Reliability Panel
AEMC

REVIEW

Reliability Panel AEMC

FINAL REPORT

Technical Standards Review

30 April 2009

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About the AEMC

The Council of Australian Governments, through its Ministerial Council on Energy (MCE), 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. Our key responsibilities are to consider Rule change proposals, conduct energy market reviews and provide policy advice to the MCE as requested, or on AEMC initiative.

About the AEMC Reliability Panel

The AEMC Reliability Panel (Panel) is a specialist body within the AEMC and comprises industry and consumer representatives. It is responsible for monitoring, reviewing and reporting on 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 Panel and are not necessarily those of the AEMC.

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Abbreviations

AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
CEC	Clean Energy Council
Code	National Electricity Code
Commission	see AEMC
MCE	Ministerial Council on Energy
MNSP	Market Network Service Provider
NCAS	Network Control Ancillary Services
NECA	National Electricity Code Administrator
NEL	National Electricity Law
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NEO	National Electricity Objective
NGF	National Generators Forum
NSP	Network Service Provider
Panel	Reliability Panel
Rules	National Electricity Rules
SCO	Standing Committee of Officials
SVC	Static VAR Compensator
TNSP	Transmission Network Service Provider
WETAG	Wind Energy Technical Advisory Group

Summary

Background

On 14 February 2008, the Australian Energy Market Commission (AEMC) requested the AEMC Reliability Panel (Panel) to undertake a review of the technical standards in the National Electricity Rules (Rules), and provide a final report by 30 April 2009 that identifies:

1. the principles that should be applied in revising the technical standards; and

2. processes for implementing the recommended changes to the technical standards including prospective Rule changes. [1]

A subsequent review (to be known as the "Comprehensive Review of Technical Standards") will then review the individual technical standards, such as the levels of each individual technical standard and clause drafting, based on the principles developed in this review.

The Panel published an Issues Paper on 9 May 2008. Based on responses to the Issues Paper, the Panel developed thirteen principles. These principles were published for consultation in a Draft Report on 19 December 2008.

The Panel has considered submissions to the Draft Report, and has refined the principles as outlined below.

Principles

The Panel recommends twelve principles to guide the Comprehensive Review of Technical Standards.

Any changes to the technical standards recommended by the Comprehensive Review of Technical Standards would require a Rule change to implement, and as such would need to be shown to contribute to the achievement of the National Electricity Objective (NEO). The principles have been developed for the purpose of providing guidance only, to streamline the Comprehensive Review of Technical Standards, and to promote consistency and transparency in the changes recommended. The principles have no legal status. Any change to the technical standards would need to advance the NEO, regardless of whether or not the change is consistent with the principles.

The Comprehensive Review of Technical Standards will review all parts of Chapter of 5 of the Rules. However the principles are of primary relevance to reviewing the access standards, that is Schedules 5.1 to 5.3a of the Rules. The remainder of Chapter 5 is generally process oriented compared to the access standards. Whilst some of the principles could be applied in reviewing these other parts of Chapter 5, the Panel considers that the NEO will suffice.

1 The Terms of Reference for this review is available at Appendix A.

Principle 1 Access standards should be consistent with achieving the system standards where appropriate.

Principle 2 The access standards should, where appropriate, take the form of automatic access standard, minimum access standard, and negotiated access standard.

Principle 3 Access standards must contribute to the achievement of the National Electricity Objective.

Principle 4 **Minimum Access Standard** - The minimum access standard must denote the lowest level of performance, considering the size, technology and location of likely connection applicants in the foreseeable future, such that there is minor influence in the network, but no harm done to others or the power system. A performance standard proposed by a connection applicant that is below the level of the minimum access standard must be rejected.

Principle 5 **Automatic Access Standard** - The automatic access standard must denote the performance level, considering the size, technology and location of likely connection applicants in the foreseeable future, where there would be no harm done to other network users or the system, and which would be unlikely to degrade the power system. A performance standard proposed by a connection applicant that meets the level of the automatic access standard must be accepted.

Principle 6 **Negotiated Access Standard** - A connection applicant and network service provider may negotiate an access standard below the level of the automatic access standard, and as low as the level of the minimum access standard, where there would be no harm done to other network users or the system, and any power system degradation is considered tolerable by NEMMCO and the relevant NSP. Where possible, the technical standards should provide clear guidance on the basis for negotiating access standards for each requirement, including a consideration for least cost development of the National Electricity Market (NEM).

Principle 7 Technical standards established following the Comprehensive Review of Technical Standards would apply only to connection applicants that have not commenced negotiations for connection by the commencement of the new technical standards.

Principle 8 Where appropriate, technical standards should be technology, size and location neutral.

Principle 9 Where market based arrangements can replace a technical standard, then this should be considered.

Principle 10	Technical standards should be specific, clearly defined, unambiguous and consistent.
Principle 11	Technical standards must be in a form that allows effective compliance and enforcement.
Principle 12	Terminology used in the technical standards should support their appropriate application. Where technically appropriate, performance of generating plant should be measured at the connection point.

In addition to the principles, the Panel has identified a number of specific topics for review during the Comprehensive Review of Technical Standards. A number of these topics were listed as principles in the Draft Report. The Panel has re-classified them as specific review topics because the Panel now considers they do not provide specific guidance to the review of the access standards and, as such, are better considered as stand-alone changes to the technical standards.

The list of specific review topics will enable the Panel to seek more targeted responses in the early stages of consultation for the Comprehensive Review of Technical Standards. The Panel considers this will enable better industry input into the development of these key policy areas.

Specific Review Topic 1	Should negotiated access standards be required to reflect the technical capability of the equipment to be connected? Should connection applicants be required to provide suitable technical evidence as to why their plant cannot meet an automatic access standard?
Specific Review Topic 2	Should formal arrangements be established to permit a network service provider and connection applicant to agree to delay investment in equipment to meet a registered performance standard when that level of performance is not required at the time of connection? Under such an arrangement, a connection agreement would need to specify exactly what level of performance could be called upon in the future, and the conditions that would need to be met to require that level of performance.
Specific Review Topic 3	Are the current arrangements for modifying registered performance standards appropriate?
Specific Review Topic 4	Should embedded generators that are not currently Registered Participants be required to comply with the Technical Standards in the Rules?

Process

In recommending a commencement date for the Comprehensive Review of Technical Standards, the Panel has considered the following:

1. the AEMC reported a need for the NEM technical standards to be comprehensively reviewed in its Final Report for the "Review into the Enforcement of and Compliance with Technical Standards" in September 2006;

2. the NEM technical standards were significantly revised in the *National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2*; and

3. submissions to the Issues Paper listed some technical standards that are currently difficult and/or inefficient for some network users to comply with, which could be corrected with a minor Rule change.

The Panel considers that the *National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2*, addressed some of the inefficiencies and compliance difficulties recognised by the AEMC in its Final Report for the "Review into the Enforcement of and Compliance with Technical Standards" in September 2006. The Panel also accepts the view put forward in some submissions that these changes have not been in effect for sufficient time to assess their impact on the NEM. The Panel considers therefore that there would be benefit in deferring the Comprehensive Review of Technical Standards until such time that there has been sufficient connections under the current technical standards for this regime to be appropriately assessed. The additional information gained from deferring the Comprehensive Review of Technical Standards would allow for a more comprehensive and complete review of the NEM technical standards providing longer term certainty for participants and investors.

However the Panel also acknowledges that a number of the technical standards are currently difficult and/or inefficient to comply with. In some cases, a minor change to a technical standard would allow more efficient compliance. The Panel considers that any such changes should be limited to changes that clarify current practice, rather than changes that would require changes in the technical capability of network users.

The Panel therefore considers that the Comprehensive Review of Technical Standards should be deferred until sufficient new connections have taken place under the current technical standards such that their effectiveness can be assessed. In addition, the Panel considers that it should develop a Rule change that seeks to make minor changes to the current technical standards to allow more efficient compliance. The Panel considers that this Rule change should be developed as soon as possible consistent with the Panel's forward work agenda.

Recommendations

The Panel makes the following recommendations for the AEMC's consideration:

1. the principles and specific review topics listed above should form the basis of the Comprehensive Review of Technical Standards;

2. the Comprehensive Review of Technical Standards should not commence until sufficient new connections have taken place under the current technical standards such that their effectiveness can be assessed; and

3. the Panel should develop a Rule change that seeks to make minor changes to the current technical standards to allow more efficient compliance.

1 Introduction

1.1 Background

On 1 September 2006, the Australian Energy Market Commission (AEMC) published its Final Report on the *Review of Enforcement of and Compliance with Technical Standards*.[2] In this report, the AEMC recommended that the AEMC Reliability Panel (Panel) undertake a review of the adequacy and content of the technical standards in the Rules. The AEMC indicated that the technical standards should be:

- based on actual sustainable plant capability; and
- clear and appropriate.

On 14 February 2008, the AEMC requested the Panel to undertake a review of the technical standards in the Rules, and provide the AEMC with a final report by 30 April 2009 that identifies:

- the principles that should be applied in revising the technical standards; and
- the processes for implementing the recommended changes to the technical standards including prospective Rule changes. [3]

The Terms of Reference for this review are contained at Appendix A.

1.2 Deliverables from the Review

In this Final Report, the Panel recommends to the AEMC a set of guiding principles for application when revising the technical standards. The Panel also recommends a process for revising the technical standards.

