% POE and 50% POE cases.[76]

The Panel agrees that AEMO should perform a sensitivity study using the 90% POE maximum demand scenarios, in addition to the 10% POE and 50% POE, in order to assess the impact on the results.

The Panel also considers that AEMO should consider a sensitivity study using the demand conditions that occurred in Victoria and South Australia on 29 and 30 January 2009.[77] The Panel considers that such a study would provide a better estimate of the unserved energy that could occur under extreme weather conditions. However, the Panel also notes that the USE in Victoria and South Australia on 29 and 30 January 2009 was also exacerbated by to reductions in the capacity of individual generating units and Basslink due to the high prevailing temperatures.

AEMO is currently calculating the MRLs that will apply from the middle of 2010. The Panel understands that AEMO will consider, as part of the MRL calculation, the extreme weather and 90% POE demand conditions when it calculates these MRLs.

3.5.2 Diversity of regional demands

The level of USE in a region at a given time depends on the support that is available from neighbouring regions. Therefore, the MRLs depend on the level of diversity between the load traces used in the Monte Carlo simulations.

Load traces used to represent the regional demands in each region and are based on historical measurements of the demand that are scaled to match the load projections in the NEMMCO SOO. Therefore, these load traces will reflect the load diversity that was specific to the year that they are based on, which may not be typical of the diversity between the regions that may exist in the future.

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75 Page 11 of the NEMMCO "Minimum Reserve Level Recalculation 2006", which is available on the AEMO website.

76 "Review of the Operational Arrangements for the Reliability Standard", NGF submission on the Issues Paper, 31 July 2009.

77 The Panel understands from AEMO that the extreme weather conditions on 29 and 30 January 2009 corresponded to approximately 4 or 5% POE conditions.

To address this issue of regional load diversity, NEMMCO developed a methodology for creating load traces with minimal diversity.[78] NEMMCO used these minimum diversity load traces to calculate the 2006 MRLs.[79]

NEMMCO considered that the demand diversity recognises that regional MDs may occur at different times. The MRLs used in the supply-demand outlook incorporate demand diversity. As a result, the MD projections used in the supply-demand calculator are not adjusted for diversity between regions. This is consistent with current operational practices and with medium-term PASA.[80]

In its Issues Paper the Panel sought stakeholder views on AEMO's approach for treating load diversity and what alternative approaches could be applied.

Stakeholders did not comment on AEMO's treatment of diversity but the Major Energy Users (MEU) did note that the ability of one region to support another during a period of supply scarcity is dependent on the capacity and reliability of the associated interconnectors.[81]

The Panel is not recommending any specific changes to AEMO's approach to load diversity.

3.5.3 The impact of increased penetration of wind generation

For the 2006 MRL calculations, wind generators were treated as an offset to the energy and maximum demand projections, and hence the load traces.[82]

Since the 2006 MRL calculation, the SOO has reported the energy and maximum demand projections on a "native" demand basis. The native demand is measured on a generator-terminal basis.[83] For a region, the measure comprises the output of scheduled, semi-scheduled and significant non-scheduled generating units (such as wind farms) within the region plus net imports (imports into the region minus exports from the region). Prior to the 2005 SOO, NEMMCO reported the energy and maximum demand projections on a scheduled generator basis. This change was introduced in the 2006 SOO to better account for the increased penetration of intermittent wind generators.

78 Section 10.1 of the report "Minimum Reserve Level Recalculation 2006 - Assumptions Report", 8 September 2006, which is available on the AEMO website.

79 Section A.4.2 of the report "Minimum Reserve Level Recalculation 2006", 8 September 2006, which is available on the AEMO website.

80 Section 2.2.2 of the 2009 AEMO ESOO.

81 Page 31 of the "Review of the Operational Arrangements for the Reliability Standard", MEU submission on the Issues Paper, 31 July 2009

82 Section A.4.6 of the report "Minimum Reserve Level Recalculation 2006", 8 September 2006, which is available on the AEMO website.

83 Measuring the regional demand on a generator terminal basis is defined in section 3.7.7 of the 2009 ESOO.

As the level of wind penetration is increasing, the MRL methodology will need to be redesigned to better accommodate wind generation. This is because the intermittent production from wind generators may have a significant impact on the expected level of USE and because some wind farms impact on network constraints that can also affect the expected USE.

NEMMCO has developed an approach to modelling wind generators as normalised wind traces based on Bureau of Meteorology wind speed data and wind-farm power versus wind speed curves[84] for the purposes of the national transmission statement (NTS).[85] AEMO intends to use a similar approach for calculating MRLs.

The Panel notes that AEMO is using the Australian Wind Energy Forecasting System (AWEFS) for estimating the output of the wind generating systems in medium-term PASA.

In its Issues Paper the Panel sought stakeholder views on the appropriateness of AEMO's proposal to adopt the approach of modelling wind generator output used in the NTS for the calculation of the MRLs.

Stakeholders did not comment on AEMO's proposed approach to modelling wind generator output although the MEU notes the importance of the issue. The MEU is concerned that in some cases wind generation has reduced interconnector transfers, especially between Victoria and South Australia. [86]

The Panel is not recommending any specific changes to AEMO's approach to modelling wind generator output.

3.5.4 Combined regions

Historically low reserve conditions have often occurred simultaneously in Victoria and South Australia due to the prevailing weather patterns. In addition, in recent years the pattern of demand growth and generator investment has meant that at the times of maximum demand in Victoria and South Australia, the Heywood interconnector has not been constrained. This means that Victoria and South Australia are generally able to share reserves. Potentially, the same reserve scenario could occur between New South Wales and Queensland in the future.

84 The formulation of wind traces for the NTS is discussed in section A14.2 of the "2009 NTS Consultation: Final Report", 14 May 2009, available on the AEMO website.

85 The national transmission statement is defined in clause 5.6.5 of the Rules.

86 Page 32 of the "Review of the Operational Arrangements for the Reliability Standard", MEU submission on the Issues Paper, 31 July 2009

The MRLs calculated by NEMMCO are in the form of a joint requirement for the Victorian and South Australian regions (currently set at 615 MW), plus a local requirement for South Australia (currently set at -50 MW).

NEMMCO indicated that for the 2006 MRL calculations there was a trade off between the local reserve requirement for South Australia and the combined reserve requirement for Victoria and South Australia.[87] That is, there is a range of possible reserve level combinations for Victoria and South Australia that would be expected to deliver equivalent levels of reliability in both regions.

This trade off between the Victorian and South Australian MRLs was evident when NEMMCO decided not to exercise the RERT for the 2008/09 summer.[88] While medium-term PASA in August 2008 showed that the MRLs would not be met because of a 168 MW shortage of reserves in Victoria, NEMMCO considered that the medium-term PASA results were overly conservative under the expected conditions for the 2008/2009 summer. This decision is also discussed in NEMMCO's incident report for the involuntary load shedding events of 29 and 30 January 2009, where NEMMCO states that:

> "NEMMCO decided not to procure reserve for the 2008/09 summer period in August 2008. MTPASA results at the time were showing reserve shortfalls in Victoria of 168 MW, with no shortfall in SA. The minimum reserve levels (MRLs) determined for Victoria and South Australia, however, were based on the assumption that any shortfall would most likely occur in South Australia.
>
> This approach resulted in MRLs that ensured the level of USE in South Australia would just meet the 0.002% reliability standard, with the equivalent level of USE in Victoria being 0.001%. Analysis of the MTPASA results at the time indicated that, because there was more generation capacity available than required in South Australia and less in Victoria, there was sufficient overall generator capacity available to achieve 0.002% in both regions over the long term." [89]

In its Issues Paper the Panel sought stakeholder views on whether medium-term PASA should include MRLs that specify dynamic joint regional reserve requirements, rather than single fixed regional MRLs.

