Australian Energy Market Commission

AEMC Reliability Panel

Technical Standards Review

Draft Report

19 December 2008

Inquiries

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About the AEMC

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

About the AEMC Reliability Panel

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

Disclaimer

The views and recommendations set out in this document are those of the Reliability Panel and are not necessarily those of the Australian Energy Market Commission.

Reliability Panel Members

Chairman

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Other AEMC Reliability Panel Members

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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

Summary

On 14 February 2008, the Australian Energy Market Commission (AEMC) requested the Reliability Panel (Panel) to undertake a review of 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, the scope and timing of which is to be determined by the AMEC, will revise the individual technical standards (such as the levels of each individual technical standard and clause drafting) based on the principles developed in this review.

This review originated from a recommendation in the AEMC's Final Report on the "Review of Enforcement of and Compliance with Technical Standards"[2].

The Panel published an Issues Paper on 9 May 2008. Based on responses to this paper the Panel has developed the following principles.

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

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

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.

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.

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

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

2 This report is available at http://www.aemc.gov.au/electricity.php?r=20051216.173039.

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.

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.

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.

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

Principle 9 - Technical standards should apply to NEMMCO, NSPs, Market Network Service Providers, and Generators and Customers whose equipment is registered with NEMMCO.

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

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

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.

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 (NEO).

The Panel also considers that the subsequent review to revise the individual technical standards should review all technical standards together to ensure consistency.

The Panel considers that revising the technical standards based on these principles would advance the NEO. This would be achieved through more efficient procurement of technical performance capability from equipment making up and connected to the power system. This would result in lower long term prices for consumers, whilst maintaining a secure power system.

These principles will provide important guidance to the process of revising the technical standards. Any changes to the technical standards would require a Rule change, and as such would be required to be assessed against the NEO.

The Panel is seeking feedback from stakeholders on these principles by 13 February 2009.

Send submissions electronically to panel@aemc.gov.au

Or mail to:
The Reliability Panel
Australian Energy Market Commission
PO Box A2449
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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"[3]. In this report, the AEMC recommended that the 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
- are clear and appropriate.

On 14 February 2008, the AEMC requested the Panel to undertake a review of technical standards in the Rules, and provide the AEMC with a final report by 30 April 2009[4] that identifies:

1. the principles that should be applied in revising the technical standards; and
2. the processes for implementing the recommended changes to the technical standards including prospective Rule changes.

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

1.2 Process

1.2.1 Deliverables from the Review

Through this review, the Panel will establish a set of principles that it will recommend to the AEMC to apply when revising the technical standards. The Panel will also recommend a process for revising the technical standards.

As such, this review will not consider the detailed aspects of the technical standards, such as levels of individual technical standards, or the drafting of individual clauses. The Panel understands that consideration of such detail will take place when revising the technical standards in a subsequent review, the process and timing of which will be determined by the AEMC.

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3 This report is available at www.aemc.gov.au/electricity.php?r=20051216.173039.

4 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.

1.2.2 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 of 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 NSPs and network users consistent?

6. Which aspects of the technical standards need more urgent review?

The Panel invited submissions from stakeholders to the Issues Paper by 13 June 2008.

1.2.3 Draft Report

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

This Draft Report outlines the Panel's preferred positions in relation to the principles, together with the Panel's reasons for adopting these preferred positions. This Draft Report also outlines the Panel's preferred position in relation to the process for revising the technical standards.

The Panel seeks the views of stakeholders on the preferred positions outlined in this report.

1.2.4 Final Report

The Panel is due to provide the AEMC with a final report by 30 April 2009. The AEMC will consider the contents of this report, and is expected to publish the Panel's Final Report by 31 May 2009.

1.3 Context of the Technical Standards Review

1.3.1 NECA Review of Technical Standards [2001]

At the commencement of the National Electricity Market (NEM), all jurisdictions derogated the technical standards in the National Electricity Code (Code)[5] in favour of existing plant standards applying at that time. 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.

In December 2001, NECA published the Final Report on its "Review of Technical Standards"[6]. 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[7]. The second stage modified the principles. 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.

1.3.2 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"[8] on 1 September 2006. The Final Report recommended an integrated package of measures intended to ensure that performance standards for existing generators are 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 are comprehensively reviewed and that appropriate penalties for failure to comply are operative.

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5 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).

6 This report is available at: www.neca.com.au.

7 These principles are outlined in Section 4 of this report.

8 This report is available at: www.aemc.gov.au/electricity.php?r=20051216.173039.

1.3.3 Technical Standards for Wind Generation and other Generator Connection [2007]

The AEMC published its Final Determination on the "Technical Standards for Wind Generation and other Generator Connection" Rule on 8 March 2007.[9]

Prior to this Rule change, wind generators were exempt from many of the requirements under schedule 5.2 because the schedule referred to synchronous, scheduled or transmission connected generating units. Whereas wind generators are classified as non-scheduled[10], generally use asynchronous technology and are sometimes connected to distribution networks.

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.

This Rule change made targeted improvements to the technical standards, but did not undertake a comprehensive review of technical standards.

1.3.4 Performance Standard Compliance of Generators [2008]

The AEMC published its Final Determination on the "Performance Standard Compliance of Generators" Rule on 23 October 2008.[11]

Under this Rule, the Panel will develop a template for generator compliance programs, and all generators will institute and maintain compliance programs. The Australian Energy Regulator (AER) will regularly conduct spot audits of selected generators' compliance programs as part of its compliance monitoring activities, and

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9 This determination is available at: www.aemc.gov.au/electricity.php?r=20060324.143345.

10 On 1 May 2008 the AEMC published its Final Determination on the "Central Dispatch and Integration of Wind and Other Intermittent Generation" Rule that will require 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.

11 This determination is available at: www.aemc.gov.au/electricity.php?r=20080228.150735

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.

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

On 8 April 2008, the AEMC received a Rule change proposal from the NGF entitled "Confidentiality Arrangements in respect of Information Required for Power System Studies". This Rule change proposal concerns 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 to.

The AEMC published its Draft Determination for this Rule change proposal on 25 September 2008[12].

1.4 National Electricity Objective

The Panel must have regard to the NEO[13] when it performs this review of the NEM technical standards. The NEO is:

> "The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of
>
> consumers of electricity with respect to:
>
> (a) price, quality, safety, reliability and security of supply of electricity; and
>
> (b) the reliability, safety and security of the national electricity system."

1.5 Submissions to the Draft Report

The Panel invites written submissions from interested parties in response to the Draft Report by 5 pm (Australian Eastern Standard Time) on 13 February 2009. Submissions may be sent electronically or by mail in accordance with the following requirements.

1.5.1 Lodging a submission electronically

The submission must be sent by email to panel@aemc.gov.au. The email must contain the phrase "Technical Standards Review – Draft Report" in the subject line or heading. The submission must be on letterhead (if submitted on behalf of an organisation), signed and dated.

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[12] This determination is available at: www.aemc.gov.au/electricity.php?r=20080424.113727

[13] The NEO is which is set out in section 7 of the National Electricity Law.

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

1.5.2 Lodging a submission by mail

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

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

The envelope must be clearly marked "Technical Standards Review – Draft Report".

Except in circumstances where the submission has been submitted electronically, upon receipt of the hardcopy submission the Panel will issue a confirmation letter. If this confirmation letter is not received within 3 business days, it is the submitter's responsibility to ensure successful delivery of the submission has occurred.

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:

1. are necessary or desirable for the safe and reliable operation of the facilities of Registered Participants;

2. are necessary or desirable for the safe and reliable operation of equipment;

3. could be reasonably considered good electricity industry practice; and

4. 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.