As such, this review has not considered the detailed aspects of the technical standards, such as levels of individual technical standards, or the drafting of individual clauses. Consideration of such detail will take place when revising the technical standards in a subsequent review (to be known as the "Comprehensive Review of Technical Standards"), the process and timing of which will be determined by the AEMC.

2 Available at www.aemc.gov.au/electricity.php?r=20051216.173039

3 On 16 September 2008, the AEMC amended the Terms of Reference for the Technical Standards Review to extend the delivery date of the final report to 30 April 2009. This was at the request of the Panel who advised that due to a number of complex issues that were identified by the Panel, the original date of 31 December 2008 was no longer considered feasible.

1.3 Review Process

1.3.1 Issues Paper

The Panel published an Issues Paper on 9 May 2008. In this paper, the Panel asked six questions to guide stakeholders in responding to this review. These questions were:

1. Are the current standards in the correct form?
2. Are the current standards set at appropriate levels?
3. Is the scope of the technical standards appropriate?
4. Are the technical standards well structured in the Rules?
5. Are the obligations between Network Service Providers (NSP) and network users consistent?
6. Which aspects of the technical standards need more urgent review?

The Panel received six submissions to the Issues Paper.[4]

1.3.2 Draft Report

Based on responses to the questions raised in the Issues Paper, the Panel identified the main issues it considered should be explored in developing principles.

The Panel published the Draft Report on 19 December 2008, in which the Panel presented 13 principles for consultation.

The Panel received 13 submissions to the Draft Report.[5]

1.3.3 Final Report

This Final Report marks the conclusion of the first stage of the Technical Standards Review.

This Final Report presents 12 principles that the Panel recommends be used to guide the Comprehensive Review of Technical Standards. The report also presents four specific review topics for the Comprehensive Review of Technical Standards.

This report has been presented to the AEMC for consideration.

1.4 Context of this Review

At the commencement of the National Electricity Market (NEM), all jurisdictions derogated the technical standards in the National Electricity Code (Code) in favour

4 Refer to Appendix B for a list of submissions to the Issues Paper.
5 Refer to Appendix B for a list of submissions to the Draft Report.

of existing plant standards applying at that time.[6] However these derogations were only granted on the basis that the National Electricity Code Administrator (NECA) would review the standards, and when the review was complete and implemented, the derogations would fall away. New entrants opposed the derogations since they were put at a disadvantage as the technical standards in the Code were generally more onerous than the standards applying to the existing generators.

1.4.1 NECA Review of Technical Standards 2001

In December 2001, NECA published the Final Report on its *Review of Technical Standards*.[7] The report addressed a number of issues including whether the standards in the Code were too onerous and therefore represented a barrier to entry to emerging technologies. Generators argued that the technical standards in the Code were onerous and assumed the standards of modern steam turbine plant. The network service providers (NSPs) and NECA countered that generators were able to negotiate standards in their connection agreements and thus could get standards tailored to their equipment.

The NECA review was conducted in two stages. The first stage established a set of principles to guide the review of individual technical standards. The second stage modified the standards. In essence, NEMMCO and NSPs sought to move more slowly in implementing the final state and therefore argued to retain some features like compulsory provision of reactive support. While there was some refinement of the standards in specific areas, the changes made were conservative.

1.4.2 AEMC Review of Enforcement and Compliance with Technical Standards 2006

The AEMC published its Final Report on the Review of Enforcement and Compliance with Technical Standards on 1 September 2006.[8] The Final Report recommended an integrated package of measures intended to ensure that performance standards for existing generators be properly documented and that procedures for ensuring compliance with those performance standards are improved. The Final Report also recommended that the technical standards on which the performance standards are based be comprehensively reviewed and that appropriate penalties for failure to comply are operative.

1.4.3 Technical Standards for Wind Generation and other Generator Connection 2007

In August 2004, the Ministerial Council on Energy (MCE) established the Renewable and Distributed Generation Working Group with responsibility, amongst other things, for wind energy policy. Under this group, the MCE also established a Wind Energy Policy Working Group to provide advice to the MCE on issues related to the

6 Prior to 1 July 2005, when the National Electricity Rules and the AEMC were established, the NEM operated under the Code which was administered by the National Electricity Code Administrator (NECA).

7 Available at: www.neca.com.au/Reviews78ed.html?CategoryID=51&SubCategoryID=188

8 Available at: www.aemc.gov.au/electricity.php?r=20051216.173039

entry of intermittent renewable energy generation into the NEM. The Wind Energy Technical Advisory Group (WETAG) was formed to assist with the analysis of technical matters associated with large-scale wind farm developments. WETAG membership included industry representation. In March 2005, WETAG published the discussion paper *Integrating Wind Farms into the National Electricity Market*, in which WETAG recommended a list of principles for guiding the development of any changes to technical standards. These principles were listed in Appendix A of WETAG's report.[9]

In early 2005, the MCE Standing Committee of Officials (SCO) requested NEMMCO to undertake a review of the technical standards using the principles agreed by WETAG. Based on the findings of this review, NEMMCO developed the Rule change proposal *Technical Standards for Wind Generation and other Generator Connections* which it submitted to the AEMC on 10 February 2006.

The AEMC published its Final Determination on the *National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2* on 8 March 2007.[10]

Prior to this Rule change, wind generators were exempt from many of the requirements under schedule 5.2. This is because the schedule referred to synchronous, scheduled or transmission connected generating units; whereas wind generators were classified as non-scheduled, generally use asynchronous technology and are sometimes connected to distribution networks.[11]

This Rule change made the following changes:

- applied performance standards at the point of connection, rather than with individual generating units, allowing generators to use auxiliary equipment to meet the standards;
- ensured each standard had a clear automatic and minimum standard and that the basis for establishing the negotiated standard was clear;
- removed, as much as possible, any language that was specific to particular technologies; and
- made the performance standards registered with NEMMCO the primary document for referring to the performance of connected plant. Previously, the connection agreement would over-ride the registered standards.

9 Available at: www.ret.gov.au/Documents/mce/rdg/wind/default.html

10 Available at: www.aemc.gov.au/electricity.php?r=20060324.143345

11 On 1 May 2008 the AEMC published its Final Determination on the National Electricity Amendment (Central Dispatch and Integration of Wind and Other Intermittent Generation) Rule 2008 No. 2. This Rule requires significant intermittent generators (such as wind farms) to participate in the central dispatch and PASA processes, and limit their output at times when that output would otherwise violate secure network limits.

1.4.4 Performance Standard Compliance of Generators 2008

The AEMC published its Final Determination on the *National Electricity Amendment (Performance Standard Compliance of Generators) Rule 2008 No. 10*, on 23 October 2008. [12]

Under this Rule, the Panel will develop a template for generator compliance programs, and all generators will institute and maintain compliance programs.[13] The Australian Energy Regulator (AER) will regularly conduct spot audits of selected generators' compliance programs as part of its compliance monitoring activities, and NEMMCO will be required to advise the AER of any breach with performance standards.

This Rule also allows for the amendment of a performance standard at any time provided that NEMMCO, the relevant participant and the relevant NSP all agree.

1.4.5 Confidentiality Arrangements in Respect of Information Required for Power System Studies

The AEMC published its Final Determination for the National Electricity Amendment (Confidentiality Arrangements in Respect of Information Required for Power System Studies) Rule 2009 No. 4, on 19 December 2008. 14 This Rule change proposal clarified the information that must be provided to NEMMCO and NSPs by generators to enable power system studies to be undertaken, and how much of and to whom this information may be transferred.

12 Available at: www.aemc.gov.au/electricity.php?r=20080228.150735
13 The Panel is currently developing the generator compliance template. More information on this process can be found at: www.aemc.gov.au/electricity.php?r=20090122.150903
14 Available at: www.aemc.gov.au/electricity.php?r=20080424.113727

2 Technical Standards in the NEM

2.1 Why do we need technical standards?

The NEM technical standards define the level of performance required of the equipment that makes up, and is connected to, the NEM power system. The overall power system is operated to these standards and allows the power system operator, NEMMCO, to effectively manage power system security.

For example, the technical standards include specifying the ability of a generating unit to ride through a disturbance on the power system. If all generators adhere to these standards, a power system incident is less likely to lead to a cascading failure and endanger power system security. In addition, the transfer limits within the NEM transmission system can be more accurately defined when the technical performance of the power system is well defined and known to NEMMCO.

Other aspects of the technical standards specify the quality of the electricity services that the network and those connected to the network can expect. This allows parties to invest in and operate equipment with a reasonable assurance of the quality and expected performance of other parties connected to the network.

2.2 What technical standards apply in the NEM?

While the term "technical standards" is not an explicitly defined term, the Rules:

- define power system security and reliability standards; and
- contain schedules of access technical standards in Chapter 5.

The power system security and reliability standards govern the level of performance of the NEM in relation to system security and reliability, including frequency standards and reserve standards. The Panel has an ongoing work program to review and approve the power system security and reliability standards and, therefore, the AEMC excluded these standards from the terms of reference for this review.