The MEU is concerned that the increased use of wind generators will constrain interconnector flows, especially between Victoria and South Australia. [90] This could mean that the ability to share reserves between regions reduces, making it potentially

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87 Section 8.3 of the report "Minimum Reserve Level Recalculation 2006", 8 September 2006, which is available on the AEMO website.

88 "Reserve Outlook for Summer 2008 2009", 3 September 2008, available on the AEMO website.

89 "Actual Lack of Reserve (LOR3) in Victoria and South Australia Regions on 29-30 January 2009", 27 May 2009, available on the AEMO website.

90 Page 32 of the "Review of the Operational Arrangements for the Reliability Standard", MEU submission on the Issues Paper, 31 July 2009

less appropriate to specify dynamic joint regional reserve requirements between regions.

The Panel notes the circumstances around NEMMCO's decision not to exercise the RERT for the 2008/09 summer. In August 2008 medium-term PASA showed a lack of reserve condition for the 2008/09 summer, which was because of the use of fixed MRLs in each region. However, further analysis showed that if the reserves were redistributed between Victoria and South Australia there was sufficient reserves available to meet the Reliability Standard.

Therefore, the Panel recommends that AEMO considers developing the ability to use dynamic joint regional reserve requirements, where reserves can be shared between regions, as this would improve the quality of the information provided by medium-term PASA.

The Panel notes the MEU's concerns and considers that AEMO should adequately model the impact of constraints on interconnector flows when developing any such dynamic joint regional reserve requirements.

3.5.5 Appropriateness of the MRL Approach

The NGF noted that NEMMCO's decision to override the breach of the MRLs shown in medium-term PASA for the 2008/09 summer using results from the Drought Study.[91] The NGF recommend consideration be given to moving away from using an MRL style approach, and toward using the now regular Energy Adequacy Assessment Projection (EAAP) to monitor reliability outlooks (at least in the medium term timeframe). It considered it would be a more accurate assessment of reserve levels against the reliability standard, and represent a more realistic trigger for intervention.

The Panel considers that there are still many benefits of the existing process of using MRLs in the medium-term PASA process, compared to the EAAP. These include:

- Speed of calculation – the medium-term PASA process can be operated weekly with minimal resources, whereas the EAAP process takes several months to operate. This would make the EAAP an inappropriate tool for coordinating generating units' scheduled outages.

- Ease of communicating results – the results from PASA clearly show which days are projected to have insufficient reserves and it quantifies the extent of any shortfall.

91 "Review of the Operational Arrangements for the Reliability Standard", NGF submission on the Issues Paper, 31 July 2009.

- Daily resolution – the results of the medium-term PASA provide a daily indication of reserve adequacy whereas the EAAP provides USE estimates with a monthly resolution based on typical demand shapes.[92] Therefore, using the EAAP to determine when to intervene would be very imprecise and likely to lead to excessive periods of intervention. In addition, the EAAP would not have sufficient resolution to allow participants to coordinate generator outages in the same manner as medium-term PASA.

The Panel also considers that the concern, as expressed by the NGF, that medium-term PASA is not always accurate will be alleviated to some degree if AEMO uses dynamic joint regional reserve requirements when determining the MRLs and within medium-term PASA.

The Panel considers that AEMO should:

- continue to use the existing process of using MRLs in medium-term PASA as the primary method for assessing reliability in the medium-term; but
- use the EAAP to inform the medium-term PASA results, particularly when it considers intervening using the RERT.

3.5.6 Appropriateness of specifying the MRLs against the 10% POE Demand Forecast

The MEU considers that the MRL should be between 20 and 30% of additional generation above the expected peak demand.[93]

The MRLs in the NEM are calculated by determining the capacity of generation that would be required to meet the Reliability Standard in a region. This level of generation capacity is then expressed as a margin above the maximum demand in the region. Therefore, the difference between the approach used in the NEM and that proposed by the MEU is simply a matter of definition. AEMO specifies the MRLs in terms of a MW margin of generator capacity above the 10% POE maximum demand while the MEU proposes specifying the MRL as a percentage above the maximum demand (presumably the 50% POE maximum demand). Therefore, the approach proposed by the MEU is in effect equivalent to that already used in the NEM, and would deliver the same level of reliability, assuming that in each case the MRL is chosen to deliver the reliability standard.

92 The Panel understands that the modelling in the EAAP uses demand traces that are derived from historical regional demand traces. This means that the day of the maximum demand is prescribed where as the day of future maximum demand conditions would be unknown in advance.

93 Page 30 of the "Review of the Operational Arrangements for the Reliability Standard", MEU submission on the Issues Paper, 31 July 2009

3.5.7 MRL calculation should consider the cost of meeting the Reliability Standard

The MEU believe that the calculation of the MRLs should consider the cost of meeting the reliability standard. [94]

The Panel considers that the costs of meeting the Reliability Standard should be considered when the standard is set, rather than when it is implemented. The Panel is currently performing a review of the Reliability Standard as part of its "Review of the Reliability Standard and Settings".[95]

94 Page 31 of the "Review of the Operational Arrangements for the Reliability Standard", MEU submission on the Issues Paper, 31 July 2009.

95 Further information on the Panel's Review of the Reliability Standard and Settings is available on the AEMC website at http://www.aemc.gov.au/Market-Reviews/Open/Review-of-the-Reliability-Standard-and-Settings.html

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4 Short-term Reserve Assessment of Reliability

4.1 Context of the review of Short-term Reserve Assessment of Reliability

In its CRR Final Report, the Panel made the following comments on the MRLs that are used in short-term PASA:

> At present NEMMCO calculates MRLs on a medium-term basis. NEMMCO then uses these medium-term MRLs to assess the adequacy of forecast reserve levels in both the medium-term (months or years) and the short-term (hours or days).
>
> As discussed in the First Interim Report, an alternative would be for NEMMCO to calculate short-term MRLs as well, to better reflect the prevailing demand conditions that apply in the short-term.
>
> The Panel's view is that the short-term reserve requirements are likely to be lower than those in the medium-term because more information is available on the system conditions, including the maximum demand and generator availability. Therefore, the Panel considers that a review by NEMMCO of the allowable short-term minimum reserve levels should be undertaken. To this end, the Panel will seek to have NEMMCO undertake this review of the level of short-term reserves that should be used in short-term PASA during 2008.[96]

The Panel wrote to NEMMCO[97] on 29 January 2008 requesting that it conduct a review of the factors that affect the short-term assessment of reliability. On 21 October 2008 NEMMCO provided its report to the Panel, which was prepared with the assistance of ROAM Consulting.[98]

Therefore to enable the Panel to consider NEMMCO's advice, the AEMC included a request to consider "the MRLs and associated arrangements and standards to be used in the short-term reserve assessment of reliability" in its Terms of Reference for this review.

