Submission to the Reliability Panel Technical Standard Review draft report

Pacific Hydro Pty Ltd

February 2009

Pacific Hydro Pty Ltd
Level 11, 474 Flinders Street, Melbourne Victoria 3000 Australia
Telephone +61 3 8621 6000 Facsimile +61 3 8621 6111
Email enquiries@pacifichydro.com.au www.pacifichydro.com.au
ABN 31 057 279 508

PacificHydro

Table of Contents

Table of Contents 1
Introduction 2
Summary of items 2
Previous Work on Technical Standards 3
Further change inefficient and premature 4
Technical Standards Working Group 5
Principles 5
Definitions 6
System Standards 6
Automatic Access Standard 6
Minimum Access Standard 7
One standard fits all - technology neutrality 8
Assessment of standards 9
Reactive Power in the NEM 11
Conclusion 11
Summary of Recommendations 11
Appendix 1: Principles in Detail 13
Proposed Reliability Principles 13
WETAG Principles 18
Appendix 2 TSRG Terms of Reference 23
Appendix Principles to be adopted for Technical Standards Code Changes 26

Introduction

Pacific Hydro wishes to thank the AEMC Reliability Panel for providing the opportunity to contribute to the Technical Standards Review draft report.

Pacific Hydro Pty Ltd has invested approximately $500 Million since 1999 in the NEM and intends to continue investing in renewable energy projects in pursuit of a low emission and sustainable future for our country. Pacific Hydro, as a small but growing company, has dealt with the continued modification of the technical standards and their negotiation for our existing and proposed wind farms. A further review of Technical Standards will impose a significant drain on our companies' resources and must be justified. We rely on the AEMC to consider the balance between the costs imposed by a review, the outcome of that review and the benefits, if any, to the market.

It is also difficult to understand whether this review is technically assessing the efficacy of the current access standards, or collecting issues from industry concerned with the application or implementation of the standards. As few, if any, generators are operating under the current standards (introduced on 15th March 2007) it is unclear how the standards could be reviewed or assessed for their effectiveness in maintaining system security as it is very early in their application. The majority of plant on the network is operated in accordance with the previous technical standards, and hence a review would be premature.

Summary of items

In summary, our submission seeks to highlight the following:

- We welcome a review of reactive power, planning, delivery and provision of services in the NEM as proposed in this report;
- A review of technical standards calls for a working group of technical experts across the industry to be formed to provide the Reliability Panel with expert advice on the efficacy of the technical standards and their implementation;
- Principles already exist and have been used with the approval of the SCO to draft the current technical standards. The existing principles were developed with extensive industry based debate and provide sound guidance for drafting a technical standard;
- There is little evidence to suggest that the access standards require a major review given that only a few connections have been negotiated under them and no generator is yet constructed or operating under them;
- Given the above, this review should not lead to redrafting of the current access standards for generators;
- The concerns raised in the report appear to be implementation and process issues rather than issues related to the actual access standards;
- The definitions proposed for minimum and automatic access standard are extremely broad;
- Several of the proposed principles are contrary to the existing principles; and
- The proposed principles provide little guidance on how a standard should be drafted to meet the principles.

These points are covered in greater detail in the discussion below, with particular reference to their relevance for generator connections.

Previous Work on Technical Standards

Since 2004 there has been a significant body of work undertaken in the electricity industry debating how best to integrate wind generation into the national grid and electricity market. One aspect of that work was a major revision to Chapter 5 of the NER, encompassing a full and thorough review of connection requirements and the technical standards. This resulted in changes to the connection arrangements and access standards for all generators. To consider this as only making 'targeted improvements' is a narrow interpretation of more than two years of work by the stakeholders. The Terms of Reference for the Technical Standards Reference Group is attached in Appendix 2.

Over the period from 2004 to 2007 Pacific Hydro (through Auswind and now the CEC) has participated in the following working groups, each of which was made up of key stakeholders in the NEM.

Working Group / involvement	Period and Purpose	Outcomes
Wind Energy Technical Advisory Group (WETAG): NEM Industry	September 2004 to January 2005 Provide a technical advisory service and industry reference point to assist the Wind Energy Policy Working Group on issues related to intermittent renewable generation into the NEM.	Draft discussion paper on key issues. Industry forum Final position paper to MCE
Technical Standards Reference Group (TSRG): NEM Industry	April 2005 to July 2005 (Tor) April 2005 to May 2006 (actual) To provide a technical advisory service and industry reference point to assist the review of technical requirements for connection of Generators to the National Electricity Grid.	Wind Generator and Other Generator Connection Rule Change gazetted March 2007. ToR for this group is submitted as an Appendix 2 to the this submission
Wind Energy Industry Reference Group (WEIRG): NEM Industry	August 2005 to November 2005 (proposed) August 2005 to Feb 2007 (actual) Further develop the technical issues arising from the WETAG paper.	Wind Forecasting Semi-scheduling rule change

Pacific Hydro is concerned that the AEMC Terms of Reference (ToR) for this RP Technical Standards Review ignores the body of work completed between the 2001 NECA review and the gazettal of the current technical standards. It appears that the AEMC has relied primarily on the industry's response to the issues paper to frame this draft report. The responses from industry are not necessarily based on specific detailed knowledge associated with these topics. It is our opinion that a more detailed assessment of the review should have been performed prior to publication of the ToR.