The access standards in the Chapter 5 schedules define the technical obligations on network users and network owners when negotiating the connection of a generating unit, a Market Network Service Provider (MNSP) or an end use customer. The framework for the access standards comprises the following hierarchy:

- system standards set out in schedule 5.1a of the Rules that establish the security, reliability and quality parameters of the power system;
- access standards set out in schedules 5.1 to 5.3a that define the levels to which plant (whether network, generator, customer or MNSP) must be able to perform in order to connect to the power system; and
- plant standards being technology-specific standards which, if met, would assure compliance with the access standards. Plant owners may request that the Panel approve particular standards for this purpose.

To date the Panel has not been requested to approve any plant standards.

2.2.1 System standards

The system standards are contained in schedule 5.1a of the Rules and set out the targets for the performance of the power system. The purpose of schedule 5.1a is to establish system standards that:

- are necessary or desirable for the safe and reliable operation of the facilities of Registered Participants;
- are necessary or desirable for the safe and reliable operation of equipment;
- could be reasonably considered good electricity industry practice; and
- seek to avoid the imposition of undue costs on the industry or Registered Participants.

System standards specify the quality and nature of the electricity supplied by the network. All network users know that these are the standards to which supply can be expected to conform and the system performance which the plant and equipment connected to the system must be designed to withstand. Similarly, the market operator and network service providers know that these are the standards that the system is to be designed and operated to achieve.

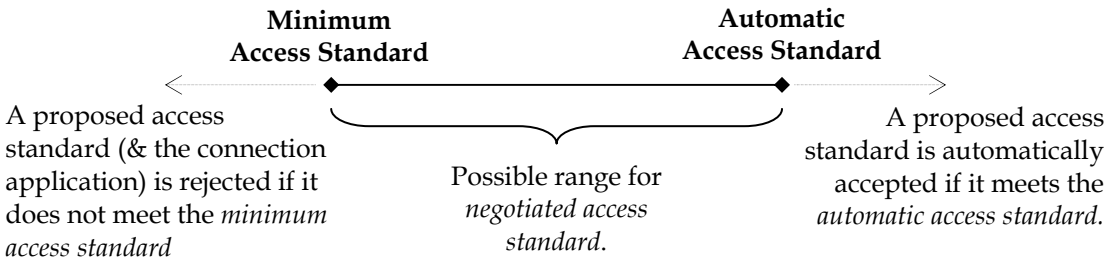
System standards should be set at a level that seeks to minimise the overall cost to all parties connected to the power system. Lowering system standards would reduce the cost of achieving those standards, but would increase costs to network users as they would need to invest in more costly equipment capable of handling lower quality electricity. Conversely, raising system standards would increase the cost of achieving those standards, but would reduce costs to network users as they could invest in less costly equipment that is only capable of handling high quality electricity.

It is clear that system standards can not easily be varied as the equipment connected to the national grid has been developed based on current expectations.

2.2.2 Access standards

While some of the access standards contained in schedules 5.1, 5.2, 5.3 and 5.3a are mandatory, most allow the flexibility of a range within which connection applicants can negotiate with NSPs for access to the network. Both the NSP and, in the case of standards that relate to system security, NEMMCO must be satisfied that the outcome of those negotiations will not adversely affect power system security or quality of supply to other network users. The negotiating range comprises:

- an **automatic access standard** where, if connecting plant achieves that standard, the plant would not be denied access to the network (because of that technical requirement); and
- a **minimum access standard** where, if the connecting plant cannot achieve that standard, the plant would be denied access.



The standards agreed to (whether the automatic access standards or negotiated access standards) become the performance standards for that network user and form part of that network user's connection agreement.

Power system equipment is designed to conform to the technical standards that apply at the time equipment is specified and commissioned. Once the equipment is commissioned it is generally difficult for it to be modified to meet a more arduous standard. As such, when access standards change, often to a higher level, network users are not expected to upgrade their plant to meet the new standard.

2.3 Which technical standards are the subject of this review?

The following technical standards are the subject of the Technical Standards Review:

- the performance standards for Generators, Market Customers and MNSPs specified under clauses 4.14 and 5.3.4A(g) that are required to be registered with NEMMCO;
- the automatic access standards, minimum access standards and performance criteria required for connection of NSPs, Generators, Market Customers and MNSPs set out in schedules 5.1, 5.2, 5.3 and 5.3a respectively, which in the case of Generators, Market Customers and MNSPs, form the basis for specific performance standards required to be registered with NEMMCO;
- the obligations of NSPs, Generators and Market Customers under clauses 5.2.3, 5.2.4 and 5.2.5; and
- the system standards in schedule 5.1a to the extent of their relation to technical matters.

2.4 Terminology

The following definitions apply for terminology used in this report. These definitions have been provided to improve the readability of this report, and as such may vary slightly to the definitions used in the Rules.

technical standards – any clauses under the Rules relating to the technical capability of any equipment making up the power system.

system standards - the standards for performance of the power system as set out in schedule 5.1a.

access standards – the standards for performance of equipment connected to the power system (including that of the networks) specified under schedules 5.1, 5.2, 5.3 and 5.3a.

performance standards – the specific levels (and other specifications) of access standards agreed to for a connection applicant's equipment. The performance standards, once agreed to, are registered with NEMMCO.

connection agreement – an agreement between a Registered Participant and an NSP outlining the conditions for connection (this includes the performance standards).

connection applicant – a person who has applied to establish connection to the power system.

network user – the Registered Participant responsible under the Rules for an item of equipment connected to the national grid.

3 Principles

The following section:

1. restates each of the 13 principles presented in the Draft Report;
2. summarises comments made in submissions in relation to each principle;
3. outlines the Panel's response to the comments made in submissions; and
4. presents the final list of principles, and a list of specific review topics for the Comprehensive Review of Technical Standards.

Some submissions contended that the Panel should adopt the principles developed by WETAG, which were used to guide the development of the *National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2.* [15] The Panel has re-examined these principles and has incorporated aspects of them into the final principles presented in this report where appropriate.

The Comprehensive Review of Technical Standards will consider all aspects of the NEM technical standards (Chapter 5 of the Rules). However the principles developed here would be of primary relevance to the review of the access standards (schedules 5.1, 5.2, 5.3, and 5.3a). In addition, note that the principles are for guidance only, and any recommended changes to the access standards would need to be justified against the NEO.

Some submissions contended that a number of the principles would not necessarily provide guidance to the review of the technical standards, and should more appropriately be considered as stand alone Rule changes. The Panel concurs with this view, and in this Final Report has outlined a set of principles to primarily guide the review of the access standards, plus a list of specific review topics for the Comprehensive Review of Technical Standards. The list of specific review topics will enable the Panel to seek more targeted responses in the early stages of consultation for the Comprehensive Review of Technical Standards. The Panel considers this will enable better industry input into the development of these key policy areas.

Some submissions recommended that the Panel establish a working group of broad industry membership to advise the Panel during the Comprehensive Review of Technical Standards. The Panel will consider this suggestion during the planning for the review.

3.1 Draft Principle 1

Draft Principle 1 - Access standards should be aligned with the system standards wherever appropriate.

15 These principles are discussed in Section 1.4.3.

3.1.1 Submissions to Draft Report

Suzlon Energy Australia (SEA), the Clean Energy Council (CEC), and Pacific Hydro considered alignment between access standards and system standards is not always desirable, as system standards are not always met all the time in all places.

NEMMCO considered that further guidance would be required in relation to the intention of this principle.

3.1.2 Panel

The system standards establish the security, reliability and quality parameters of the power system. The achievement of the system standards is dependant on the performance capability of the individual equipment making up the power system. To enable the system standards to be achieved, the equipment making up the power system must be capable of an adequate level of performance, defined by the access standards. The Panel therefore considers that a key objective of any review of technical standards must be to ensure consistency between the access standards and the system standards. Inconsistency between these standards has the potential to create inefficient outcomes, such as unnecessarily onerous access standards or reduced power system performance.

Consistency between access standards and system standards does not, in the Panel's opinion, impose hard constraints on the levels at which access standards are set. The access standards must allow each network user to make different contributions to the achievement of the system standards depending on a range of factors including location. Some network users will inevitably make a greater contribution to system security than others. The access standards can also have a broader role than just supporting the system standards, such as maintaining network capability (s5.2.5.12). The Panel therefore considers that it is a desirable goal for the access standards to be consistent with system standards, but recognises that in some cases this may not be possible or efficient (and therefore in some cases would not contribute to the achievement of the NEO).

To better articulate the reasoning outlined above, the Panel has modified the language of the principle so that the objective is "consistency with achieving" the system standards rather than "alignment" to the system standards. The Panel has added the qualification "where appropriate" to reinforce that this principle does not impose hard constraints on the setting of access standards.

The Panel has also decided that the principles should clarify that the access standards should take the form of automatic access standard, minimum access standard, and negotiated access standard. The Panel considers that this form of standard has been effective in practice. It has allowed for flexibility in performance standard setting allowing for differences in technology, size and location, whilst imposing bounds on what is considered an acceptable standard. Whilst this form of standard is desirable in most cases, the Panel recognises that in some cases (such as much of schedule 5.1) a different form of standard may be more efficient, and as such the principle should allow for this.

The Panel has established a new principle to clarify the form that access standards should take.

3.1.3 Final Principle

Final Principle 1 – Access standards should be consistent with achieving the system standards where appropriate.

Final Principle 2 – The access standards should, where appropriate, take the form of automatic access standard, minimum access standard, and negotiated access standard.