4.2 Overview of NEMMCO Report to the Panel

The NEMMCO report is published as an accompanying document to this Issues Paper. The report:

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96 Page 88 of the Panel's CRR Final Report is available on the AEMC website at http://www.aemc.gov.au/Market-Reviews/Completed/Comprehensive-Reliability-Review.html

97 On 1 July 2009 NEMMCO ceased to exist and its functions were transferred to AEMO.

98 "Assessment of Short-Term Reliability" prepared by NEMMCO with the assistance of ROAM Consulting.

- summarises the current practice for short-term reliability assessment;
- sets out the relationship between MRLs and the Reliability Standard;
- provides an indication of the impact of reduced uncertainties regarding generator availability and load forecasts on the assessment of reserve adequacy in the short-term;
- provides a limited review of overseas practice regarding assessment of reliability; and
- presents options for alternative intervention triggers to maintain reliability in the short-term.

The NEMMCO report reaches the following conclusions:

- the current triggers for intervention used in the short term timeframe are not equivalent to those used in the medium term time-frame and are too low to meet the Reliability Standard;
- an additional short term intervention trigger should be introduced to work in tandem with the current LOR2 trigger; and
- a specific short-term intervention trigger should be added to the Reliability Standard because meeting the current standard cannot be assured when the methodology only operates in a short-term timeframe.

NEMMCO's conclusions are discussed in detail in section 4.5 of this Issues Paper.

4.3 Overview of short-term PASA process

The NEMMCO report and Chapter 2 of this Issues Paper contain brief descriptions of the short-term PASA process.

4.3.1 Lack of reserve conditions

Short-term PASA provides a week ahead assessment of the adequacy of the projected lack of reserve (LOR) and low reserve condition (LRC) measures.

As discussed in Chapter 2 of this Issues Paper, LOR short-term PASA runs are used to quantify the ability of a region to meet its demand following a credible contingency. There are three LOR conditions (LOR1, LOR2 and LOR3) that relate to the severity of the system conditions in terms of the number of contingencies that can occur before involuntary load shedding occurs:

- LOR1 – signifies insufficient short terms reserves to provide complete replacement of the contingency capacity reserve following of a critical single credible contingency event;

- LOR2 – the occurrence of a critical single credible contingency event is likely to require involuntary load shedding; and
- LOR3 – involuntary load shedding would be, or is actually, occurring in order to maintain or restore power system security.

LOR runs of short-term PASA assess reserves against the most likely demand forecasts.[99] AEMO[100] uses the LOR2 condition as a short-term intervention trigger.[101]

4.3.2 Low reserve condition

As discussed in Chapter 2 of this Issues Paper, LRC conditions occur in PASA when the capacity reserves fall below those required under the capacity reserve standards. That is, if the reserves are less than the medium-term MRLs determined by AEMO to be necessary to satisfy the Reliability Standard in the medium-term. As it is currently implemented, both medium-term PASA and short-term PASA use the same medium-term MRLs.

LRC runs in short-term PASA that indicate a reserve shortfall are only communicated to the market for information and do not currently trigger a market intervention by AEMO. That is, the basis for market intervention by AEMO is currently a shortfall in the LOR2 short-term PASA criteria, which is associated with system security, and the medium-term MRLs do not currently have any role in ensuring any particular level of reliability in short-term adequacy assessments.[102]

4.4 Relationship between medium-term and short-term MRLs

The medium-term MRLs are determined to ensure that, over the long-term, the average USE is better than the Reliability Standard of 0.002% USE over a given year. During the course of the year the level of reserves is generally well above the demand. Therefore, the reserves tend to significantly exceed the medium term MRL, except for short periods when the demand approaches its peak.

The ROAM Consulting analysis shows that, if a short-term MRL were to be calculated for a fixed level of reserves above the demand, the MRL would be very high compared to the existing MRLs. That is the available generation is varied so that it always equals the demand plus a fixed reserve, then the MRL required to meet the 0.002% USE reliability standard would be significantly higher than the medium-term

99 50% POE demand forecasts as defined in the NEMMCO SOO and discussed in Chapter 3 of this Issues Paper.

100 On 1 July 2009 NEMMCO ceased to exist and its functions were transferred to AEMO.

101 Page 3 of the NEMMCO and Roam Consulting report "Assessment of Short-Term Reliability".

102 Page 4 of the NEMMCO and Roam Consulting report indicates that these outcomes are not able to ensure any particular level of reliability. However, this measure is important as it describes the way in which the medium-term MRLs are currently used in the short-term.

MRLs. This is because, under this scenario, there is an approximately equal risk of USE at all times, rather than just at the peak demand, which is the case in the NEM.

4.5 Recommendations from NEMMCO and ROAM Consulting

4.5.1 Alternative MRL Triggers in Short Term PASA

The ROAM Consulting report indicates that the current triggers for intervention used in the short term timeframe are not equivalent to those used in the medium term time-frame and are too low to meet the Reliability Standard, and therefore, it is not credible to further reduce short term reserve levels.

NEMMCO and ROAM Consulting explored the following alternative methods for defining the reserve levels required in the short-term to comply with the 0.002% USE Reliability Standard:[103]

- MRLs based on the short-term generator availability;
- a per–period USE target;
- a weekly MRL; and
- relaxed MRLs.

4.5.2 Recommendations from the ROAM Consulting Report

The ROAM Consulting report reaches the following significant conclusions:

1. The current short-term PASA intervention trigger of LOR2 must be retained, as it concerns maintaining sufficient reserve to cover the single largest contingency;

2. Reliability measures and standard compliance be assessed over the medium and long-term time-frames only, while in the short-term, the system would be administered to maintain supply security (as is the case now).

3. If desirable, an additional short-term PASA intervention trigger be considered by the Reliability Panel, which would work in tandem with the current LOR2 assessment. Any such trigger will necessarily be more conservative than LOR2. Amongst the options studied, ROAM Consulting recommends the Relaxed MRL methodology, while stressing that it does not theoretically ensure adherence to the Reliability Standard. This alternative is recommended for the reasons presented in Section 6.5 of the NEMMCO and ROAM Consulting report.

4. The Reliability Panel consider the addition of a clause in the Reliability Standard, specifying an explicit short-term requirement. This is recommended as the

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103 These options are discussed in sections 6.1, 6.2, 6.3 and 6.4 of the ROAM report, with an appraisal of the alternative methods in section 6.5.

Reliability Standard, a long-term measure, cannot be ensured by any methodology when considering only the short-term.

NEMMCO advised that it was seeking comment from the Panel on the recommendations, particularly in relation to the need for changes to the Reliability Standard, before proceeding further with this project.

4.6 Implications for short-term RERT

Chapter 6 of this Issues Paper describes a proposed change to the arrangements for the RERT such that AEMO may contract for reserves with as little as 24 hours of notice. Therefore, the choice of the short-term PASA trigger for reliability would be important if it is to be used as a trigger for intervention by AEMO.

4.7 Stakeholder Views

In its Issues Paper the Panel encouraged stakeholders to review the NEMMCO report that was prepared by ROAM Consulting, and sought stakeholder views on whether:

- an additional short term intervention trigger should be introduced to work in tandem with the current LOR2 trigger, which would be more conservative by its nature; and

- the Panel should define a specific short-term intervention trigger in the Reliability Standard because meeting the current standard cannot be assured by a methodology which operates only in the short-term.