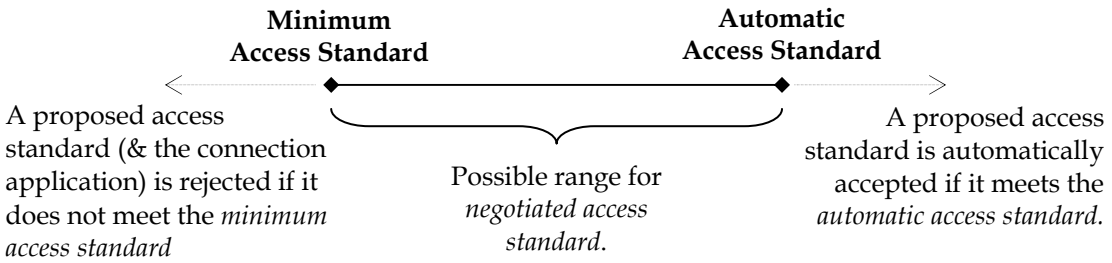
It is clear that system standards can not easily be varied as the equipment connected to the national grid has been developed based on current expectations.

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 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 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 Issues Raised in Submissions

Based on responses to the Issues Paper, the Panel has identified the main issues it considers should be explored in developing the principles. Each of the issues identified are discussed in this section of the Draft Report, including:

- a summary of the relevant responses in submissions to the Issues Paper;
- the Panel's analysis of the issue;
- some options for addressing the issue; and
- the Panel's preferred position in relation to the issue.

The Panel appreciates the well-considered submissions made in response to the Issues Paper. In many cases, submissions provided detailed feedback on individual technical standards and specific Rule clauses. Whilst the Panel is not considering such detail at this stage of the Review, the Panel has taken these comments into account in developing the principles. These detailed comments will also make a valuable contribution to the subsequent review in which the detailed content of the technical standards will be revised.

3.1 Align Access Standards with the System Standards

3.1.1 Submissions

Clean Energy Council

The Clean Energy Council (CEC) considered that the AEMC described the automatic access standard well in the "Technical Standards for Wind and other Generator Connections" Rule change[14], in which the AEMC linked the access standards to achieving the system standards.

National Generators Forum

The National Generators Forum (NGF) contended that the access standards should be aligned with the system standards.

3.1.2 Analysis

The system standards specify the quality and nature of electricity supplied by the power system. The Rules require NEMMCO to operate the power system in accordance with the system standards, enabling network users to design their equipment to connect to a power system of known characteristics.

NEMMCO does not own any of the equipment making up the power system, and thus must rely on the performance capability of the networks and network users to

[14] This determination is available at: www.aemc.gov.au/electricity.php?r=20060324.143345

achieve the system standards. It is thus logical for the performance standards of network users to align with the system standards to ensure sufficient performance capability is available so that NEMMCO can operate the power system in accordance with the system standards.

However the Panel considers that the access standards have a broader role than just achieving the system standards. One such example is network capability (clause S5.2.5.12). NEMMCO could achieve the system standards following a new network connection by reducing the transfer limit on a network element. This may allow system security to be maintained, but could reduce competition in the NEM, and could threaten the supply of some customer loads. Another example is the quality of supply to other network users. NEMMCO could be capable of managing the power system is accordance with the system standards following a new network connection, however an NSP may no longer be capable of supplying electricity to another network user at the quality agreed to in its connection agreement.

3.1.3 The Panel's Position

The Panel considers that:

1. **Access standards should be aligned with the system standards wherever appropriate.**

Providing a specific basis on which to establish access standards would enable the setting of standards to be less arbitrary, and more targeted at delivering an efficient level of performance to meet the requirements of the power system. This would also result in standards that are more robust and defendable, and that would promote greater transparency and confidence in the setting of the levels of the access standards.

2. **Access standards should support the efficient operation of the power system.**

The Panel considers the role of access standards is broader than just achieving the system standards and, as such, the system standards cannot be the sole basis for setting access standards.

NEMMCO can operate the power system in accordance with the system standards by lowering secure operating limits. This is inefficient as it results in under-utilisation of the network, can reduce competition in generation, and could threaten the reliability of supply to customers. The access standards should not allow system degradation that would reduce the efficiency of the power system.

3.2 Definition of Minimum Access Standard and Automatic Access Standard

In the Issues Paper, the Panel referred to principles established by NECA in its 2001 review of technical standards. Two of these principles included:

1. participants should be able to connect to the system if they cause no degradation to the system (automatic access standard); and

2. a participant who would degrade the system to an unacceptable extent cannot access the system (minimum access standard).

3.2.1 Submissions

CEC

The CEC expressed concern at using the words "no degradation to the system" to describe the level of the automatic access standard. The CEC considered that the AEMC described the automatic access standard well in the "Technical Standards for Wind and other Generator Connections" Rule change[15], in which the AEMC described the automatic access standard as the point at which system standards are expected to be met.

The CEC states that currently many of the minimum access standards are set too high for small generators (such as 5 MW units connected to distribution networks), even though such generation would have no detrimental impact on the system or the network. The CEC considers that the minimum access standards should represent the true minimum, which in many cases should place limited or no requirements on the generator.

NGF

The NGF expressed concern at using the words "no degradation to the system" to describe the level of the automatic access standard. The NGF considered that if the automatic access standard represents the point below which the system would experience degradation, then negotiated access standards (which are set at a level below the automatic access standard) should result in degradation to the system. The NGF considered that system performance has been maintained, and in a large number of areas there have been improvements in performance through diversified generation technologies. The NGF contended that the current level of automatic access standards represents an area above the no degradation level. Thus either the levels of the automatic access standards are set too high, or the automatic access standards represent something other than the point of no degradation.

3.2.2 Analysis

Chapter 5 of the Rules states that the minimum and automatic access standards are to be used for establishing performance standards for network users (i.e. the minimum and automatic access standards mark the lower and upper bounds within which a performance standard must be established). However the Rules (or any other legal instruments) do not define what these standards represent.

It is necessary to understand what the minimum and automatic access standards represent to set the levels for each individual technical standard. For example, if the automatic access standard represented the point of "no system degradation", then the level of each technical standard would be set to achieve this objective. However,

[15] This determination is available at: www.aemc.gov.au/electricity.php?r=20060324.143345

if the automatic access standard represented the point of "limited system degradation", then each technical standard would be set at a lower level to achieve this less onerous objective. Understanding what the minimum and automatic access standards represent will be important for the subsequent review of technical standards when the levels of individual standards will be open for revision.

The role of the minimum and automatic access standards is to simplify the process of establishing performance standards. In the absence of minimum and automatic access standards, performance standards could be established entirely by negotiation. This would be costly and time consuming. The minimum and automatic access standards reduce the number of individual technical requirements that require negotiation by establishing some pre-set acceptance and rejection levels.

Automatic Access Standard

The automatic access standard represents 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 and not adversely impact the operation of the power system in accordance with the system standards.

Due to the high level of certainty of achieving the system standards, connection applications that meet the automatic access standards for any technical requirements are granted automatic acceptance for that technical requirement. This avoids the need for NSP analysis and negotiation, provides the connection applicant certainty of acceptance, and also provides NSPs and NEMMCO a high degree of certainty that system standards would be met.

The automatic access standards must be sufficiently high such that no connection applicant is automatically granted access to the power system where their connection could adversely impact system security.

Minimum Access Standard

At the other end of the spectrum, the minimum access standard represents 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 the operation of the power system in accordance with the system standards.