3.2 Draft Principle 2

Draft Principle 2 - Access standards should support the efficient operation of the power system.

3.2.1 Submissions to Draft Report

Submissions generally considered this principle to be too narrow, and some submissions including Roaring 40's, Loy Yang, AGL, TRUenergy, and International Power recommended broadening the principle to include "efficient investment".

CEC and SEA considered that access standards support the integrity of the power system, and that other factors have a greater influence on the efficient operation of the power system.

NEMMCO contended that this principle needs to the carefully framed to ensure that those persons setting the standards take a balanced view in terms of market efficiency – i.e. network operational efficiency versus generation development cost.

CEC and Pacific Hydro questioned the need for this principle as, in their views, the NEO already covers this principle.

3.2.2 Panel

Any changes to the technical standards would require a Rule change, and as such it would need to be demonstrated that the change would contribute to the achievement of NEO.

Principle 2, that is "support the efficient operation of the power system", is one element of the NEO. But other elements of the NEO such as "promote efficient investment in … electricity services" are also relevant to technical standards.

In making a Rule, the AEMC may give weight to any aspect of the NEO as it considers appropriate.[16] As such, the Panel could anticipate the appropriate weightings that the AEMC would likely apply to each element of the NEO and

16 s88 of the NEL.

develop this principle accordingly. Upon further reflection, the Panel now considers that this would be inappropriate. Appropriate NEO weightings could vary for each technical standard under review and, as such, locking in weightings to apply to all technical standards could result in the Panel developing and proposing sub-optimal changes to the technical standards that would likely be rejected or modified by the AEMC.

The Panel has therefore modified this principle so that any recommended changes to the technical standards must contribute to the achievement of the NEO. It could be argued that this principle is not necessary as the National Electricity Law (NEL) requires any change to the Rules to contribute to the achievement of the NEO, but the Panel considers the inclusion of this principle will assist in ensuring that the NEO is appropriately considered for every change the Panel recommends to the technical standards.

3.2.3 Final Principle

Final Principle 3 – Access standards must contribute to the achievement of the National Electricity Objective.

3.3 Draft Principle 3

Draft Principle 3 - An access standard proposed by a connection applicant should be rejected when it fails to meet the level of the minimum access standard. The minimum access standard denotes the performance level where there is a high degree of certainty that any network user, employing any technology, located at any point on the national grid, would adversely impact system security, the quality of supply to other network users, or where relevant, the operation of the power system in accordance with the system standards.

3.3.1 Submissions to Draft Report

NEMMCO and Pacific Hydro contended that the proposed definition would produce minimum access standards at infinitely low levels.

Some submissions noted that the minimum access standard has previously be described as a "do no harm" standard, and that minimum access standards set under that description have been satisfactory.

The NGF contended that this principle should be removed and placed in the Rules glossary.

3.3.2 Panel

There are two aspects of the minimum access standard that requires definition; the purpose (or use) of the minimum access standard; and what the minimum access standard is intended to represent.

There is general agreement in relation to the purpose of the minimum access standard. The minimum access standard is used as the lower bound of acceptable performance standards, such that any proposed performance standard less than the level of the minimum access standard must be rejected.

What the minimum access standard is intended to represent is however less clear. It is important to understand what the minimum access standard is intended to represent in order to establish the level at which the standard should be set. In the past, the minimum access standard has been referred to as a "do no harm" standard. At this level of performance there could be some degradation to the power system, but no harm done to the system or other network users.

In the Draft Report, the Panel considered that setting minimum access standard levels based on a definition of "do no harm" was quite arbitrary. The Panel was concerned that this could have lead to minimum access standards set at levels too high because there has been no specific requirement to consider all possible connections and locations. High minimum access standards create barriers to entry, especially for connection applicants proposing smaller generating units employing non-conventional technologies. This view was supported by comments made by CEC in their submission to Issues Paper in which they stated:

> "The Council [CEC] believes that a number of the minimum standards detailed in the Rules are set too high. They do not recognise range of size of generators and the different locations where connections are made. The standards needed to apply for generators from the smallest (5 MW connected within the distribution network) to the largest (750 MW connected to the transmission network). At present, many of the minimum standards are set too high for small generators, even though such generation will have no detrimental impact on the system or the network. Minimum standards should represent the true minimum; which in many cases should place only limited or no requirements on the generator."

The definition for minimum access standard proposed by the Panel would have taken technology, size of plant and location into account when establishing the level of minimum access standards, such that no connection applicant would be denied access when their equipment would not adversely impact the power system or other network users. In the Draft Report, the Panel recognised that this definition would lower the levels of minimum access standards, and thus increase the need for performance standards to require negotiation.

The Panel did not receive the support it anticipated for the proposed definition, or a variation of that definition, especially from smaller generators employing non-conventional technologies. Some submissions did not object to the general intent of the panel's proposed definition, but no submissions offered strong support. The proposed definition would impose additional costs on industry due to an increased need to negotiate performance standards, and as such the Panel would not proceed with the proposed definition unless it was confident that substantial benefits were realisable to outweigh the costs. In light of responses to the Draft Report, the Panel is not confident that such benefits are likely. As such the Panel has decided to revert to a "no harm" definition which the Panel considers would be more broadly accepted. This would allow participants to have greater confidence in the levels set for each

technical standard. In addition, maintaining the historical definition would require significantly less change to the current minimum access standard levels thus providing increased certainty for participants.

The principles developed by WETAG to guide the development of the *National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2* did not provide any guidance in relation to how to establish levels for minimum access standards. Commentary attached to the WETAG principles did however refer to NECA's 2001 Review of Technical Standards, in which NECA stated that the minimum access standard should "normally be related to the level at which a risk to system security or of harm to other connected parties may arise".

Pacific Hydro, in its submission to the Draft Report, considered the following definition for minimum access standard to be acceptable:

> "Minimum Standard; is a 'do no harm access standard' the level of performance is such that there is minor influence in the network and no harm done to others or the system."

Pacific hydro stated that this definition was proposed by NEMMCO to the Technical Standards Working Group.

The Panel is broadly comfortable with the definition proposed by Pacific Hydro. The Panel considers that this definition is consistent with the approach taken to set the current levels for minimum access standards. This definition recognises that performance standards set at the minimum access standard could influence the network, but importantly not cause harm. The Panel has added the word "lowest" to this definition to ensure that the minimum access standard levels are set as the lowest level possible where no harm is caused.

The Panel has also included clarification that consideration should be given to the size, technology and location of likely connection applicants in the foreseeable future. By requiring consideration of likely connections, the Panel considers that the likelihood of minimum access standards being set at levels that would unnecessarily deny access would be reduced. However the requirement is far less definitive than the respective requirement proposed in the Draft Report, and only requires consideration be given to "likely connection applicants". As such, the Panel considers this principle will not result in minimum access standards being set at unrealistically low levels.

3.3.3 Final Principle

Final Principle 4 - The minimum access standard must denote the lowest level of performance, considering the size, technology and location of likely connection applicants in the foreseeable future, such that there is minor influence in the network, but no harm done to others or the power system. A performance standard proposed by a connection applicant that is below the level of the minimum access standard must be rejected.

3.4 Draft Principle 4

Draft Principle 4 - An access standard proposed by a connection applicant should be accepted when it meets the level of the automatic access standard. The automatic access standard denotes the performance level where there is a high degree of certainty that any network user, employing any technology, located at any point on the national grid, could connect to the power system and not adversely impact system security, the quality of supply to other network users, or where relevant, the operation of the power system in accordance with the system standards.

3.4.1 Submissions to Draft Report

VENCorp contended that this principle imposes a weaker requirement than principle 5 (negotiated access standard). This is because principle 5 requires performance standards to be set at a level that does not adversely impact system security, whereas principle 4 only requires there to be a high level of certainty that the level of performance standard does not adversely impact system security.

CEC, Pacific Hydro and SEA contended that the automatic access standard should denote the level of performance that is granted automatic acceptance, and at which a NSP or NEMMCO cannot request a higher level of performance.

Pacific Hydro noted that there will always be a point where if a large enough item of equipment is connected there would be adverse impacts on system security. Hence the proposed definition for automatic access standard would require an infinitely high level of standard.

Loy Yang, AGL, TRUenergy, and International Power contended that automatic access standards should be set at levels that can be met by plant and equipment readily available in the power industry.

CEC and SEA contended that in some cases an automatic access standard should result in some impact on the system.

VENCorp contended that maintaining system security and reliability is paramount. There must therefore be no uncertainty that a network user would adversely impact system security.

3.4.2 Panel

As with the minimum access standard, the Panel considers there are two aspects of the automatic access standard that require definition; the purpose (or use) of the automatic access standard; and what the minimum access standard is intended to represent.

There is general agreement in relation to the purpose of the automatic access standard. The automatic access standard is used as the upper bound of acceptable performance standards. A proposed performance standard that meets the level of the automatic access standard must be accepted, and an NSP or NEMMCO cannot demand a higher standard.

What the automatic access standard is intended to represent is however less clear. It is important to understand what the automatic access standard is intended to represent in order to establish at what level the standard should be set.

As an NSP or NEMMCO cannot demand a performance standard above the level of the automatic access standard, the Panel considers that the automatic access standard must be set sufficiently high such that there is no potential for a network user to connect equipment that would cause harm to the power system or other network users.