The NGF consider that there is a need for an additional short term intervention trigger to work in tandem with the LOR2 trigger, and that the Panel should clearly define in the Reliability Standard the trigger for each region in the NEM.[104] The Victorian Distribution Businesses also support the development of an additional short term intervention trigger.[105]

The MEU are concerned with the costs following the short term intervention trigger being met. To this end the MEU supports a mechanism to allow AEMO to contract for reserves at short notice, as provided by the enhancements to the short-notice RERT.[106]

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104 "Review of the Operational Arrangements for the Reliability Standard", NGF submission on the Issues Paper, 31 July 2009.

105 "Review of the Operational Arrangements for the Reliability Standard", joint submission on the Issues Paper 31 July 2009 from Citipower, Jemena Electricity Networks, Powercor Australia, SPI Electricity and United Energy Distribution.

106 Page 31 of the "Review of the Operational Arrangements for the Reliability Standard", MEU submission on the Issues Paper, 31 July 2009.

The Panel is seeking further information from AEMO and ROAM on options for the way forward. This will include considering specific options for the form of the short term intervention trigger and a proposed work program. The Panel will report on this as part of its final report for this review.

5 Guidelines for the Management of Electricity Supply Shortfall Events

5.1 Terms of Reference

The AEMC included the requirement that the Panel consider "the current guidelines for management of electricity supply shortfall events (sometimes referred to as 'share the pain' guidelines) that were issued by the Panel in September 1998" in its Terms of Reference.[107]

5.2 Original guidelines for management of electricity supply shortfall events

The current guidelines that govern the management of electricity supply shortfall events, [108] otherwise known as the 'share the pain' guidelines, were developed by the NECA[109] Reliability Panel in September 1998 and have remained unchanged since.[110]

During the CRR consultation process, the Panel received submissions from TRUenergy proposing amendments to the guidelines published by NECA that it considered to better reflect 'equitable load shedding' given that, in the case of South Australia, the current arrangements can lead to a greater probability of USE being accrued in that region.

In addition, correspondence from AEMO[111] to the Panel has also highlighted that it considered that the guidelines require clarification in the context of current market arrangements, in particular, in relation to mandatory restrictions and the definition of the demand to be used in the load sharing calculations.

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107 See Appendix A for a copy of the AEMC's Terms of Reference.

108 See Appendix B for a copy of the current guidelines that govern the management of electricity supply shortfall events.

109 Prior to 1 July 2009 the National Electricity Code Administrator was responsible for maintaining the National Electricity Code. From the 1 July 2009 the National Electricity Code was superseded by the National Electricity Rules.

110 Under the National Electricity Law (schedule 3, part 8, clause 12) and the National Electricity Regulations (schedule 2, part 2, clause 18) the obligations and requirements of the Reliability Panel under NECA remained the same at the commencement of the Rules.

111 At the time the Issues Paper was published NEMMCO was the NEM market operator; however, from the 1 July 2009, the market operator became AEMO.

5.3 Review of the guidelines

5.3.1 USE accrual in South Australia

In its submission to the CRR, TRUenergy indicated that the South Australian region is unusual in the NEM because it has both a local MRL and an MRL shared with Victoria. Therefore, South Australia is able to accrue USE in two different situations:

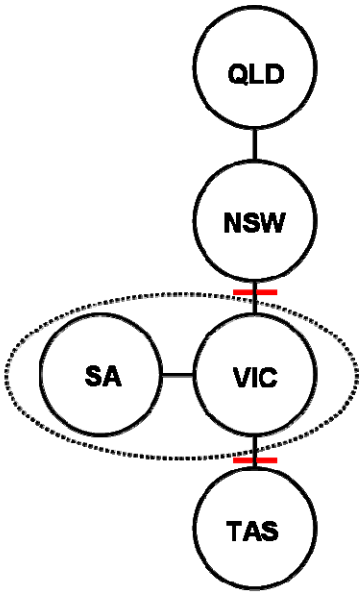
- when there is a shortfall of generation in a region and South Australia is linked to that region by an unconstrained interconnection. One example of this situation would be if the South Australian and Victorian regions combined had insufficient generation to meet demand; that is, when both the New South Wales to Victoria and Tasmania to Victoria interconnectors are at their transfer limits; [112] and

- when there is a shortfall of generation in South Australia alone when the Victoria to South Australia interconnectors are at their transfer limits.

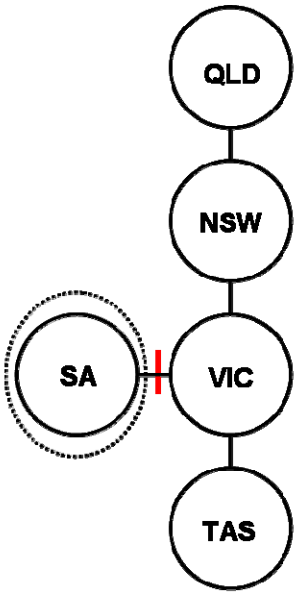
TRUenergy consider that load shedding equity during multiple region shortfall events should be emphasised when developing the guidelines for the management of electricity supply shortfall events. Further, TRUenergy considers that managing the equity of load shedding across multiple regions in a better manner compared with the current arrangements, would allow the South Australian MRL calculations to be less onerous, while not exceeding 0.002% expected USE.

112 Another example would be if there was a NEM-wide shortfall of reserve. Under this scenario all regions would experience USE unless they are exporting up to the constrained limit.

Figure 5.1 Two situations where USE accrues in South Australia



Scenario 1: Load shed across VIC/SA
VIC-NSW and VIC-TAS constrained



Scenario 2: Load shed in SA only
SA-VIC constrained

The MRL Monte Carlo simulations correctly recognise that USE accrues in South Australia primarily from one of the above two scenarios. Alternatively, the situation where Victoria is in shortfall while South Australia is in surplus is extremely rare.

Under the current 'share the pain' guidelines, load is shed in Victoria and South Australia in proportion to the demand in each region. In scenario 1, the modelling must allocate the USE proportionally and, therefore, both regions accrue USE in proportion to their demand at the time. However, when scenario 2 occurs, load is shed in South Australia alone and South Australia accrues all the USE. TRUenergy considers that, taking the two scenarios together, South Australia has an increased probability of having to shed load and accrue USE.

5.3.2 Submission from TRUenergy on the Comprehensive Reliability Review

In its submission to the Panel's CRR, TRUenergy suggested what it considered to be a better allocation of USE in relation to the two scenarios noted above. TRUenergy's recommendation was that "more optimal allocation of USE would be to allocate Victoria the majority (if not all) the USE in scenario 1, allowing more scenario events to occur before South Australia reaches its USE target".[113] However, TRUenergy noted that this approach is not possible under the current guidelines which require that "load shedding [is] to be shared on a real-time basis".

TRUenergy suggested that modification of the guidelines to "share the pain over time" could be a practical solution to minimising onerous MRLs on South Australia

[113] TRUenergy's supplementary submission on the CRR Issues Paper, 3 November 2006, p.3.

and reducing USE resulting from both scenarios.[114] This would, however, require AEMO to keep a record of the volumes of load shedding it has instructed TNSPs to shed. When an event requires load shedding, but it is possible to recruit from multiple regions, AEMO would attempt to equalise the amount of load shedding over a rolling period of time.