Due to the high degree of certainty of not achieving the system standards, connection applicants that do not achieve at least the minimum access standard for any technical requirement are automatically denied access to the power system. This avoids wasting time and resources analysing a proposed performance standard that is likely to threaten the achievement of the system standards.

The minimum access standards must be sufficiently low such that no connection applicant is denied access to the power system when their connection is unlikely to adversely impact system security.

The automatic and minimum access standards represent the upper and lower boundaries of acceptable performance standards, the levels at which proposed technical requirements are automatically accepted and rejected. In between these two boundaries is a large area of "uncertainty". Within this area there is a possibility that a connection applicant could connect equipment and not adversely impact the achievement of the system standards, however analysis is required by NEMMCO and the NSP to determine the impact of that particular connection.

The Panel considers the following points relevant for establishing definitions for minimum and automatic access standard:

- The level of performance standards must enable NEMMCO and NSPs to operate the power system in accordance with the system standards.

- Under the NEM's open access regime, any network user must have reasonable access to the power system. The levels of the automatic and minimum access standards determine what equipment will be granted access to the system and what equipment will be denied access. The levels of the minimum and automatic access standards also determine the level of investment required by a connection applicant to be granted access.

- Access standards are common across the NEM, and hence must account for network characteristics at all locations in the NEM. Access standards are common for all forms of generation technologies, and thus must account for variations in the capability of technologies seeking or potentially seeking connection. Access standards are also common for all sizes of equipment and, taking generation for example, must apply to generating units ranging from around 5 MW up to 750 MW.

- The definitions of automatic access standard and minimum access standard must be consistent with the philosophy that any connection applicant that meets the automatic access standards should be able to connect to the system, and any connection application that is not capable to meeting any minimum access standard should be denied access to the system.

3.2.3 Options for Change

The Panel has considered the following options for defining minimum and automatic access standard.

1. Include a specific objective for the automatic access standard to promote or incentivise technological development.

   By setting the automatic access standard high, connection applicants would be incentivised to invest in research to develop new and innovative technologies to meet the automatic access standard. However without strong incentives to meet the automatic access standard, the incentive to invest in new and innovative technologies would be low. Raising the level of the automatic access standard would also reduce the number of connection applicants capable of meeting that

standard, thus resulting in a greater number of connection applicants requiring negotiated access standards.

The Panel considers it is unlikely that this option would promote the NEO.

2. Define the minimum and automatic access standards as follows:

> 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.
>
> 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.

Access standards based on these definitions are intended to ensure that no connection applicant is automatically denied access unless there is a high degree of certainty that its connection would adversely impact the achievement of the system standards. Conversely, these definitions are intended to ensure that no connection applicant is automatically granted access unless there is a high degree of certainty that its connection would not adversely impact the achievement of the system standards.

The Panel recognises that access standards based on these definitions may broaden the range of technical requirements requiring negotiation, compared to the current levels of access standards. As discussed in Section 3.3, this could increase the time and cost of establishing performance standards. However the Panel considers the access regime has an important role in maintaining appropriate levels of performance, whilst not creating inefficient barriers to entry. As such, the Panel does not consider the time and cost of negotiating standards should be a consideration in determining who is denied access to the power system (the minimum access standard), and what level of performance is required by the power system (the automatic access standard).

These definitions for minimum and automatic access standards are aligned with the system standards where relevant, as discussed in Section 3.1. Importantly, they also allow for the broader consideration of power system security and quality of supply (also discussed under Section 3.1).

3.2.4 The Panel's Position

The Panel considers that:

1. **Minimum access standard should be defined as:**

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.

2. **Automatic access standard should be defined as:**

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.

3.3 Negotiated Access Standards

3.3.1 Submissions

CEC

The CEC considered that the negotiated access standards should allow for the lowest practical standard at each connection point to minimise the cost of connection and minimise long-term costs to consumers.

Grid Australia

Grid Australia stated that connection applicants should be encouraged to adopt the automatic access standards and that connection applicants should be required to prove why they are unable to meet an automatic access standard. Grid Australia explained that the process of negotiating access standards is time consuming and can result in delays to new investment requiring network access. The process also adds complexity and thus costs to network performance modelling and compliance processes. Grid Australia further explained that acceptance of a low performance standard today, can result in someone else paying for that shortfall in the future.

NEMMCO

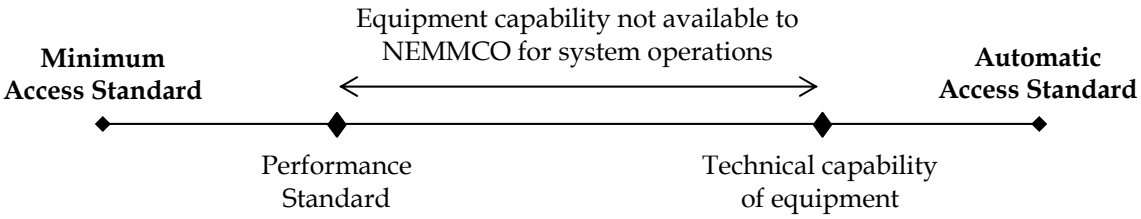
NEMMCO stated that when a connection applicant is unable to meet an automatic access standard, then the negotiated access standard should be set as close as possible to the automatic access standard and should reflect the actual capability of the connection applicant's equipment. NEMMCO lists some possible outcomes of registering performance standards below the capability of the equipment including a need for other network users to re-tune their control systems, reduced secure operating limits, and increased costs for future connection applicants.

3.3.2 Analysis

The Rules currently allow connection applicants to negotiate performance standards below the level of the automatic access standards, and as low as the minimum access standards, where this does not adversely affect power system security or quality of

supply to other network users. Each negotiated access standard provides some guidance to NSPs and connection applicants in relation to the requirements of and the process for negotiating that standard.

The Rules generally do not require performance standards to be set as close as possible to the automatic access standard or to reflect the capability of the connecting technology. This can result in the registration of performance standards below the capability of the connecting technology. There are however some exceptions, such as clause S5.2.5.13(f) which requires the negotiated access standard to be "the highest level that the generating system can reasonably achieve". In negotiating a performance standard, NEMMCO and NSPs have little power to enforce a level of performance standard higher than that required to maintain power system security and quality of supply to other network users.



In the absence of any requirement for connection applicants to register a performance standard at the highest level reasonably possible, connection applicants are incentivised to seek the lowest possible performance standard to minimise the cost of connection and the risk of non-compliance with a standard set too close to the technical capability of the plant. The main incentive for connection applicants to accept the automatic access standard is to save the time and cost of negotiating a lower standard

The Panel considers that the current process for establishing performance standards can be described as a "bottom up" approach, where the minimum access standard is the default starting point for negotiation, and the performance standard is lifted above this level only when necessary to maintain power system security. This approach contrasts to a "top down" approach, where the automatic standard would be taken as the default starting point for negotiation, and the level of the performance standard reduced below that level only when a connection applicant is unable to meet the automatic access standard.

Permitting connection applicants to register the least onerous performance standard possible (i.e. closest to the minimum access standard) minimises the investment cost for that connection applicant. Reduced capital investment would allow network users to bid more competitively into the spot market thus putting downward pressure on spot prices. In addition, reduced investment cost could also promote increased investment and competition in the NEM, thus applying further downward pressure on spot prices.

However permitting connection applicants to register the least onerous performance standard possible can increase the cost of system operations. This is due to increased

connection and modelling complexity, lower network utilisation due to reduced secure operating limits, and in some cases the need for NEMMCO and NSPs to purchase additional services to manage power system security. Performance standards at lower levels could also potentially increase the connection costs for future connection applicants as any spare technical capability available in the system is used up, and could also reduce the quality of services for other network users.