In its Draft Report, the Panel recognised that the proposed definition for automatic access standard would result in higher levels for those standards. Pacific Hydro correctly pointed out in its submission to the Draft Report that the proposed definition would in fact result in infinitely high levels for automatic access standards. This is because there will always be a point where if a large enough item of equipment is connected there would be adverse impacts on system security. A similar issue was raised by Loy Yang, AGL, TRUenergy, and International Power. The Panel has addressed this issue by clarifying that in setting the levels for automatic access standards, only equipment that is likely to be connected to the system should be considered. There is no benefit in establishing standards to cater for equipment that is unlikely to ever be connected to the power system. The Panel considers that it would be preferable to re-evaluate the levels of standards in the future if the characteristics of equipment connecting to the power system changes.

The Panel has changed the language of this principle so that "harm to the power system and other network users" becomes the basis for consideration. This aligns the language to that of the minimum access standard. The Panel acknowledges that this language is less specific than the language proposed in the Draft Report. The Panel considers this to be appropriate because setting standards is not a precise science due to the number of input variables and unknowns, and as such requires a degree of discretion. The Panel considers the language of the revised principle provides high level guidance for the setting of standards, without imposing hard constraints that may not always be most appropriate.

CEC pointed out that in some cases, a performance standard set at the level of the automatic access standard would result in some impact on the system. The Panel accepts that this may be the case, but considers that this should be the exception rather than the rule. It is the role of negotiated access standards to allow a lower level of standard that could impact the power system where the power system can withstand such as impact. However in some cases, the power system may not be capable of withstanding system degradation, and as such NSPs need to be able to request a level of performance capability that would not degrade the power system.

VENCorp and NEMMCO expressed concern with the Panel's use of the language "high degree of certainty". VENCorp contended that standards should be sufficiently high such as there is "no uncertainty" in relation to adverse impacts. Whilst the Panel considers it would be inefficient to remove all uncertainty, the Panel has removed the terms "high degree of certainty" from the principle to strengthen the objective. However the Panel has added the term "unlikely" in relation to power system degradation. The Panel considers that "power system degradation" is less critical than "harm to the power system" and as such the automatic access standard

does not need to be set to remove all reasonable doubt of power system degradation (this also addresses the previous issue raised by CEC).

3.4.3 Final Principle

Final Principle 5 - The automatic access standard must denote the performance level, considering the size, technology and location of likely connection applicants in the foreseeable future, where there would be no harm done to other network users or the system, and which would be unlikely to degrade the power system. A performance standard proposed by a connection applicant that meets the level of the automatic access standard must be accepted.

3.5 Draft Principle 5

Draft Principle 5 - A connection applicant may negotiate an access standard below the level of the automatic access standard, but above the level of the minimum access standard, where this does not adversely impact system security, the quality of supply to other network users, or where relevant, the operation of the power system in accordance with the system standards. A negotiated access standard must reflect the technical capability of the equipment to be connected, and connection applicants must prove why their plant cannot meet an automatic access standard.

3.5.1 Submissions to Draft Report

CEC and Roaring 40s contended that the requirement to prove why connecting plant cannot meet the automatic access standard is likely to be unworkable. Equipment suppliers specify the capability of their equipment. It would be extremely expensive for a connection applicant to prove why the equipment they are proposing to connect is not capable of higher performance.

Grid Australia considered that the requirement to prove why connecting plant cannot meet the automatic access standard would reduce the complexity of analysis and negotiation required to establish new connections thus streamlining the process.

NEMMCO contended that the word "prove" may be too strong and vague, and that perhaps it would be clearer if the words "provide suitable technical evidence" were used.

Roaring 40s noted that the definition does not address situations where a negotiated standard for a new connecting party hinders an existing network user.

Roaring 40s also noted that situations will arise when connecting parties will be able to meet a higher performance standard by enhancing the capability of their plant (at substantial additional cost). In the absence of an efficiency requirement to balance cost to the connecting party with benefit to the broader system, it could be argued that infinite cost is justified in meeting the Automatic Access standard. This is clearly inconsistent with the NEO.

ESIPC and the NGF contended that the technical standards should provide clear guidance on the basis for negotiating access standards. ESIPC also contended that any negotiation needs to take into account the development of the system as least cost over the short to medium term. ESIPC recommended that the Principle be modified to reflect the need to consider the planning context within which any assessment of likely impacts is being made.

Loy Yang, TRUenergy, AGL and International Power contended that NSPs should be obliged to justify that the desired standard sought by a generator is below the minimum acceptable level. Negotiated access standards should be based on what an NSP can justify is required above the minimum standard.

CEC contended that the connecting party is obligated to provide reasonable quality plant but the NSPs need to show why a particular standard is required for network performance.

Pacific Hydro contended that some onus must go back on NSPs to demonstrate that the network at a connection point meets the systems standards.

Grid Australia noted that in the United Kingdom and Ireland, deviation from a base standard is permitted only in exceptional circumstances. Grid Australia understands that this approach, which reduced the level of negotiation, has been of assistance in processing the very large number of wind generator connections occurring in those jurisdictions.

Loy Yang, TRUenergy, AGL and International Power stated that the negotiated standard must cause no net harm to the system.

Loy Yang, TRUenergy, AGL and International Power did not support the requirement for negotiated standards to reflect the technical capability of a connection applicants' equipment, contending that negotiated standards reflect both technical and business considerations.

Pacific Hydro contended that demanding a matching of registered standard to capability is increasing the risk unnecessarily for a generator's compliance program.

Pacific Hydro contended that the obligation to meet a particular standard does not physically withhold capability from the network, the obligation is to meet or exceed the performance standard.

ESIPC contended that negotiation of a performance standard needs to take into account the development of the system at least cost over the short to medium term. While it may be possible to connect one or two modest size generators at something close to the minimum standards, the application of low standards across a significant number of generators seeking connection in the same region is likely to be unacceptable.

3.5.2 Panel

The first component of this principle supports the concept of negotiated standards. The Panel acknowledges that this is currently supported by a Rule clause, but

considers it beneficial to include as a principle to maintain consistency when developing the form of the access standards, and in developing guidelines for establishing negotiated access standards (see point below).

The Panel supports the view that the minimum access standard can be an acceptable standard. To clarify this position, the Principle has been modified by replacing "but above the level of the minimum access standard", with "and as low as the level of the minimum access standard".

The Panel has changed the language of this principle so that "harm to the power system and other network users" becomes the basis for consideration. This aligns the language to that of the minimum and automatic access standards. Again the Panel acknowledges that this language is less specific than the language proposed in the Draft Report. The Panel considers this to be appropriate for the purposes of providing high level guidance, which is the purpose of the Principles. The Panel does not propose replicating this language in the Rules. The inclusion of "harm to … other network users" addresses the concern raised by Roaring 40s that the proposed definition did not adequately address the impact of a performance standard on other network users.

The Panel does not support the view of Loy Yang, TRUenergy, AGL and International Power that negotiated access standards should be based on what an NSP can justify is required above the minimum access standard. The Panel considers that this would increase the complexity, cost, and time required for establishing performance standards. The Panel considers it would be appropriate for an NSP to justify a performance standard higher than the technical capability of equipment proposed by the connection applicant, but otherwise the connection applicant should be required to propose a performance standard either at the level of the automatic access standard, or that is consistent with the technical capability of the equipment.

The Panel supports the view that the technical standards must provide clear guidance on the basis for setting negotiated access standards. Many technical standards currently provide guidance for setting negotiated access standards. This creates a better understanding of the intent of the technical standard and the factors that should be considered in setting a negotiated standard. This creates a more efficient negotiating environment. Guidance also promotes consistency and transparency. The Panel has modified this principle so that guidance must be provided where possible.

The Panel has added a requirement that where appropriate the guidance provided for negotiating access standards should include a consideration for least cost development of the power system. This would clarify how future connections are to be considered when establishing performance standards. This needs to strike a balance between a connection applicant paying a fair share of the costs of maintaining network performance, whilst not future proofing the system. The Panel considers that this amendment also addresses the concern raised by Roaring 40s in relation to balancing cost to the connecting party with benefit to the broader system.

The Panel has removed the second component of this Principle (that is the requirement for a negotiated access standard to reflect technical capability), and will now consider this as a specific topic for review as part of the Comprehensive Review

of Technical Standards. This decision was made because this component of the principle will not provide specific guidance to the setting of the access standards.

The Panel acknowledges the argument that it would be costly to prove why an item of equipment cannot exceed its design specification to meet the automatic access standard. The intent of this component of the principle was to place further discipline on network users to propose the highest technical standard reasonably possible. The Panel considers that a manufacturer's specification would satisfy this requirement. To clarify this issue, the Panel has changed this principle such that the requirement is to provide "suitable technical evidence" rather than "proof".

Pacific Hydro contended that the obligation to meet a particular standard does not physically withhold capability from the network. The obligation is to meet or exceed the performance standard. The Panel understands that when a network user registers a performance standard below the technical capability of that user's equipment, then this does not necessarily mean that the user will deliver performance at a level below the technical capability of the equipment. In most cases, equipment delivers the level of performance that it is designed to deliver regardless of any agreed performance standard (subject to the operation of the equipment and the power system). The accuracy of performance standards is however important for operating the power system efficiently. For example, NEMMCO may be forced to operate the power system more conservatively than necessary because it is unaware of the true capability of equipment connected to the system. Or a future connection applicant could be required to register a performance standard that is more onerous than necessary because an NSP is modelling power system performance based on network user capability lower than what is physically available.