TRUenergy suggested that this would be a "truer interpretation of the equity concept implied by 'share the pain', as the burden of shortfall would be more equitably distributed over time, regardless of the actual events experienced and would increase the chance of actual performance meeting the 0.002% [Standard] in all regions".[115]

Finally TRUenergy noted that the approach it suggests would provide a better allocation of reserves and the costs of market intervention should be lowered (while still not exceeding an expected 0.002% USE in any region) and therefore furthers the national electricity objective with respect to the long-term price of electricity.[116]

TRUenergy's suggested amended drafting of the guidelines was to add the following:

> In the second dot point (in the guidelines), after "as far as practical, any reductions must occur" insert "over a 3 year rolling time period".[117]

The Panel considers that, if the approach proposed by TRUenergy is pursued further in response to the comments of stakeholders, it would be necessary to consider how it would be applied in both an operational timeframe and in the Monte Carlo simulations. AEMO advised the Panel that adopting TRUenergy's approach would be difficult if it required continual reassessment in the middle of a load shedding event.

5.3.3 AEMO's power system emergency management plan

AEMO advised the Panel that it is currently reviewing its Power System Emergency Management Plan, part of which includes how AEMO manages the equitable sharing of load shedding between regions in the event of a supply shortfall event. Under clause 4.8.9(i) of the Rules, AEMO is required to implement load shedding equitably as specified in the Reliability Panel's published *power system security and reliability standards* as specified below:

> When issuing *clause 4.8.9 instructions* to implement *load shedding* across *interconnected regions*, *AEMO* must use reasonable endeavours to implement *load shedding* in an equitable manner as specified in the *power system security*

114 ibid.
115 ibid.
116 ibid.
117 ibid p.3-4.

and reliability standards, taking into account the *power transfer capability* of the relevant *networks*.[118]

The *Guidelines for management of electricity supply shortfall events* have remained unchanged since their publication by NECA in 1998 and form part of the current Panel's *power system security and reliability standards*. Therefore, the reference to 'equitable manner' in clause 4.8.9(i) refers to the requirement in the guidelines that 'any reductions must occur in proportion to the aggregate demand of the effective connection point'.

AEMO considers that it is necessary to clarify some of the language in determining the equitable sharing of load shedding, especially when mandatory load restrictions are also in place and load shedding from separate transmission and generation events. The proposed drafting of AEMO's Power System Emergency Plan based on NECA's guidelines is presented in tracked changes in Appendix C of this Issues Paper.

5.4 Issues for stakeholder comment

In the Panel's Issues Paper it sought comments from stakeholders on the following:

- whether the amendment from TRUenergy would be a more equitable method of sharing the burden of shortfall, while increasing the chance of actual performance meeting the 0.002% USE Reliability Standard;[119]
- whether AEMO's amendments to the guidelines would be sufficient to equitably share load shedding across regions for electricity supply shortfall events within the current market setting; and
- any other issues in respect of the guidelines for managing electricity supply shortfall events that stakeholders consider are relevant.

The NGF did not support the changes proposed by TRUenergy as it considered that the proposal:

- allows more "scenario events" to occur in South Australia before that state reaches its USE targets, however the implications for Victoria are unclear if all the USE was allocated to Victorian during a supply shortfall event;
- is unachievable under the current Rules; and
- will prove difficult to implement in an operational time frames. [120]

The NGF did not comment on the changes proposed by AEMO.

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118 National Electricity Rules, version 28.

119 The Panel notes that the TRUenergy proposal would be applied to all regions and not just the South Australia region discussed in TRUenergy's submission.

120 "Review of the Operational Arrangements for the Reliability Standard", NGF submission on the Issues Paper, 31 July 2009.

The Major Energy Users (MEU) considers that South Australia should be treated as a stand alone region, rather than part of a Victoria and South Australia region, and therefore also does not support the changes proposed by TRUenergy.[121]

The MEU also considers that the probably of a shortfall in South Australia may be reduced as a result of greater wind-farm penetration. The Panel notes the MEU's concern, but considers that joint shortfalls between Victoria and South Australia are still possible, as demonstrated on 29 and 30 January 2009, and hence the guidelines are still relevant.

The Panel intends to adopt the operational changes proposed by AEMO as it considers the changes would contribute to achieving the National Electricity Objective (NEO) by clarifying the arrangements:

- to produce more equitable load shedding, particularly during periods of mandatory restrictions; and
- for load shedding from separate transmission and generation events.

The Panel is not proposing to adopt the changes to the "Guidelines for Management of Electricity Supply Shortfall Events" proposed by TRUenergy because:

- there are not demonstrated benefits of the proposed changes to customers;
- the proposed changes would be difficult to implement; and
- there is no support from any stakeholders.

The Panel anticipates that any amendments to the guidelines for management of electricity supply shortfall events will be made by 31 December 2009 and could consequently affect load shedding arrangements for the summer of 2009/2010, should an electricity supply shortfall event occur. The Panel also notes that amendments to these guidelines in addition to those proposed by AEMO could affect future MRL determinations undertaken by AEMO.

121 Page 35 of the "Review of the Operational Arrangements for the Reliability Standard", MEU submission on the Issues Paper, 31 July 2009.

6 Short-notice RERT for Critical Emergencies

6.1 Terms of Reference

As discussed in Chapter 1 of this Issues Paper, following the involuntary load shedding events on 29 and 30 January 2009 in Victoria and South Australia, the MCE indicated that the AEMC would "review energy market frameworks in light of the impact on electricity supplies of the extreme heat wave of 29-31 January 2009".[122]

To this effect the AEMC included the requirement that the Panel consider "the need and possible design of a short-term version of the Reliability and Emergency Reserve Trader (RERT) that could be used in a critical emergency" in its Terms of Reference. The AEMC Terms of Reference noted the desirability of implementing any appropriate changes in a timely manner for the summer of 2009/10.

6.2 Original Reserve Trader Provisions

AEMO[123] has had the power to contract for reserves (termed Reserve Trading) since the start of the NEM. Reserve trading enabled the then NEMMCO to procure additional reserves if a shortfall of reserves was forecast. This acted as a safety net in the event that the NEM energy only market does not deliver sufficient reserves to ensure that the Reliability Standard of 0.002% USE.

At the start of the NEM, NEMMCO's power to operate the Reserve Trader was reviewed and the associated sunset clause extended. The most recent extension of the original Reserve Trader provisions occurred when the Panel submitted a Rule change in December 2005, which was accepted with minor amendments by the AEMC, to extend the Reserve Trader provisions until 30 June 2008. This allowed the Reserve Trader to continue to operate while the Panel completed its CRR. [124]

6.3 Development of the RERT

The RERT was originally developed by the Panel as part of the CRR and was incorporated into the Rules in June 2008.[125] The RERT redesigned the original Reserve Trader provisions. The main operational changes included:

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122 Ministerial Council on Energy, 18th *Communiqué*, Canberra, 6 February 2009.

123 At the time the Issues Paper was published NEMMCO was the NEM market operator; however, from the 1 July 2009, the market operator became AEMO.

124 National Electricity Amendment (Reliability Safety Net Extension) Rule 2006 No. 7, available on the AEMC website at http://www.aemc.gov.au/Electricity/Rule-changes/Completed/Reliability-Safety-Net-Extension.html

125 National Electricity Amendment (NEM Reliability Settings: Information, Safety Net and Directions) Rule 2008 No. 6, available on the AEMC website at http://www.aemc.gov.au/Electricity/Rule-changes/Completed/NEM-Reliability-Settings-Information-Safety-Net-and-Directions.html

- allowing the then NEMMCO to contract for reserves up to nine months ahead of a projected shortfall, instead of six months; and

- allowing the then NEMMCO to perform multiple tendering rounds, instead of being limited to one, so that the level of reserve contracting can be adjusted as more information becomes available.