The CEC makes the statement in its submission that allowing the lowest practical standard at each connection point would minimise long-term costs to consumers. In some cases this may be true but, as described above, in many cases the increased costs of power system operations as a result of connecting network users with low performance standards would outweigh the benefits resulting from reduced connection costs.

NEMMCO and NSPs can utilise the capability of network users to manage power system security. Equally, NEMMCO and NSPs (mainly NSPs) can utilise the capability of their own assets or services contracted to them to manage power system security. In some cases, an NSP could be capable of providing capability to manage system security at a lower price than the network user. Currently, a connection applicant could agree to compensate an NSP for providing performance capability, in return for allowing a lower performance standard.

3.3.3 Options for Change

The Panel considers that performance standards should be set at an appropriate level that seeks to minimise the overall cost to all parties connected to the power system. This would advance the NEO by reducing the long term price consumers pay for electricity, whilst maintaining a level of system security that consumers appropriately value.

The Panel considers the Rules are currently biased towards establishing performance standards below the efficient level. This is because the Rules only require performance standards to be set at the minimum level necessary to maintain system security, with no consideration of other costs resulting from this level of performance.

The level of performance standards can be increased by incentivising or requiring investment in equipment capable of higher performance, or by incentivising or requiring the registration of a higher performance standard for a given item of equipment. The Panel has considered each of these approaches in the following options for increasing the level of new performance standards registered in the NEM.

1. Require performance standards to reflect the technical capability of the equipment to be connected.

   Permitting performance standards at levels below the technical capability of a connection applicant's equipment is inefficient. This is because NEMMCO and NSPs are unable to fully utilise the performance of that equipment. By requiring a network user to register a performance standard that reflects the technical capability of its plant, the costs of power system operations would be reduced

through increased secure operating limits and a reduced need for network operators to purchase services to manage system security. This could be achieved at little or no cost to the connection applicant because the decision to invest in a particular technology would have already been made.

The Panel recognises that network users may want to register performance standards below the technical capability of the equipment to allow for a degradation of equipment performance over time. However the Panel considers performance degradation to be minor relative to equipment capability, especially in the early years of life. The Panel considers that minor performance degradation can be accounted for in the setting of performance standards, and any material performance degradation should be managed through the negotiation of a new performance standard or equipment upgrade.

From a practical perspective, NSPs and NEMMCO may experience difficulties establishing the technical capability of the equipment of some connection applicants due to information asymmetry. This would especially be the case for new technologies. The Panel does not consider this issue to be an impediment to introducing a requirement for performance standards to reflect the technical capability of equipment. The Panel considers there are measures that can be taken to minimise the impact of information asymmetry such as engaging the assistance of experts to provide advice on equipment capability.

The Panel notes that requiring performance standards to reflect the technical capability of the equipment would enable the performance of the equipment to be better utilised by NEMMCO and NSPs. However it would not affect the investment decisions of connection applicants who may still choose to invest in equipment that is only capable of meeting the minimum access standard.

2. Require connection applicants to connect industry best technology to enable performance standards to be as close as possible to the automatic access standards.

   This would likely reduce the cost of system operation due to the possibility of higher secure operating limits, reduced costs in managing performance standards, and a reduced need for NEMMCO and NSPs to acquire services to manage power system security.

   Requiring connection of industry best technology would likely lead to higher spot prices due to the need for generators to recover higher capital costs and possibly due to reduced competition as investors could be less incentivised to invest in new generating plant.

   In some cases, the high level of a performance standard provided by industry best technology would not be fully utilised where this level of performance is superfluous to system requirements. The additional cost of connecting industry best technology would be inefficient because a cheaper investment could have provided an adequate level of performance. Hence the Panel considers that this would be a costly method of reducing the cost of system operations and that other options are more likely to advance the NEO.

3. Introduce technology specific technical standards to reduce the need for negotiated access standards.

   The need for negotiated access standards would be reduced because more connection applicants would be capable of achieving the automatic access standard levels when those standards are established for a specific technology. Technology specific standards are discussed in further detail under Section 3.4.

4. Abandon the concept of negotiated access standards (together with minimum and automatic access standards) and replace with a single access standard (possibly varying for specific technologies) that every connection applicant must meet.

   This would reduce the cost and time of negotiating access standards. A single standard would most likely be set at a level higher than the minimum access standard, but lower than the automatic access standard. The effect of this would be to reduce the performance standards for some network users that would otherwise be capable of meeting the higher level of the automatic access standard. It would also prevent access to the power system for some connection applicants that are unable to meet the level of the single standard, but would otherwise not adversely affect power system security and could have met the lower level of the minimum access standard. The Panel considers that the benefit of reducing the cost and time of negotiating access standards would be small compared to the increased costs of system operations and the economic costs of creating barriers to entry for some equipment. The Panel therefore considers it is unlikely that this option would advance the NEO.

5. Reduce the level of the automatic access standards to allow most connection applicants to meet this level.

   This would reduce the need to negotiate performance standards below the level of the automatic access standards because more connection applicants would be capable of meeting the automatic access standards. Thus this would reduce the cost and time of negotiating access standards. However reducing the level of the automatic access standards would also reduce the overall levels of performance standards, thus increasing power system operating costs to achieve the system standards. For similar reasons to option 4, the Panel considers it is unlikely that this option would advance the NEO.

6. Require connection applicants to prove why they can't meet an automatic access standard.

   This would create a "top-down" approach to setting performance standards (as opposed to what the Panel considers is currently a bottom-up approach). When negotiating a performance standard, a connection applicant would be required to accept the automatic access standard, or where this level is not achievable the connection applicant would be required to prove why its equipment is not capable of meeting that standard.

Some of the access standards currently require a connection applicant to demonstrate why an automatic access standard can not be achieved. An example of this is clause S5.2.5.13(e).

Under the Rules currently, there is an implicit requirement on NSPs to demonstrate why a level of standard greater than the minimum access standard is required to avoid adverse affects on power system security. This can result in standards set at the level of the minimum access standard when system security is not adversely affected, despite the connection applicant's equipment being capable of greater performance. By creating an explicit Rule requirement for connection applicants to prove why their equipment cannot achieve the automatic access standard, the default starting point for negotiation shifts from the minimum access standard to the automatic access standard. This would result in performance standards that better reflect the technical capability of the equipment being connected, and would allow NEMMCO and NSPs to better utilise the performance of connected equipment.

Requiring connection applicants to prove why they cannot meet an automatic access standard would create an additional burden on connection applicants. However this would provide further incentive for connection applicants to accept the automatic access standard to avoid the time and cost of providing proof for not achieving that standard. It would also reduce the issue of information asymmetry as connection applicants would need to supply more information on their equipment to establish proof.

7. Allow a lower performance standard at the time of connection on the condition that equipment is upgraded in the future if a higher performance standard is deemed necessary.

   Consider a connection applicant proposing to connect a new wind farm to the power system. At the time of connection, the NSP may determine that no reactive power capability is required from that wind farm to manage power system security. But the NSP may determine that this will change in the future at which point more reactive power capability would be required at that location (this could be the result of another network user connecting to the power system, at which point the reactive power capability requirement could be apportioned between the two network users). Under these situations, the NSP could agree to the minimum standard for reactive power capability (which is zero), on the condition that the wind farm upgrades its equipment when the NSP requires it to in the future.

   This approach is economically efficient because the network user is able to benefit from delayed investment in equipment to achieve a higher performance standard, without adversely impacting power system security.