3.5.3 Final Principle

Final Principle 6 - A connection applicant and network service provider may negotiate an access standard below the level of the automatic access standard, and as low as the level of the minimum access standard, where there would be no harm done to other network users or the system, and any power system degradation is considered tolerable by NEMMCO and the relevant NSP. Where possible, the technical standards should provide clear guidance on the basis for negotiating access standards for each requirement, including a consideration for least cost development of the NEM.

Specific Review Topic 1 - Should negotiated access standards be required to reflect the technical capability of the equipment to be connected, and should connection applicants be required to provide suitable technical evidence as to why their plant cannot meet an automatic access standard?

3.6 Draft Principle 6

Draft Principle 6 - A lower performance standard should be permitted at the time of connection on the condition that equipment is upgraded in the future if a higher performance standard is deemed necessary.

3.6.1 Submissions to Draft Report

Submissions generally expressed concern that this principle could create uncertainty for network users. A requirement for an upgrade at a later date must be identified and justified at the time of connection, so that the user knows the specification of, and the trigger conditions for, any future upgrade requirements.

CEC contended that generators (or customers) should not be forced to inefficiently invest in equipment on the chance that another party may connect. Under these circumstance there should be an option to negotiate a lower standard, with the option of providing a later upgrade to address specific concerns if they should occur. CEC contended that this principle should not hinder principle 7.

Loy Yang, TRUenergy, AGL and International Power contended that in circumstances where a commitment to upgrade equipment is given, then the required level of performance should be known in advance and apply under pre-determined conditions. A connection agreement can be used as the vehicle to require upgrades where there is limited capability for a particular characteristic at a location (eg. harmonics) and there may be a later requirement to share that capability with another participant.

The NGF contended that this approach should only apply if an agreed standard is less than the minimum access standard or if the rectification is considered reasonably "easy" and "inexpensive" to achieve or, where it can be rigorously proven by the relevant NSP or NEMMCO that a security issue is present.

Roaring 40s suggested amending this principle to preclude the application of this mechanism to force connecting parties to install auxiliary plant to meet future system requirements in situations where power system requirements could be more efficiently met either by regulated augmentation of the network or sourcing of system requirements through market mechanisms.

3.6.2 Panel

In the Issues Paper, the Panel considered that this principle would only be viable if the connection agreement specified what level of performance could be called upon in the future, and under what conditions. This would give a network user total certainty as to future costs.

The Panel envisaged the process as follows:

1. The NSP and NEMMCO would determine performance capability requirements for a new connection based on expectations of the characteristics of network usage (as is the case currently);
2. The NSP and NEMMCO would then determine what proportion of that performance capability is required at the time of connection, and what proportion could be delayed (such as until another connection applicant commissions its equipment).

Under this arrangement, the performance that an NSP could require from a network user in the future, is no more than a NSP can currently require (and justify) from a network user at the time of connection under the current connection arrangements.

A prudent investor would cost a project based on the performance specified for the future, which would be equivalent to costing a project based on the performance specified at the time of connection under the current regime.

The Panel considers that this arrangement would produce mainly upside benefit for the connection applicant. The connection applicant would benefit from delayed investment, or if circumstances change the investment to meet the future performance standard may never be required. Alternatively, the NSP and the network user may be able to renegotiate the future performance standard if circumstances change to the benefit of all parties (note that all parties are required to agree to change a performance standard so a TNSP cannot require a network user to meet a higher standard in the future).

The Panel considers that this arrangement would be particularly beneficial in circumstances such as where several users are connecting at a similar location. The power system may be capable of sustaining significant degradation whilst there are few users connected to a location on the network. This could enable a network user to connect equipment with a low performance capability. As additional users connect to that location on the network and the performance requirements of the system increase, the NSP could then call upon those users with low performance capability to upgrade their systems to the level agreed to in their connection agreements. This could be an incremental process such as adding auxiliary equipment to the user's system. If investment conditions change and the network users that were expected to connect to the system never eventuate, then those users connected may never be required to upgrade their system.

The Panel accepts that in many cases there may be no economic benefit for the connection applicant to delay investment because the cost of upgrading equipment at a later date would be greater than the cost of investing to meet a performance standard at the time of connection. In such cases a connection applicant would not opt to delay investment. But in come cases the option of delayed investment could benefit a connection applicant.

As this proposal would not directly affect the review of access standards, the Panel has removed this principle. The concept will be considered further as a specific review topic as part of the Comprehensive Review of the Technical Standards.

3.6.3 Final Principle

Specific Review Topic 2 – Should formal arrangements be established to permit an NSP and connection applicant to delay investment in equipment to meet a registered performance standard when that level of performance is not required at the time of connection? Under such an arrangement, a connection agreement would need to specify exactly what level of performance could be called upon in the future, and under what conditions.

3.7 Draft Principle 7

Draft Principle 7 - The performance standards under a connection agreement are protected for the duration of those agreements, and a performance standard may only be changed when agreed to by the relevant network user, the relevant NSP, and NEMMCO.

3.7.1 Submissions to Draft Report

CEC and Pacific Hydro noted that this principle is already embodied in the transitional arrangements for new rules and the current approach to 'grandfathering'. Unless carefully applied, principle 6 has the potential to undermine this principle.

The NGF contended that WETAG Principle 6 (changes to the registered technical standards must include appropriate transitional arrangements) should be reconsidered for the proposed principles. Changes to technical standards has a massive impact on generation projects that are progressing to construction or are under construction.

NEMMCO questioned whether this principle can be applied to existing generators whose registered performance standards were not developed through the process described in Chapter 5 of the Rules. The Principle may also be inconsistent with the National Electricity Amendment (Performance Standard Compliance of Generators) Rule 2008 No. 10, which allows registered performance standards to be adjusted where all parties (i.e. NEMMCO, the relevant participant and the relevant NSP) agree – but places no obligation on parties to amend the connection agreement to reflect the change in the performance standard.

Roaring 40s contended that the effectiveness and workability of this provision should be enhanced by requiring explicit consideration of economic loss suffered by connected parties in the course of meeting generator performance standards under changed network conditions (i.e. where lost production or additional cost is required to meet a performance standard due to changes in load or connection/retirement of other plant on the system).

VENCorp contended that given the limited ability to vary performance standards once incorporated into a connection agreement, it is crucial that this review settle on an agreeable level of performance standards in order to give both NSPs and generators confidence in entering into long term connection agreements.

Loy Yang, TRUenergy, AGL and International Power contended that the provision opens the connection applicant to the risk of monopoly network providers seeking shorter agreements. Maintaining standards for the economic life of plant provides certainty and therefore better meets the NEO. As there could be debate about the definition of economic life, it is appropriate to roll-over standards into connection agreement term extensions.

SEA stated that currently any physical change to equipment requires the affected performance standards to be re-negotiated even though the plant is able to satisfy the

pre-existing performance standards. This requirement is unnecessary if the change to the plant satisfies the pre-existing performance standards.

CEC contended that the electricity system is operating reliably with the currently connected plant. The operation of the market provides little or no evidence to suggest that the current standards are hindering the market's ability to maintain system security. This would also indicate that if the technical standards are further amended, there is no need to insist that plant that is already connected be upgraded.

The NGF proposed a new principle stating that any changes to access standards must be technically justified. To provide adequate certainty to generators and intending generators the technical standards should only be changed if an appropriate industry body can demonstrate an adequate technical requirement for the change. The justification for this could include the need to correct an error or omission or to incorporate a new technology. In general, when changes are required to incorporate a new technology into the (Rules based) technical standards, contributions to the technical standards review should be sought from both power system experts and specialists from the new technology.

3.7.2 Panel

The concept of grandfathering performance standards is embodied in Chapter 11 of the Rules. Clause 11.10.3 of the Rules covers the transition to the new technical standards established following the National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2.

Transitional arrangements for new technical standards following the Comprehensive Review of Technical Standards would require a new Rule. Despite the fact that transitional arrangements would require a stand-alone Rule, the Panel maintains the view that a principle addressing transitional arrangement is needed. Clarity in relation to transitional arrangements would allow the Comprehensive Review of Technical Standards to proceed with less constraints. For example, if changes to technical standards were to impact existing network users, the cost to industry of any change would be far greater, and thus more difficult to justify, than if changes only impacted new network users.

Whilst the Panel supports providing long term certainty to network users, the Panel now questions the benefit of a Rule (or a principle) that locks in a network user's performance standard for the duration of a connection agreement. Such a Rule could be changed at a later date, thus providing little long term certainty. The Panel has therefore modified this principle to better reflect practical reality by addressing transitional arrangements from the existing technical standards to a new set of technical standards. Any future changes to technical standards would have to reconsider the issue of transition.

The Panel considers that a connection applicant that has commenced negotiations for a connection agreement should not be effected by a change in the technical standards. Requiring such a connection applicant to comply with a new set of standards would be costly and inefficient because the connection applicant could have already spent considerable money in developing an investment in accordance with the existing standards. The Panel considers that the commencement of

negotiations for a connection agreement is the appropriate point to transition to a new set of technical standards. This is consistent with transitional arrangements for the National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2.