The RERT has a sunset in the Rules of 30 June 2012, with a requirement for the Panel to review the need for the RERT by 30 June 2011.

6.4 Proposed amendments to the RERT

6.4.1 Exposure draft of amendments to the RERT

In accordance with its Terms of Reference, the Panel investigated the operation of the current RERT with the objective of developing improvements that would facilitate AEMO contracting for reserves at short notice and that could be implemented for the summer of 2009/10.

The Panel is proposing to increase the flexibility of the existing RERT arrangements by clarifying that AEMO may operate a RERT panel such that:

- entities that wish to be on the RERT panel would provide AEMO with expressions of interest to offer reserves;

- AEMO would assess expressions of interest and resolve any technical and legal issues with the associated entity, prior to placing the entity on the RERT panel;

- entities on the RERT panel would be free to offer their capacity to the market, but would be requested to advise AEMO if they do so;

- AEMO would not make payments to entities for being on the RERT panel; and

- AEMO would use a full tendering process when contracting for reserves if time permits or, when there is insufficient time for such a tender process, select members of the RERT panel and then enter into reserve contracts.

Further, the Panel is proposing a short-notice process for when AEMO is required to enter into reserve contracts at short notice. That is, when there is insufficient notice of a reserve shortfall for AEMO to undertake a detailed assessment of the expressions of interest. Under this short-term process AEMO would:

- develop processes whereby it could enter into reserve contracts with short notice;

- operate a RERT panel and regularly solicit expressions of interest from entities wishing to offer reserves to AEMO;

- monitor the results of the medium-term PASA, short-term PASA and predispatch processes to assess whether to contract for reserves in the short term;

- develop methodologies to select the optimal portfolio of reserve contracts based on a reasonable endeavours basis;

- consult with the affected Jurisdictions when determining whether to enter into reserve contracts and how to share the associated costs between the Market Customers in those regions; and

- develop processes to ensure that reserves that are the subject of a reserve contract are not otherwise available to the market.

In addition, the Panel considers that there is value in clarifying that AEMO may use contracted reserves during system security events. The Panel notes that generally security events are characterised by little or no notice and usually have only a localised effect, but considers that AEMO should be able to utilise contracted reserves in the cases where this is possible.

6.4.2 Impact on the operation of the wholesale market

When it proposed the RERT in its CRR, the Panel expressed its concern that any form of reserve trader was a distortion to the operation of the energy-only wholesale market. However, at the time the Panel also noted that there appeared to be risks on the horizon that may impact the NEM achieving the reliability standard in the future. Therefore, the Panel proposed that, on balance, a revised form of the Reserve Trader (the RERT) should be developed and that it should operate in such a way as to minimise any distortion to the market.

The Panel still considered that the RERT is a market distortion but considers that prudent incremental improvements to the RERT are warranted to further increase the flexibility, including clarifying that AEMO may reserve contract with as little as one day of notice. In coming to this view, the Panel noted that the proposed changes aimed to minimise market distortion and that, in any case, the RERT is subject to a sunset of 30 June 2012 and will be the subject of further review before that date.

6.4.3 Exposure draft Rule and RERT Guidelines

The Panel prepared an Exposure Draft of a Rule change proposal and interim amendments to the RERT Guidelines that it believed would implement the policy objectives above. Under the proposal in the Panel's Exposure Draft AEMO would be required to develop processes whereby it could enter into reserve contracts with as little as 24 hours notice.

The Panel published the Exposure Draft[126] for consultation on 1 May 2009 to seek stakeholders' comments on:

- the proposed policy contained in the Exposure Draft document; and

126 Further information on the Panel's Exposure Draft is available on the AEMC website at: http://www.aemc.gov.au/Market-Reviews/Open/Review-of-Operationalisation-of-the-Reliability-Standards.html

- the proposed implementation of the policy in the Exposure Draft Rule and associated Exposure Draft of interim amendments for the RERT Guidelines.

Submissions on the Exposure Draft closed on Friday 29 May 2009. The Panel received submissions from Ergon Energy, Energy Response, NEMMCO, the National Generators Forum (NGF), Origin Energy and the South Australian Government.

6.4.4 AEMC assessment of the short-notice RERT Rule change proposal

On 11 August 2009, the Panel submitted a Rule change proposal entitled "Improved RERT: Flexibility and Short-notice Reserve Contracts" to the AEMC.[127] The Panel considered that its Rule change proposal should be expedited and include provisions for interim amendments to the RERT Guidelines and Procedures so that the short notice RERT could be in place by September 2009. This would allow AEMO several months before the 2009/10 summer to form a RERT panel. The Panel and AEMO would consult on the potential long-term amendments to the RERT Guidelines and Procedures with respect to the short notice RERT in 2010.

The Rule change proposal sought to:

- provide a framework to implement changes to the operation of the RERT to facilitate long-notice, medium-notice and short-notice reserve contracting;
- clarify that AEMO can form a RERT panel;
- require AEMO to develop processes whereby it could enter into reserve contracts with as little as three hours notice ; and
- clarify that AEMO may use reserve contracts during system security events.

On 15 October 2009 the AEMC published its determination on the Panel's Rule change proposal.[128] The AEMC determined to make the proposed Rule, with some minor drafting revisions. The Rule took effect from 15 October 2009.

127 Further information on the Panel's Rule change proposal is available on the AEMC website at: http://www.aemc.gov.au/Electricity/Rule-changes/Open/Improved-RERT-Flexibility-and-Short-notice-Reserve-Contracts.html

128 The AEMC's determination is available at http://www.aemc.gov.au/Electricity/Rule-changes/Open/Improved-RERT-Flexibility-and-Short-notice-Reserve-Contracts.html

7 Clarification of the Reliability Standard

7.1 Context of the review

The current definition of the Reliability Standard was developed by the Panel through stakeholder consultation and was published as part of the CRR final report.[129] The Reliability Standard is reproduced in Appendix D of this Issues Paper. Since the publication of the CRR in December 2007:

- a number of power system incidents, including the involuntary load shedding incidents on 29 and 30 January 2009, have been assessed against the Reliability Standard; and
- AEMO[130] has commenced a process to recalculate the medium-term MRLs that are expected to apply before summer 2010/11.

Therefore, the AEMC included a requirement in the Terms of Reference for the Panel to review "whether the wording of the standard as published by the Panel in the CRR could be clarified to give better guidance to AEMO as to how to operationalise the Standard."

Therefore, the Panel is reviewing the wording of the existing standard in consultation with AEMO in order to ensure that the policy intent in the CRR has been clearly implemented. Any changes to the Reliability Standard as a result of this review would take effect immediately and should be used by AEMO for its current process to recalculate the medium-term MRLs.

A complete review of the Reliability Standard is also being undertaken by the Panel as part of its Reliability Settings and Standard Review.[131] This review will consider the Reliability Standard, and the associated reliability settings,[132] to apply from 1 July 2012.

7.2 Clarifications to the Reliability Standard

In its Issues Paper, the Panel sought stakeholder comments on the proposed changes to the wording to the Reliability Standard outlined below.