   The approach would only be suitable where the achievement of a higher performance standard can be achieved by adding to installed equipment rather than replacing installed equipment. This can be the case with the reactive power capability of wind farms. Wind turbines are generally not capable of supplying reactive power capability, and as such need to invest in equipment such as static VAR compensators (SVC) to meet reactive power capability obligations. In the

scenario outlined above, the wind farm could delay purchasing the SVC until it is actually needed.

To provide investment certainty, the connection agreement would need to specify what level of performance could be called upon in the future. This would allow the network user to incorporate this into a project's projected costs.

8. Require connection applicants to register performance standards higher than necessary at the time of connection, to avoid future connection applicants from being required to register disproportionately high performance standards.

   A connection applicant may apply to connect to the power system at a time when there is a surplus of power system capability already available. This may allow the connection applicant to register a relatively low performance standard, and thus degrade the power system to a degree, but without adversely affecting power system security. However, should a similar connection applicant choose to apply for connection at a similar location at a later time, the surplus power system capability may no longer be available due to the relatively low performance standard registered by the first connection applicant. Thus any power system degradation caused by this connection applicant could adversely affect power system security.

   Under situations such as these, the first connection applicant could be required to register a higher performance standard than required at the time of connection, to avoid future connection applicants being faced with disproportionately high connection costs. This would effectively share power system capability surpluses, and the costs of maintaining system security, between present and future connection applicants.

   The Panel considers that this would not necessarily result in an efficient outcome and thus is unlikely to promote the NEO. A further connection applicant may never apply to connect at that particular location. Thus the power system capability surplus may never be utilised, and the additional costs imposed on the first connection applicant would be inefficient. In addition, the benefit of a lower performance standard could be considered an efficient signal to connection applicants to locate in areas where power system capability is stronger.

   The exception to this position could be where there is a reasonably degree of certainty that a further connection applicant will apply to connect at a location affected by the performance standard of the initial connection applicant. Under this situation, it could be argued that the first connection applicant should not have rights to the full power system capability surplus, and should be required to share this with other connection applicants.

3.3.4 The Panel's Position

The Panel considers that:

1. **Performance standards should be required to reflect the technical capability of the equipment to be connected for all technical standards.**

The Panel considers this would allow NEMMCO and NSPs to better utilise the performance of equipment connected to the system, thus reducing power system operating costs, for little or no cost to network users.

2. **Connection applicants should be required to prove why they can't meet the automatic access standard for all technical standards.**

   The Panel considers this would create a "top-down" approach to negotiating access standards, and would result in performance standards being set at levels closer to the levels of the automatic access standards.

3. **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.**

   The Panel considers that this approach is economically efficient because the connection applicant is able to benefit from delayed investment in equipment to achieve a higher performance standard, without adversely affecting power system security.

   The Panel recognises that some boundaries would be required to such a provision.

3.4 Technology or Size Specific Access Standards

3.4.1 Submissions

Grid Australia

Grid Australia suggested that the technical standards could possibly be improved through more standardisation of the technical standards for specific generation technologies in order to streamline the connection application processes.

NGF

The NGF stated that in some cases, it has to be recognised that different technologies may need special recognition.

CEC

The CEC contended that some minimum standards are too onerous for small generators (such as 5 MW) to meet, even though such generation would have no detrimental impact on power system security.

3.4.2 Analysis

Technology Specific Access Standards

Creating technology specific access standards would be theoretically discriminatory as some technologies would be subject to less onerous access standards than others at the same connection point. Thus some generator technologies would be required to

make a greater contribution to system security and quality of supply than others. This is inconsistent with the principle of technology neutrality.

However in practice, the negotiated access standards already allow connection applicants to register performance standards that are less onerous than other network users in the same geographical area. For some technologies (such as wind generation), it is never possible to meet some current automatic access standards, and thus they always negotiate access standards below the levels of the automatic access standards. For some technologies, it is more economic to meet a particular access standard than others.

Standardising some individual access standards for specific technologies would recognise the maximum capability of that technology. This would allow more connection applicants to meet the automatic access standards. This would reduce the complexity and cost of negotiating performance standards.

An "achievable" access standard for particular technologies would reduce the need to negotiate standards below the level of the automatic access standard. As many connection applicants strive to negotiate a performance standard as close as possible to the minimum access standard, removing the need to negotiate would likely result in registered performance standards at higher levels.

Technology specific access standards could stifle innovation. By lowering the level of the automatic access standard for some technologies to a level that is reasonably achievable, over time as the technology improves there will be little incentive to invest in new and innovative forms of the technology that are capable of achieving a higher performance standard.

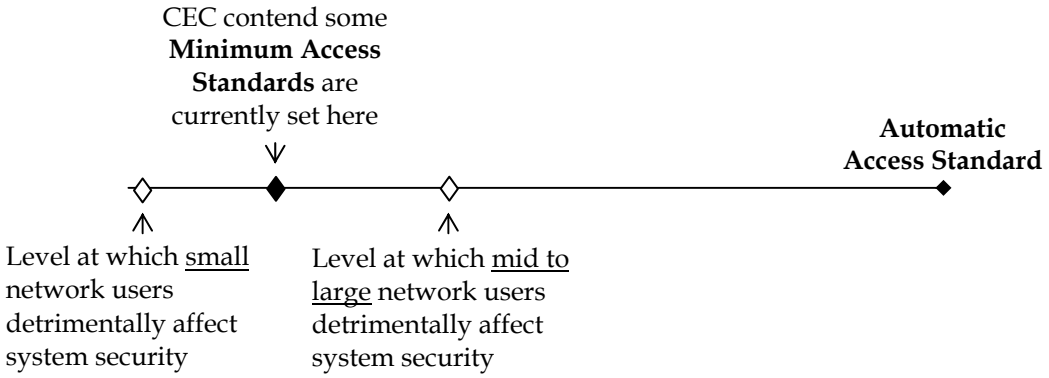
Technology specific access standards set at levels lower than the current automatic access standards would not be possible for every individual technical standard because in same cases the power system may not be capable of supporting a lower standard at all locations on the national grid.

Clause 5.3.3(b2) of the Rules currently allows participants to request the Panel to set plant specific standards for one or more technical standards. The Panel has never been requested to set a plant specific standard under clause 5.3.3(b2), and no plant specific standards currently apply in the NEM.

Size Specific Access Standards

As discussed in Section 3.2, minimum access standards need to be set sufficiently low so that any network user, no matter how small, is allowed access to the power system when this would not adversely affect power system security.

Small network users generally have a lower impact on the operation of the power system than larger network users. Therefore, a minimum access standard set low enough not to deny access to small network users, would be well below the minimum access standards required for mid to large sized network users. The CEC contends that currently some minimum access standards are set too high, resulting in the denial of access to some connection applicants even though such generation would have no detrimental impact on power system security.

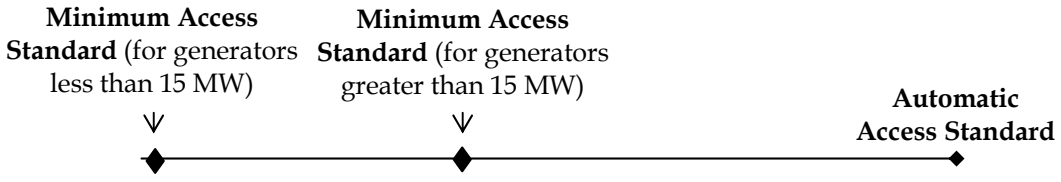


Setting the minimum access standard at a level appropriate for the smallest of network users (i.e. generally around 5 MW for generators) reduces the relevance of the minimum access standard for mid to large network users. The minimum access standards would provide little guidance to proponents of mid to large equipment when designing connection equipment and proposing performance standards, which would likely increase the time and cost of negotiating a performance agreement with an NSP.