The Panel therefore considers that new technical standards established following the Comprehensive Review of Technical Standards should only apply to connection applicants that have not commenced negotiations for connection. The Panel anticipates that a Rule to give effect to these transitional arrangements would take a form consistent with Clause 11.10.3 9 (Transitional arrangements for the National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2)

The Panel has removed the second component of this principle that addressed changing agreed performance standards. The Panel made this decision because this component of the principle would not influence the review of access standards. The Panel notes that some submissions made comments in relation to changing agreed performance standards. The Panel considers that there would be merit in reviewing the process for modifying agreed performance standards and as such has included this a specific review topic for the Comprehensive Review of Technical Standards.

3.7.3 Final Principle

Final Principle 7 - Technical standards established following the Comprehensive Review of Technical Standards would apply only to connection applicants that have not commenced negotiations for connection by the commencement of the new technical standards.

Specific Review Topic 3 – Are the current arrangements for modifying registered performance standards appropriate?

3.8 Draft Principle 8

Draft Principle 8 - Technical standards should be technology, size and location neutral.

3.8.1 Submissions to Draft Report

CEC, NEMMCO and the NGF noted that technology specific wording is required for some standards where there are fundamental differences between technologies, such as differences between synchronous and asynchronous machines or between different voltage levels on the network.

3.8.2 Panel

In the Issues Paper, the Panel considered that technical standards should be technology, size and location neutral to promote efficient investment. Technical standards specific to particular technologies, sizes of equipment or locations on the network could distort investment signals by creating less onerous and therefore less

costly technical standards for particular investments. This would lead to sub-optimal investment.

However the Panel recognises that for some technical standards it is not practical to maintain neutrality, and in some cases neutrality may result in a less effective technical standard.

The Panel has amended this Principle so that neutrality remains a goal of the review of technical standards, but not a hard constraint that could reduce the effectiveness of technical standards.

3.8.3 Final Principle

Final Principle 8 - Where appropriate, technical standards should be technology, size and location neutral.

3.9 Draft Principle 9

Technical standards should apply to NEMMCO, NSPs, Market Network Service Providers, and Generators and Customers whose equipment is registered with NEMMCO.

3.9.1 Submissions to Draft Report

CEC, Loy Yang, TRUenergy, AGL and International Power contended that technical standards should be related to actual connection rather than registration status.

Roaring 40s contended that this principle is undesirable. Application of technical standards to plant on the basis of registration status may result in two generators of the same size and potential impact on the system being subject to different technical standards. The opportunity should be taken in a pro-active manner to establish technical standards arrangements that would be robust to large scale penetration of embedded generation.

EnergyAustralia noted that non registered generators can significantly impact the performance and reliability of a distribution network and therefore on a DNSP's ability to comply with its network performance requirements under the Rules. To address this concern, EnergyAustralia proposed introducing high level principles into the Rules that expressly permit a DNSP to impose technical standards on a non-registered generator. EnergyAustralia considered that, as the amount of embedded generation increases in the mid to long term, the combined performance of embedded generation could adversely affect the overall power system (such as the combined effect of a lack of fault ride-through capability producing cascading outages).

EnergyAustralia considered that the Panel should recommend that the Energy Networks Association or Standards Australia develop a set of national technical standards for different types of generating units less than 30 MW.

VENCorp considered that it will become increasingly difficult to meet system standards as the number of embedded generators in the NEM increases. VENCorp considered that there is merit in establishing an alternative and less onerous framework of technical standards for embedded generators.

3.9.2 Panel

This principle originated from the Panel's position that embedded generators, that are not Registered Participants, should not be required to comply with technical standards in the Rules. The principle was intended to maintain the status quo.

The Panel notes that many submissions expressed a view that embedded generators should be required to comply with the technical standards in the Rules. The Panel recognises the benefits of this such as national consistency and transparency. But the Panel is also concerned that this could require small generators to comply with unnecessarily onerous technical standards that have been developed for larger generators, and could also expose small generators to other NEM costs, risks and complexities.

The Panel is aware that this issue, or related issues are being investigated by other NEM institutions including the AEMC in its 'Review of Energy Market Frameworks in light of Climate Change Policies'.

The Panel included this principle, that maintains the status quo, as a means of generating focus and limiting the scope of the Comprehensive Review of Technical Standards. However a recommendation to alter the status quo, and require embedded generators to comply with the technical standards in the Rules is beyond the scope of this stage of the review.

In recognition that some stakeholders hold the view that this issue requires further consideration, the Panel has removed this principle, and has added the issue as a specific review topic for the Comprehensive Review of Technical Standards.

3.9.3 Final Principle

Specific Review Topic 4 - Should embedded generators that are not currently Registered Participants be required to comply with the Technical Standards in the Rules?

3.10 Draft Principle 10

Draft Principle 10 - Where market arrangements can replace a technical standard, then this should be considered.

3.10.1 Submissions to Draft Report

Submissions generally agreed that in some cases market arrangements could mitigate the need for technical standards.

Some submissions raised concerns with the specific example of reactive power, including the practicalities of establishing a market to procure reactive power which is location specific.

ESIPC submitted a consultants' report that outlined a framework under which the reactive power capability requirements of the NEM could be more efficiently satisfied.

3.10.2 Panel

Based on stakeholder support, the Panel considers that there would be merit in investigating whether there could be more efficient means of procuring certain technical capabilities in the NEM. Market arrangements could be one option, but the Panel considers that the scope of investigations should not be limited to just market arrangements. Other options could include the proposal put forward by ESIPC, or a simple funding mechanism to enable payments to be made to providers of some technical capabilities. As such, the Panel has modified this principle by replacing "market arrangements" with "market based arrangements".

The Panel acknowledges that the introduction of market based arrangements may only partially replace a technical standard. The Panel also acknowledges that the introduction of market based arrangements to replace a technical standard could have significant impacts on other aspects of NEM, and as such the degree analysis to support such a change would need to be appropriately extensive.

3.10.3 Final Principle

Final Principle 9 - Where market based arrangements can replace a technical standard, then this should be considered.

3.11 Draft Principle 11

Draft Principle 11 - Technical standards should be specific, clearly defined, unambiguous and consistent.

3.11.1 Submissions to Draft Report

All submissions generally supported this Principle.

CEC contended that technical standards should be interlinked and not assessed in isolation.

3.11.2 Panel

The Panel has not modified this Principle.

3.11.3 Final Principle

Final Principle 10 - Technical standards should be specific, clearly defined, unambiguous and consistent.

3.12 Draft Principle 12

Draft Principle 12 - Technical standards should be measurable and assessable, in a form that allows effective compliance programs to be developed and maintained, and be enforceable.

3.12.1 Submissions to Draft Report

Submissions generally supported this Principle. However some submissions noted that it is not practically possible to test compliance with some technical standards except by monitoring responses to actual power system conditions.

3.12.2 Panel

The Panel considers that compliance with technical standards is crucial to maintaining the integrity and security of the power system. As such, effective compliance must be a major consideration when developing technical standards.

The Panel acknowledges that it is not feasible to physically test compliance with some technical standards such as fault ride-through. However compliance can be assessed through other means such as modelling and monitoring performance following power system events.

The Panel did not intend for this principle to drive the development of sub-optimal technical standards to manage impractical testing requirements as suggested in some submissions. To address this concern, the Panel has redrafted the Principle so that the focus of the Principle is on effective compliance and enforcement, and not on specific measures to achieve effective compliance and enforcement.

3.12.3 Final Principle

Final Principle 11 - Technical standards must be in a form that allows effective compliance and enforcement.

3.13 Draft Principle 13

Draft Principle 13 - The technical standards should place obligations on the party that is most capable of responding to that obligation in a manner that advances the National Electricity Objective.

3.13.1 Submissions to Draft Report

SEA and CEC contended that it would be difficult to determine who is most capable of responding when several parties are connecting at a similar location.

SEA believed that this principle would give NSPs power to demand higher levels of performance from network users.

Pacific Hydro and CEC contended that almost any additional cost on a connecting party could be justified under this statement in particular with reference to deeper network augmentations. This contributes to the lopsided negotiation process for connections that already exists.

Loy Yang, AGL, TRUenergy and International Power contended that this principle is also taken to mean that NSPs have a responsibility where their equipment impacts on the performance standards of generation to provide appropriate capability if this is the least cost provision.

The NGF contended that where NSP equipment plays a part in the performance standard of a generator, this should be recognised.

VENCorp expressed the view that obligations that ultimately depend on the performance of contractual obligations of third parties should remain a "best endeavours" one.

3.13.2 Panel

The intent of this principle was to ensure that where a performance standard is set for a network user's equipment, then that user has control over the equipment needed to meet that standard. A performance standard becomes ineffective when a network user cannot physically comply with its performance standard because of the actions of others.

The Panel considers that the new Principle 9 now adequately covers the intent of this principle. New Principle 9 requires technical standards to allow effective compliance, which would require technical standards to only place obligations on parties that are capable of responding. Thus the Panel has removed this principle.

3.14 New Principle

3.14.1 Submissions to Draft Report

The NGF proposed adding a new principle to clarify that, where technically appropriate, the performance of generating plant should be measured at the connection point.