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129 "NEM Reliability Standard – Generation and Bulk Supply – December 2007" is contained in Appendix D of the CRR, December 2007, and is available on the AEMC website at http://www.aemc.gov.au/Market-Reviews/Completed/Comprehensive-Reliability-Review.html

130 At the time the Issues Paper was published NEMMCO was the NEM market operator; however, from the 1 July 2009, the market operator became AEMO.

131 The Reliability Settings and Standard Review is being undertaken in accordance with the AEMC Terms of Reference in Appendix A of this Issues Paper and as a requirement of clause 3.9.3A of the Rules.

132 The reliability settings are the market price cap (previously known as VoLL), the cumulative price threshold (CPT) and market floor price.

7.2.1 Applying the Reliability Standard

The current wording of the Reliability Standard requires that the Standard be "targeted to be achieved in each financial year, for each region and for the NEM as a whole."

The Panel is proposing to clarify that:

- the NEM should be operated and planned in such a way that the Reliability Standard is expected to be achieved; and
- the Reliability Standard will be achieved in the NEM as a whole if it is achieved in each region.

Therefore, the Panel is proposing to amend the associated paragraph to:

> Operationally, it should be planned to achieve an expected USE that is within this Reliability Standard for Generation and Bulk Transmission ~~should be targeted to be achieved~~ in each financial year~~,~~ and for each region ~~and~~, which means that it should also be achieved for the NEM as a whole.

7.2.2 USE from multiple single contingencies

The Reliability Standard only includes USE associated with single credible contingencies of generating unit or transmission element outages, while it excludes the USE associated with multiple or non-credible contingencies. However, the Reliability Standard needs to include USE for scenarios with independent but overlapping outages. For example, this could occur if at a time of high demand a large generating unit trips in the morning, which will not be repaired for several days, and later that same day a second large generating unit in the same region trips unexpectedly and independently.

To clarify this intent the Panel is proposing to amend the associated dot point in the Reliability Standard to:

> - a single credible contingency on a generating unit or an inter-regional transmission element, that may occur concurrently with ~~planned~~ generating unit or inter-regional transmission element outages; or

7.2.3 USE from network outages

The Reliability Standard excludes USE that is caused by planned outages of the intra-regional transmission and distribution networks, with different standards applying to these networks. However, in practice:

- it can be difficult to distinguish between intra-regional and inter-regional transmission elements; and

- the Reliability Standard is unclear whether USE caused by unplanned network outages should be included.

Therefore, to clarify this intent the Panel is proposing to amend the associated dot point in the Reliability Standard to:

- ~~planned~~ outages of ~~intra-regional~~ transmission or distribution network elements that do not significantly impact the ability to transfer power into the region where the USE occurred; or

7.3 Stakeholder feedback

The MEU expressed concern that "the proposed changes to the wording of the Reliability Standard have the potential to reduce the effectiveness of the target".[133] To overcome this, the MEU considers that the "Reliability Panel should be looking at the USE as seen by consumers as the starting point, as the NEL objective is written in terms of the market to perform in the long-term interest of consumers".[134]

Furthermore the MEU considers that any amendments to the wording of the Reliability Standard should:[135]

- "be a target to be achieved as an average over a number of years;
- reflect performance of the wholesale market for all incidents, as consumers do not differentiate between losses of supply due to different causes. Therefore to limit USE to only single credible contingencies is a distortion which provides a benefit to supply side entities rather than consumers; and
- limiting events to exclude network outages is a construct which does not recognise that despite the cause, consumers are still curtailed".

The NGF support the clarifications and consider that they add clarity to the current policy decisions made by the Panel.[136]

The Panel agrees with the MEU that the customers' perspective is important. However, the supply chain to customers can be divided into the following three links:

- generation and bulk transmission networks;
- transmission networks within a Jurisdiction or region; and
- distribution networks within a Jurisdiction or region.

133 Submission by the Major Energy Users Inc., August 2009, p. 36.

134 Ibid.

135 Ibid.

136 Submission by the National Generators Forum, 31 July 2009, p. 2.

While the overall reliability seem by customers depends on the reliability of each link of the supply chain, each link operates differently and needs to be specified and managed separately. The Reliability Standard that is the subject of this review refers to the 0.002% USE due to generator availability and inter-regional network capability.

The Panel's Draft Report proposes to adopt the recommended clarification to the wording outlined in the Issues Paper.

The Panel is also currently reviewing the Reliability Standard as part of its Reliability Settings and Standard Review.[137] The Panel will consider the changes to the form of the standard proposed by the MEU as part if this review.

137 The Reliability Settings and Standard Review is being undertaken in accordance with the AEMC Terms of Reference in Appendix A of this Issues Paper and as a requirement of clause 3.9.3A of the Rules.

Appendix A: AEMC Terms of Reference (3 March 2009)

Review of the operational arrangements of the reliability settings and the Reliability standard and settings review

Introduction

The Reliability Panel (Panel) made a number of recommendations in relation to the operationalisation of the bulk supply reliability standard in the final report of its Comprehensive Reliability Review (CRR), which was published in December 2007. The Panel also forecast in the CRR a number of other initiatives and reviews it would undertake as a response to issues raised during consultations. The Panel is also required to undertake periodic reviews of reliability matters.

The Panel's indicative work program in 2009 and 2010 foreshadowed a number of the issues subject to these terms of reference. Therefore, the terms of reference align a range of related matters.

Scope of the reviews

The Panel is requested to review the operationalisation of the Reliability Standard including:

- the methodology and process used by NEMMCO for calculating the minimum reserve levels (MRLs), especially where the MRLs apply across more than one jurisdiction;
- the MRLs and associated arrangements and standards to be used in the short-term reserve assessment of reliability;
- the current "Guidelines for management of electricity supply shortfall events" (sometimes referred to as 'share the pain' guidelines) that were issued by the Panel in September 1998;
- the need and possible design of a short-term version of the RERT that could be used in a critical emergency;
- whether the wording of the Standard as published by the Panel in the CRR could be clarified to give better guidance to NEMMCO as to how to operationalise the Standard; and
- whether the Rules should be amended to clarify the requirement for market participants to inform NEMMCO, via dispatch bids or offers, of their actual capability under the prevailing or forecast temperature conditions.

In addition, the Panel is also requested to commence a 'Reliability Standard and settings review' as proposed by the Panel in its Rule change proposal "NEM Reliability Settings: VoLL, CPT and Future Reliability Review". Although a final

determination is yet to be made on this Rule change proposal, it is considered desirable that this review be commenced now to test the appropriateness of the future standard and settings. Furthermore, under the existing Rules, the Panel would have been required to review VoLL by 30 April 2010.

Process

The recent unserved energy events in Victoria and South Australia have highlighted the need for close scrutiny of the way the Reliability Standard is put into operation in the NEM, and also the appropriateness of the Reliability Standard and settings.

Therefore, these reviews are likely to have important implications for NEM stakeholders. Consistent with its philosophy of engaging with those parties, the AEMC requests the Panel to plan to involve stakeholders by seeking submissions and holding at least one forum for these reviews.

The Panel is requested to consider the national electricity objective (NEO) contained in section 7 of the National Electricity Law (NEL) when it considers issues raised in these reviews and when making associated recommendations.

Timing

Recognising the extensive work program within the Panel, the Panel should aim to complete its review into the operationalisation of the Reliability Standard by the end of December 2009 and the Reliability Settings and Standard Review by the end of April 2010.