This issue could be addressed by establishing two minimum access standards. One for small network users, and another for mid to large users. This could allow extremely low minimum access standards for equipment that has little impact on the power system, whilst maintaining higher minimum access standards for equipment that does materially impact the power system.

Dual minimum access standards may only be beneficial for some access standards, and as such could be used selectively.

The equipment size at which each minimum access standard applies could vary for each access standard. For example, for one access standard it could be determined that the impact of generators less than 30 MW is immaterial for that particular standard. Whereas for another technical standard that point could be 15 MW, and for another it could be 0 MW.



As with technology specific standards, size specific standards could stifle innovation as network users are able to connect equipment with very low performance capability, and hence are not incentivised to invest in more technologically advanced equipment capable of higher performance. It is also questionable as to whether it is good regulatory practice establishing a different set of requirements for one set of network users.

3.4.3 The Panel's Position

The Panel's considers that:

1. **Further scope for technology or size specific access standards should not be added to the Rules.**

The Panel considers that it is not good regulatory practice introducing rules that favour one group of network users over another. Technology neutrality promotes efficient investment decisions by ensuring the true cost of a technology is considered in the economic assessment of an investment. Further, the Panel considers that the negotiating framework for establishing performance standards is sufficiently flexible to allow network users of different technologies and sizes to access the system.

The Panel considers that clause 5.3.3(b2) of the Rules would allow for any future need for plant specific standards if identified, and as such should remain in the Rules. The Panel is seeking stakeholder views as to whether this provision of the Rules should continue to apply if the principle of technology neutrality is adopted.

3.5 Embedded Generation

3.5.1 Submissions

Energex

Energex suggested that the technical requirements for embedded generators connected to the distribution network should be included in the Rules.

3.5.2 Analysis

All registered participants must currently comply with the technical standards. The Rules require generators to register under the relevant classification with NEMMCO. NEMMCO exempts some generators from registering in the NEM. These are generally generators less than 5 MW in capacity, and some generators between 5 MW and 30 MW. Many embedded generators are required to register and as such must comply with the technical standards.

Generators exempt from registering would generally have minimal impact on the power system, and any impact would be largely local. It would be inefficient to require such generators to comply with standards developed to apply across the NEM, when potentially less onerous and less complex standards could satisfy the requirements of the local network. It would be more efficient to determine performance standards for small generators based on local requirements.

Requiring embedded generators to comply with the technical standards in the Rules could result in the denial of access to some generators whose impact on the system would be immaterial. This issue could be addressed by introducing a different set of technical standards for small generators, but this would go against the principle supported by the Panel in this report that one set of technical standards should apply to network users.

The Panel notes that small embedded generators are still required to meet Australian Standards and licence requirements.

3.5.3 The Panel's Position

The Panel considers that:

1. **Non-registered generators should not be required to comply with technical standards in the Rules.**

3.6 Reactive Power

3.6.1 Submissions

NGF

The NGF suggested that services that can be provided through market arrangements, such as reactive power, should not be a requirement under the technical standards.

CEC

The CEC contended that services that can be provided through market arrangements, such as reactive power, should not be a requirement under the technical standards.

The CEC considered that mandatory requirements to provide reactive power capability are unlikely to lead to the optimal amount or location of reactive power, and unnecessarily add to the cost of building generation assets.

The CEC also considered that the division of responsibilities between NSPs and NEMMCO should be reviewed with respect to the provision and dispatch of reactive power to ensure that the most appropriate body manages both the procurement and dispatch of the service.

3.6.2 Analysis

Current Arrangements

The automatic access standard requires connection applicants to be capable of supplying and absorbing reactive power. The minimum access standard does not require connection applicants to supply or absorb any reactive power.

This has resulted in some participants being required under their performance standards to supply and absorb reactive power, whereas for others there is no requirement.

Where network users do not supply sufficient reactive power capability under performance standards, NEMMCO and NSPs are forced to acquire reactive power capability through a tender process, thus adding to the cost of system operations.

The current arrangements for reactive power capability incentivises connection applicants to negotiate a performance standard for reactive power close to the minimum standard for two reasons. Firstly, for some generation technologies, providing reactive power capability adds to the cost of a project (such as wind farms that need to invest in ancillary equipment such as SVCs). Secondly, generators are not paid for reactive power provided under performance standards, so by withholding reactive power capability from performance standards, generators are able to sell this service to NEMMCO or NSPs.

Responsibility for procuring Reactive Power Capability

The Rules currently lack clarity on the division of responsibility between TNSPs and NEMMCO for procuring reactive power capability.

NEMMCO, in its "Review of Network Support & Control Services – Draft Determination"[16], recommended Rule changes that remove NEMMCO's obligation to plan and procure Network Control Ancillary Services (NCAS), including Reactive Power Ancillary Services. The responsibility to plan and procure reactive power capability would then fall to TNSPs under existing TNSP obligations in the Rules contained in schedules 5.1 and 5.1a.

NEMMCO contended that "the current NCAS environment no longer appears to be consistent with good regulatory practice, and does not guarantee efficient delivery of necessary transmission network services because of: lack of clarity in the responsibilities of TNSPs and NEMMCO for procuring services; and differences in the NCAS planning, procurement and cost recovery arrangements of TNSPs and NEMMCO."[17]

Regional Cross-Subsidies

NEMMCO generally only needs to purchase reactive power capability in New South Wales, and to a lesser extent in Queensland. However the cost of reactive power capability is recovered from all NEM customers by a smearing approach. This results in regional cross-subsidies because the cost of supplying reactive power capability in regions such as South Australia (where reactive power capability is provided predominantly through performance standards) would be reflected in the pool price for that region as this is the only mechanism available for network users to recover the cost of providing reactive power capability. Customers in South Australia therefore pay a higher pool price (that reflects the provision of reactive power capability), plus contribute towards the cost of Reactive Power Ancillary Services in New South Wales. NEMMCO estimates that over the next three years of

[16] NEMMCO, Review of Network Support & Control Services – Draft Determination, p. 75, www.nemmco.com.au/powersystemops/168-0101.pdf

[17] NEMMCO, Review of Network Support & Control Services – Draft Determination, p. 75, www.nemmco.com.au/powersystemops/168-0101.pdf

its current NCAS contracts, cross subsidies would benefit New South Wales customers by around $51 million.[18]

This issue is likely to worsen in the future as government schemes to combat climate change promote future investment in asynchronous machines such as wind farms that are generally not capable of supplying or absorbing reactive power. In South Australia for example, licence conditions require wind farms to meet the automatic access standard for reactive power capability. As a wind turbine is generally unable to absorb or supply reactive power, wind farm developers are required to invest in ancillary equipment such as SVCs to satisfy this requirement. This cost must be recovered through the price it sells its real power for. A wind farm in NSW is not constrained by reactive power requirements in licence conditions, and therefore may be able to negotiate a reactive power capability of zero in its performance standard. Any future requirement for reactive power capability in NSW would then need to supplied from the market, and the cost of this smeared across all NEM customers including those in South Australia.

Previous Reviews

NECA in its review of technical standards in 2001 concluded that where system standards can be met using an ancillary service, the relevant access standard should require only the minimum capability at which the system performance would not be significantly degraded". NECA recognised that there should be a transition from the requirement that services be provided under performance agreements, to those services being acquired as an ancillary service.