3.14.2 Panel

The NGF's proposal would allow distributed generating systems such as windfarms, which are comprised of numerous small units, to consider the performance of the combined system including auxiliary equipment for their performance standards. This can allow distributed generators to more efficiently meet performance standards, with no impact on system security. This principle was adopted for the *National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2*, and is reflected in WETAG Principle 3.

The Panel supports the NGF's proposal. This is current practice, and supports the decision made by the AEMC for the 'Technical Standards for Wind Generation and other Generator Connections' Rule.

WETAG Principle 3 also required the language used in technical standards to support their appropriate application. WETAG provided the example of inappropriate use of the term "scheduled", when power system security is generally governed by the laws of physics rather than whether equipment is scheduled or non-scheduled.

The Panel considers that use of appropriate language in technical standards promotes clarity and effectiveness. As such the Panel has adopted all of WETAG Principle 3.

3.14.3 Final Principle

Final Principle 12 - Terminology used in the technical standards should support their appropriate application. Where technically appropriate, performance of generating plant should be measured at the connection point.

4 Process

The AEMC, in its Terms of Reference for this review, requested that the Panel identify processes for implementing the recommended changes to the technical standards including prospective Rule changes.

The next stage of the process for reviewing technical standards is the Comprehensive Review of Technical Standards. Under that review, the Panel will review the technical standards based on principles presented in this report, and develop Rule changes to implement any changes recommended. The AEMC at this stage has not committed to a timeframe for the Comprehensive Review of Technical Standards.

Some submissions to the Draft Report, particularly from the wind industry, did not support the Comprehensive Review of Technical Standards proceeding at this stage.

Roaring 40s stated the following:

> "Roaring 40s. experience of technical standards in the NEM suggests that the current arrangements are largely workable and efficient. The .Technical Standards for Wind Generation and other Generator Connection. Rule in 2007 represented a substantial overhaul of the arrangements and addressed the majority of Roaring 40s concerns regarding the technical standards in place prior to this date. For the reasons outlined above Roaring 40s does not believe it is appropriate for this review to be a mechanism for major overhaul of the technical standards arrangements, rather it should seek to build on the substantial progress made to date in this area. Focus should be placed on issues not covered by previous reviews (such as market arrangements for reactive power services and mechanisms for variation of Generator Performance Standards over time)."

CEC made the following points:

> "However, as we pointed out in our submission to the Issues Paper to this review, the National Electricity Rules (the Rules) were amended in March 2007 with the making of "the National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No.2". This Rule was incorporated in Version 13 of the Rules and has applied since that time, however it has not been in operation long enough to fully determine the effectiveness of the changes or to identify any problems that may still exist in the technical standards sections of the Rules. Only a very small number of generators have registered under these technical standards. The Council therefore questions the need for a further review of the technical standards at this time.
>
> Further, it should be noted that the review of technical standards at that time was quite broad and covered a much broader range of standards than just those required to better integrate wind generation into the National Electricity Market (NEM).
>
> The Council does not support a further review of technical standards at this time"

Pacific Hydro contended that the Technical Standards for Wind Generation and other Generator Connection Rule in 2007 significantly revised the technical standards for all future generator connections and was done so in accordance with principles which were approved and accepted by SCO. Due to the time lag in planning, approval and construction of new generation projects, very few generators have yet been built to the 2007 standards. Pacific Hydro has however recently negotiated a connection under these standards and considers them both thorough and adequate for maintaining system security and Pacific Hydro believes that NSPs and NEMMCO share this view. Pacific Hydro questioned whether the standards require broad revision or significant change at this point in time. Implementing unnecessary change to the standards creates a significant cost impost on the industry due to the time taken to interpret, negotiate and implement the standards. It also has the potential to create barriers to the delivery of the expanded RET through industry uncertainty and, at least in the early stages of implementing new standards, increasing the time taken to negotiate a connection.

In recommending a commencement date for the Comprehensive Review of Technical Standards, the Panel has considered the following:

1. the AEMC reported a need for the NEM technical standards to be comprehensively reviewed in its Final Report for the "Review into the Enforcement of and Compliance with Technical Standards" in September 2006;

2. the NEM technical standards were significantly revised in the *National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2*; and

3. submissions to the Issues Paper listed some technical standards that are currently difficult and/or inefficient for some network users to comply with, which could be corrected with a minor Rule change.

The Panel considers that the *National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2* addressed some of the inefficiencies and compliance difficulties recognised by the AEMC in its Final Report for the "Review into the Enforcement of and Compliance with Technical Standards" in September 2006. The Panel also accepts the view put forward in some submissions that these changes have not been in effect for sufficient time to assess their impact on the NEM. The Panel therefore considers that there would be benefit in deferring the Comprehensive Review of Technical Standards. This would allow the changes made by the *National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connections) Rule 2007 No. 2* to be better assessed. This additional information would allow for a more comprehensive and complete review of the NEM technical standards providing longer term certainty for participants and investors.

However the Panel also acknowledges that a number of the technical standards are currently difficult and/or inefficient to comply with. Most submissions to the issues paper listed technical standards where improvements could be made. In some cases, a minor change to a technical standard would allow more efficient compliance. The Panel considers that any such changes should be limited to changes that clarify

current practice, rather than changes that would require changes in the technical capability of network users.

The Panel therefore considers that the Comprehensive Review of Technical Standards should be deferred until sufficient new connections have taken place under the current technical standards such that their effectiveness can be assessed. In addition, the Panel considers that a Rule change should be developed by the Panel that seeks to make minor changes to the current technical standards to allow more efficient compliance.

Appendix A – Terms of Reference

Reliability Panel
Review of Technical Standards
AEMC Terms of Reference
14 February 2008 (revised 16 September 2008)

Introduction

On 1 September 2006 the AEMC published its "Review of Enforcement of and Compliance with Technical Standards". In its final report the AEMC recommended that the Reliability Panel (Panel) undertake a review of the adequacy and content of the technical standards. In the final report for this review the AEMC indicated that the technical standards should:

- be based on actual sustainable plant capability; and
- be clear and appropriate.

The AEMC has also noted the Panel's indicative work program which included the likelihood of this review being completed in 2008.

Scope of the Technical Standards Review

Clause 8.8.1(a)(7) of the National Electricity Rules requires the Panel to:

> monitor, review and *publish* a report on the implementation of *automatic access standards* and *minimum access standards* as *performance standards* in terms of whether:
>
> 1. their application is causing, or is likely to cause, a material adverse effect on *power system security*; and
> 2. the *automatic access standards* and *minimum access standards* should be amended or removed;

Therefore, the AEMC requests the Panel, in accordance with section 38 of the NEL, to undertake a review of the technical standards, including the individual technical standards as well as the effectiveness of the interaction between the system, access and plant-specific standards as a whole.

The term "technical standards" is not a defined term in the Rules. However, the AEMC indicated in its final report that the technical standards to be reviewed by the Panel should include:

- the performance standards for Generators, Market Customers and MNSPs specified under clauses 4.13, 4.14 and 5.3.4A(g) that are required to be registered with NEMMCO;

- the automatic access standards, minimum access standards and performance criteria required for connection of NSPs, Generators, Market Customers and MNSPs set out in schedules 5.1, 5.2, 5.3 and 5.3a respectively, which in the case of Generators, Market Customers and MNSPs, form the basis for specific performance standards required to be registered with NEMMCO;

- the obligations of NSPs, Generators and Market Customers under clauses 5.2.3, 5.2.4 and 5.2.5; and

- the system standards in schedule 5.1a to the extent of their relation to technical matters.

The frequency and reliability standards for the mainland and Tasmania are excluded from the scope of this present review by the Panel.

Deliverables

The AEMC requests that, following the completion of its review of the adequacy and content of the technical standards, the Panel should provide the AEMC with a Final Report that includes the findings and recommendations of its review, and which identifies:

- the principles that should be applied in revising the technical standards; and

- processes for implementing the recommended changes to the technical standards including prospective Rule changes.

Process

This review of the Technical Standards is 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 forums on the main review issues paper and on each of its draft decisions.

The Panel may choose to utilise consultant support engaged and provided by the AEMC to assist the Panel in the preparation of scoping and issues papers, draft and final review documents, and undertaking research and analysis.

The Panel is requested to deliver its Final Report by 30 April 2008.

The Panel should also keep the AEMC informed of progress during the review.

Appendix B – List of Submissions to the Issues Paper

Submissions are available at:
http://www.aemc.gov.au/electricity.php?r=20080509.151254

Energex Limited

Clean Energy Council

Grid Australia - Covering Letter

Grid Australia - Submission

National Measurement Institute - Covering Letter

National Measurement Institute - Submission

NEMMCO

National Generators Forum

Appendix C – List of Submissions to the Draft Report

Submissions are available at:
http://www.aemc.gov.au/electricity.php?r=20080509.151254

AER - Received 16 February 2009

Clean Energy Council - Received 16 February 2009

Energex - Received 16 February 2009

Energy Australia - Received 13 February 2009

ESIPC - Received 13 February 2009

ESIPC - Attachment

Grid Australia - Received 13 February 2009

LYMMCO, AGL, TRUenergy, International Power - Received 13 February 2009

NEMMCO - Received 13 February 2009

NGF - Received 13 February 2009

Pacific Hydro - Cover Letter - Received 17 February 2009

Pacific Hydro

Roaring40s - Received 13 February 2009

Suzlon Energy Australia - Received 13 February 2009

Vencorp - Received 17 February 2009