Clearly, these Panel reviews will also assist the AEMC in responding to the MCE directed review into the energy market frameworks in light of the impact on electricity supplies of the extreme heat wave of 29-31 January 2009, which was identified in the MCE's 6 February 2009 Communiqué.

Notwithstanding the end dates for these reviews and given the desirability of implementing any appropriate changes in a timely manner for the summer of 2009/10, the Panel should consider the possibility of making necessary changes to guidelines or proposing Rule changes before the completion of these reviews.

Appendix B: NECA Reliability Panel – Managing electricity supply shortfall events

The Reliability Panel is required to determine guidelines for the equitable management of any shortfalls in the supply of electricity in the National Electricity Market. The Panel has received advice from NEMMCO and undertaken consultation on suitable guidelines.

Management of supply shortfalls in an electricity system requires curtailment of supply to customers in order to maintain the basic technical integrity of the power system to ensure that demand never exceeds supply. The guidelines to be established by the Panel will be used by NEMMCO to develop detailed procedures.

Except as noted, the guidelines require that all loads within an area are treated equally on any occasions when demand exceeds the supply able to be delivered in that area. If this occurs, involuntary load shedding is required to match demand to the available supply. For this purpose, an area is to be defined without regard to the boundaries of market regions or jurisdictions. In most cases an area will be bounded by elements of the transmission network operating at full capacity. Market regions have been defined with the expectation that the most likely elements of the network that might be limiting also define market regions. Network elements within a region may, however, in some circumstances become limiting and the boundaries of an area with a supply shortfall then not align with region boundaries.

In the event that load is required to be reduced the procedures are to take into account sensitive loads nominated by the jurisdictions and priorities for the order of load reduction advised by network service providers where appropriate.

The Panel recognises that it will often be impractical for NEMMCO to share any reductions precisely on the pro-rata basis required by the guidelines, particularly where rarely used manual processes are required to be used. This determination is intended to establish the principle from which NEMMCO will develop detailed practical operating procedures.

The determination is attached.

National Electricity Code Administrator

September 1998

Reliability Panel

Guidelines for management of electricity supply shortfall events

If there is a major supply shortfall in the National Electricity Market, NEMMCO must, under with 4.8.9 (b)(2) implement any necessary load involuntary shedding in an equitable manner, in accordance with guidelines established by the Reliability Panel as part of the Power System Security and Reliability Standards.

The Reliability Panel has established the following guidelines for equitable involuntary load shedding in these circumstances.

- if insufficient generation, intra and inter regional network transfer capability is available to allow all demand to be supplied (after taking into account demand side bids in the market), at one or more connection points, in one or more regions, then

- in conjunction with the despatch of generation and demand side capacity through the despatch processes of the market, NEMMCO may as necessary initiate reductions in demand, supplied from those connection points affected by the shortfall. As far as practicable, any reductions must occur in proportion to the aggregate demand of the effective connection points, until the remaining demand can be met, such that the power system remains or returns (as appropriate) initially to a satisfactory operating state and ultimately to a secure operating state, as defined in the Code.

- an effective connection point is a connection point at which continued reduction is effective in reducing the supply shortfall, taking into account network constraints at all times.

- any reductions in demand required under these arrangements must take into account sensitive loads and priority order advised to NEMMCO in accordance with the Code.

National Electricity Code Administrator

September 1998

Appendix C: Amended guidelines for management of electricity supply shortfall events incorporating NEMMCO's suggested amendments[138]

Equitable Load Shedding Arrangements

If there is a major supply shortfall in the National Electricity Market, AEMO must, under clause 4.8.9 (i) of the National Electricity Rules (Rules) implement any necessary load involuntary shedding in an equitable manner, in accordance with guidelines established by the Reliability Panel as part of the Power System Security and Reliability Standards.

The Reliability Panel has established the following guidelines for equitable involuntary load shedding in these circumstances.

If insufficient generation, intra and inter regional network transfer capability is available to allow all demand to be supplied (after taking into account demand side bids in the market), at one or more connection points, in one or more regions, then:

- in conjunction with the dispatch of generation and demand side capacity through the dispatch processes of the market, AEMO may as necessary initiate reductions in demand, supplied from those connection points affected by the shortfall; and

- as far as practicable, any reductions, from load shedding as requested by AEMO and/or mandatory restrictions, in each region must occur in proportion to the aggregate notional demand of the effective connection points in that region, until the remaining demand can be met, such that the power system remains or returns (as appropriate) initially to a satisfactory operating state and ultimately to a secure operating state, as defined in ~~the~~ clause 4.2.6 of the Rules.

Any reductions in demand required under these arrangements must take into account sensitive loads and priority order advised to AEMO in accordance with clause 4.3.2(f) of the Rules.

Effective Connection Point (~~is a~~) – connection point at which continued reduction is effective in reducing the supply shortfall, taking into account network constraints at all times.

Notional demand – is the total demand being supplied, plus the amount of demand reduced through involuntary load shedding as requested by AEMO, and the amount of demand reduction due to mandatory restrictions imposed by the Jurisdiction, as estimated in the mandatory restrictions schedule.

138 Note that these guidelines are those suggested by NEMMCO, with minor alterations. In addition, references to NEMMCO have been replaced with references to AEMO.

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Appendix D: NEM Reliability Standard – Generation and Bulk Supply – December 2007

This Reliability Standard for Generation and Bulk Supply[139] was determined by the Reliability Panel (Panel) as part of its Comprehensive Reliability Review (CRR), which it completed on 30 November 2007. This Reliability Standard forms part of the *power system security and reliability standards* and was determined in accordance with clauses 8.8.1(a)(2) and 8.8.3 of the National Electricity Rules (Rules).

Form of the Reliability Standard

The NEM Reliability Standard for Generation and Bulk Supply is an output-based measure expressed in terms of the maximum permissible unserved energy (USE), or the maximum allowable level of electricity at risk of not being supplied to consumers, per financial year. The USE is measured in GWh and should be expressed as a percentage of the annual energy consumption for the associated region or regions.

Level of the Reliability Standard

The maximum permissible unserved energy (USE), or the maximum allowable level of electricity at risk of not being supplied to consumers, is 0.002% of the annual energy consumption for the associated region or regions per financial year.

Compliance with the Reliability Standard

Compliance with this Reliability Standard for Generation and Bulk Transmission should be measured over the long-term using a moving average of the actual observed levels of annual USE for the most recent 10 financial years.

Operationally, this Reliability Standard for Generation and Bulk Transmission should be targeted to be achieved in each financial year, for each region and for the NEM as a whole.

Scope of the Reliability Standard

This Reliability Standard for Generation and Bulk Supply includes unserved energy associated with power system reliability incidents that results from:

- a single credible contingency on a generating unit or an inter-regional transmission element, that may occur concurrently with planned generating unit or inter-regional transmission element outages; or

139 "NEM Reliability Standard – Generation and Bulk Supply – December 2007" is contained in Appendix D of the CRR, December 2007, and is available on the AEMC website.

- delays to the construction or commissioning of new generating units or inter-regional transmission network elements, including delays due to industrial action or 'acts of God'.

This Reliability Standard for Generation and Bulk Supply excludes unserved energy associated with power system security incidents that results from:

- multiple or non-credible contingencies;
- planned outages of intra-regional transmission or distribution network elements; or
- industrial action or 'acts of God' at existing generating or inter-regional transmission facilities.