Efficiency Considerations

Providing a service through a market arrangement is likely to deliver a more efficient outcome for the following reasons:

i. it would create more transparency in the pricing of the service and more competition in the delivery of the service, which should result in more efficient delivery of that service;

ii. the network user that can most efficiently provide the service is more likely to provide that service under a market arrangement, whereas when the service is a requirement of performance standards, the costs of a network user providing the service are not considered;

iii. it would allow the costs of the service to be more easily recovered from the customers that benefit from the service.

Technical Consideration

In some cases it may not be possible to completely remove a requirement from the technical standards. For example, a requirement for reactive power capability would

[18] NEMMCO, Review of Network Support & Control Services – Draft Determination, p. 91, www.nemmco.com.au/powersystemops/168-0101.pdf

not necessarily align with region boundaries, and in some cases the requirement can be very location specific which could lead to market power issues.

3.6.3 The Panel's Position

The Panel considers that:

1. **Where market arrangements can replace a technical standard, then this should be considered.**

This would promote transparency in costs, and would incentivise those network users that can supply a technical requirement most efficiently to supply this service.

The Panel considers that there is a reasonable likelihood that some technical requirements such as the provision of reactive power capability, could be provided more efficiently through market arrangements. The Panel therefore considers there is merit in undertaking a detailed investigation of removing (or at least reducing) the technical requirement for reactive power.

Clause 8.8.1 of the Rules defines the Panel's functions, which are limited generally to matters relating to power system security and reliability. The Panel considers an investigation into establishing market arrangements for some technical requirements to be outside the Panel's functions and powers under the Rules, and as such would be more appropriately carried out by another body such as the AEMC.

3.7 Structure of Standards

3.7.1 Submissions

Submissions generally supported the structure of the technical standards.

CEC

The CEC contended that the technical standards have open statements that need tightening and that many of the standards have a 'general requirement'. The CEC explained that general requirements can be very difficult to assess, draft and commit to. The CEC also noted that the Partial Load Rejection standard (S.5.2.5.7) is not possible to comply with.

Grid Australia

Grid Australia noted that there is inconsistency in the way the performance standards are referred to throughout the Rules. Grid Australia observed that access standards should be as clear and unambiguous as possible. Grid Australia cites examples of where there is scope for improvement including being more specific in terms of physical quantity, and avoiding the use of general terms such as 'control systems'.

NGF

The NGF contended that ambiguities in the current Rules make it difficult to develop compliance programs. The NGF cited Fault Ride Through as an example.

The NGF considered that the form and structure of the current technical standards may need some further refinement in order to ensure that compliance programs can be developed. A number of generators have experienced difficulties developing compliance programs with their existing agreed standards.

3.7.2 Analysis

In its Final Report on the "Review of Enforcement of and Compliance with Technical Standards"[19], the AEMC recommended that technical standards should be clear and appropriate.

As raised in submissions, the Panel considers there is considerable scope to improve the drafting of the technical standards.

Technical standards should be specific, clearly defined, and unambiguous. This is important so that all parties know exactly what is required from them and from others under the technical standards. This would reduce the scope for misunderstanding and disputes, would provide greater certainty of what can be expected from other network users, and would simplify the process of assessing requirement for new connections.

Technical standards should not only be consistent within the Chapter 5 schedules, but also with other provisions in the Rules relating to power system security. This applies to the requirements themselves, who the requirements apply to, and the language used to describe the requirements. The integrity of the technical standards can be threatened by inconsistencies because the intention of the standards becomes unclear, and the standards become difficult to legally enforce.

Technical standards should enable effective compliance. To achieve this, technical standards must be measurable and easily assessable so that the AER can efficiently determine when a participant is failing to comply with the technical standards. The technical standards should be in a form that participants can develop simple, efficient, reliable, and auditable compliance programs. Finally, the technical standards should be enforceable by enabling the AER to successfully take action against participants for non-compliance.

3.7.3 The Panel's Position

The Panel considers that:

1. **Technical standards should be specific, clearly defined, unambiguous and consistent.**

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19 This report is available at: www.aemc.gov.au/electricity.php?r=20051216.173039

2. **Technical standards should be measurable and assessable, in a form that allows effective compliance programs to be developed and maintained, and be enforceable.**

3.8 Obligations between NSPs and Network Users

3.8.1 Submissions

CEC & NGF

The CEC and the NGF noted that the Rules currently place many obligations on generators to ensure their equipment performs, but only requires NSPs to use their best endeavours in managing their equipment. Generators are currently required to ride through faults on NSP's networks. The CEC and the NGF considered that the technical standards should place appropriate obligations on NSPs.

NGF

The NGF believed that TNSPs should have obligations for the performance of their plant in the same way that generators do and they should also be required to have and use compliance programs.

The NGF further stated that in some instances generators are exposed to obligations for assets which are actually under the control of NSPs. The NGF considered that obligations should be placed on those who can best manage them.

Grid Australia

Grid Australia observed that the role of TNSPs extends beyond that of a network operator. Grid Australia stated that TNSPs are also required to ensure that the service levels of existing network users continues to be met following each new connection or changes to the technical performance of an existing connected party. To enable efficient planning and development of the network, Grid Australia explained that TNSPs need to have confidence that the technical performance of every connected party is accurately modelled. Grid Australia is not convinced that the obligations on network users are sufficient to support TNSPs in these areas.

Some performance standards are classified as 'NEMMCO advisory matters' because of their relevance to system security. Grid Australia considers that 'NSP advisory matters' should be established for performance standards that are crucial to NSPs.

3.8.2 Analysis

Technical standards can affect the efficiency of the NEM through the way in which they apportion responsibility between participants for supporting power system security. The technical standards should require performance capability from those participants that can most efficiently provide that capability. It is for this reason that the technical standards provide negotiating frameworks for network users so that performance standards can vary to a degree depending on the characteristics of each

individual connection. It is also the reason network users are required to have fault ride through capability, rather than expect networks to be fault-free.

For some assets on the power system, the party that owns the asset can be different to the party that operates the asset. In these situations, it can become difficult determining who should be responsible for the performance of that asset. Is it the party that owns the asset as this is the party that determined the plants capability through the investment decision. Or is it the party that operates the asset and thus determines how the asset should operate within its capability envelope. This issue is further complicated by contractual arrangements between the parties, and regulatory requirements.

Obligations should be placed on the party that is most capable of responding to that obligation in a manner that advances the NEO. In most cases this would be the party that is responsible for making decisions on how to respond to a particular technical requirement.

Rule provisions that use terminology such as 'best endeavours' are difficult to legally enforce because it is difficult to define and prove non-compliance. 'Best endeavour' provisions can be appropriate where a party does not have full control over an asset, such as when significantly influenced by a third party, or other uncertainties. The Panel considers that where possible, use of terminology such as 'best endeavours' should be avoided. The technical standards should wherever possible be enforceable by the AER. This is covered by the Panels preferred position under 3.6.2.

Some of the technical standards in the Chapter 5 schedules are labelled "NEMMCO advisory matters". These are matters that relate to NEMMCO's functions under National Electricity Law or the Rules. An NSP must consult with NEMMCO on standards labelled "NEMMCO advisory matters". The Panel does not consider there is a need to introduce NSP advisory matters, as recommended by Grid Australia, because NSPs have a role in the establishment of all aspects of a network users performance standard.

3.8.3 The Panel's Position

The Panel considers that:

1. **The technical standards should place obligations to support system security on the party that is most capable of responding to that obligation in a manner that advances the NEO.**

3.9 Priorities for Review

3.9.1 Submissions

Submissions listed various specific areas of the technical standards where they consider urgent review is desirable.

3.9.2 Options

Following the finalisation of the principles in this review, a subsequent review will be undertaken to revise all technical standards in the Rules based on the established principles. The Panel has considered the following options for conducting the subsequent review.

1. Review all elements of the technical standards at the same time. This would promote consistency and remove the need to prioritise.

2. Review each schedule of the technical standards separately, starting with the system standards.

3. Review non-controversial technical standards first where improvements can be made quickly without delay.

3.9.3 The Panel's Position

The Panel considers that:

1 All technical standards should be reviewed at the one time to ensure consistency.

3.10 Measurement and Testing

3.10.1 Submissions

The National Measurement Institute (NMI) recommended that measurement and testing capabilities, and the cost of establishing relevant new capabilities and infrastructure should be considered in detail.

3.10.2 The Panel's Position

The Panel considers that the subsequent review to this in which the detail of the technical standards will be revised would be a better place to review the issue of measurement and testing in detail. The Panel notes that the issue of measurement is included in principle 8.

4 Principles

The output of this review will be a set of principles to guide the subsequent review to this in which the detail of each technical standard will be revised. These principles will provide important guidance to the process of revising the technical standards. However any changes to the technical standards would require a Rule change, and as such would be required to be assessed against the NEO.

Grid Australia was the only submitter to comment on to the principles. Grid Australia recommended the following principles be adopted:

1. the rights established for parties to existing connection agreements are protected for the duration of those connection agreements;

2. new connection applications, and changes to the technical performance of parties already connected to the power system, are managed in a way that ensures the achievement of system standards;

3. the performance of all parties connected and/or seeking connection to the transmission system be clearly defined and available to NSPs and NEMMCO, and other legitimate stakeholders;

4. the roles and responsibilities of NSPs (and all other participants) in the management of technical standards are clear and appropriate;

5. standards support the market entry of new generation regardless of technology; and

6. standards are consistent with relevant national and international standards and good practice.

NECA, in its review of technical standards in 2001, established the following principles:

1. participants should be able to connect to the system if they cause no degradation to the system (automatic access standard);

2. a participant who would degrade the system can still connect if the network can absorb the degradation and the participant compensates the system for that degradation;

3. a participant who would degrade the system to an unacceptable extent cannot access the system (minimum access standard);

4. participants had no obligation to support the system (with reactive support for example) but could contract to provide the service;

5. there needed to be some transition from the current state where participants did provide some network support (particularly reactive) to the final state;

6. it was essential that NEMMCO was aware of participant capability and that any variation from the "no harm" state should be documented. Existing participants

could use the derogations as the starting point for their documented capabilities; and

7. all standards should be defined in terms that were either technology neutral or plant specific to minimise compliance costs. The standards would be defined in the Code and set (and reset) by the Reliability Panel.

Additionally, submissions suggested that technical standards should be clarified by using more specific language and better articulated definitions.

4.1 The Panel's Proposed Principles

The Panel has developed the following set of principles based on the Panel's positions outlined in Section 3, giving consideration to the proposed principles submitted by Grid Australia, the principles developed by NECA for its review of technical standards in 2001, and the Panel's own considerations.

4.1.1 Principle 1 – System Standards

Access standards should be aligned with the system standards wherever appropriate.

See Section 3.1 for discussion.

4.1.2 Principle 2 – Efficient Operation of the Power System

Access standards should support the efficient operation of the power system.

See Section 3.1 for discussion.

4.1.3 Principle 3 – Minimum Access Standards

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.

The approach of denying access to the power system when a connection applicant fails to meet a minimum access standard is consistent with current practice. The Panel considers this practice has worked well and does not propose to modify this approach.

See Section 3.2 for discussion on the definition of minimum access standard.

4.1.4 Principle 4 – Automatic Access Standards

A technical 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.

The approach of accepting a proposed technical standard when it meets the level of automatic access standard is consistent with current practice. The Panel considers this practice has worked well and does not propose to modify this approach.

See Section 3.2 for discussion on the definition of automatic access standard.

4.1.5 Principle 5 - Negotiated Access Standards

A connection applicant may negotiate a performance standard below the levels of the automatic access standards but, above the levels of the minimum access standards, 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 performance standard must reflect the technical capability of the equipment to be connected, and connection applicants must prove why their plant cannot meet the automatic access standard.

The concept of negotiated access standards is consistent with the current approach for establishing performance standards. The Panel considers the concept of allowing negotiated access standards has worked well in practice and does not propose to modify this approach.

The Panel has proposed two changes to the process for negotiating access standards, as discussed in Section 3.3.

The Panel has also linked the negotiated access standards with the system standards, which is consistent with the Panel's decisions for the minimum and automatic access standards. See Section 3.1 for discussion.

4.1.6 Principle 6 – Interim performance standards

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.

See Section 3.3 for discussion.

4.1.7 Principle 7 – Modifying Performance Standards

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.

The Panel recognises that it can be expensive for network users to modify their plant to meet a revised technical standard. This would create investment uncertainty and would result in higher risk premiums being built into new investments.

The "National Electricity Amendment (Performance Standard Compliance of Generators) Rule 2008"[20] established a process for amending performance standards where agreement is reached between the relevant network user, the relevant NSP, and NEMMCO. The Panel supports this approach.

4.1.8 Principle 8 – Technology Neutral

Technical standards should be technology, size and location neutral.

Discussed in Section 3.4.

4.1.9 Principle 9 – Application

Technical standards should apply to NEMMCO, NSPs, MNSPs, and Generators and customers whose equipment is registered with NEMMCO.

This is consistent with current practice.

See section 3.5 for discussion regarding applying technical standards to embedded generators.

4.1.10 Principle 10 – Market Arrangements

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

Discussed in Section 3.6.

4.1.11 Principle 11 – Specific

Technical standards should be specific, clearly defined, unambiguous and consistent.

Discussed in Section 3.7.

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[20] The Final Determination for this Rule is available at: www.aemc.gov.au/electricity.php?r=20080228.150735

4.1.12 Principle 12 – Enforceable

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

Discussed in Section 3.7.

4.1.13 Principle 13 – Obligated Party

The technical standards should place obligations on the party that is most capable of responding to that obligation in a manner that advances the NEO.

Discussed in Section 3.8.

4.2 The NEO

The Panel considers that revising the technical standards based on these principles would advance the NEO. This would be achieved through more efficient procurement of technical performance capability from equipment making up and connected to the power system. This would result in lower long term prices for consumers, whilst maintaining a secure power system.

Efficient investment in electricity services

The Panel notes that changes to the technical standards based on the principles would likely generate a number of benefits to investors in the NEM, namely:

- Reduced barriers to entry because minimum access standards would better represent the minimum performance capability that the power system can support.
- Financial benefit of delayed investment when a lower performance standard can be permitted until a higher performance is required by the power system.
- Certainty that performance standards are protected for the duration of connection agreements.
- Clarity in relation to what a technical standards requires and who it applies to.

Efficient operation and use of electricity services

The Panel notes that changes to the technical standards based on the principles would likely improve the efficient operation and use of electricity services in the NEM, namely:

- The levels of performance standards should be more targeted at delivering an efficient level of performance to meet the requirements of the power system. This should allow the requirements of the power system to be met at a lower cost.

- Utilisation of the network should improve as a result of performance standards that reflect technical capability and measures to set performance standards at levels closer to the level of the automatic access standards. This would reduce the need for network investment, reduce network congestion, and provide NEMMCO additional capability for managing system security.

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.