Further change inefficient and premature

Each time the technical standards change, a large amount of work is required to assess the adequacy of contracts and technical designs. Any new rule that may affect a project needs to be interpreted and the impact varies according to the project status. Additional studies may be required and suppliers re-analyse their product performance in relation to a new rule. If the project is in the connection negotiation period, consensus will need to be reached with the NSP, NEMMCO and the project proponent on the drafting of a technical standard to meet the new access standard. This has the effect of delaying new projects and increasing costs. With this in mind, it is with some concern that we read in this review of the Reliability Panel's intention to make further changes to the technical standards.

The Reliability Panel suggests that a change in technical standards is necessary because the existing standards are biased 'towards establishing standards below the efficient level'. This seems to be based on a view that generators aim at standards lower than their full capability, and that this removes from network or power system some additional support. Since no evidence or examples have been provided to support this view, we question the basis on which it is formed. From a generator's standpoint, the obligation in the NER is to meet or exceed its performance standard, so if the standard is slightly below the full capability, this ensures a greater ability to exceed. As most standards are set on the basis of protection settings, the only standard on which this efficiency complaint could be based is the delivery of reactive power capability in to the network. The complaint must be based on the premise that generators are the most efficient to deliver the reactive power to the network. Pacific Hydro is of the opinion that this is not always the case.

During recent connection negotiations, Pacific Hydro has come across several matters in which agreeing to meet the automatic standard is problematic. For example, the stability guideline referred to in S5.2.5.10 does not yet exist, so although it is likely that the plant would meet the automatic standard, there is no possibility to study it to ensure that it does. In this case the lower standard is taken, despite a likelihood of achieving a higher standard.

Also, under the current technical standards there are few projects that have negotiated a connection and even less of those have completed construction. As this is the current situation, it appears premature to be calling for further changes. And while it may be appropriate to evaluate the inclusion of some economic principles in the assessment of a technical standard negotiation, it would appear to confuse the drafting of a 'one size fits all' technical standard.

The draft review states that all areas of the technical standards, S5.1, S5.2 and S5.3 are to be covered, yet the primary discussion is focussed on the access standards and thus focusing on what generators are obligated to deliver to the

network. There seems to be little or no discussion related to network performance, or of changes to load standards, resulting in a biased draft report.

Technical Standards Working Group

The assessment of the efficacy of the standards, called for in this review, warrants a repeat call for a working group of technical experts to be created, as has been suggested in the past by WETAG[1]. This group should undertake the assessment of the adequacy, content and implementation of the standards and report back to the Reliability Panel on whether the technical standards are maintaining the delivery of system security. The working group should consist of participants from all industry stakeholders and have a high degree of technical expertise. It is difficult to see how an appropriate review of the standards can be done without a high level of technical expertise with appropriate levels of research and analysis. Such a group would be best suited to provide high level guidance concerning the standards for the purposes of NER 8.8.1 (a)(7). Pacific Hydro also suggests that the group should become a long standing support group to the reliability panel to avoid loss of industry knowledge.

Principles

As noted earlier, the report has failed to adequately acknowledge the industry contribution to recent developments in the access standards for generator connection and the setting of technical performance standards.

There are existing principles[2], developed by the WETAG, presented to the WEPWG, and used by NEMMCO and the TSRG in the drafting of the current access standards, with the approval of the SCO[3]. The AEMC has not acknowledged these principles in their setting of the Terms of Reference for this review. Further, the Reliability Panel has not referred to them in the issues paper or in this draft report. These guiding principles are referred to by NEMMCO in Attachment A of the technical standards for wind generators and review of existing provisions rule change proposal 2006 (see section 2.3 page 3). This document is available on the AEMC website at:
http://www.aemc.gov.au/electricity.php?r=20060324.143345

The principles adopted by NEMMCO in the TSRG were developed by the industry for the industry and provided the way forward for the technical standards to be reviewed. They represent the concerted effort and industry wide debate that has taken place since the NECA review of 2001. This review draft report overlooks these principles, and instead is suggesting a new set of principles that are different from, and in some cases contrary to the existing principles. Furthermore, the proposed new principles have not been subject to the same level of industry debate or collaboration.

The proposed principles and the existing principles along with comments are tabled in Appendix 1 of this submission.

[1] WEPWG Discussion Paper –WETAG report : Section 5.8 Technical Standards "Ensuring appropriate Code technical standards".
[2] http://www.mce.gov.au/index.cfm?event=object.showContent&objectID=C74DA46E-65BF-4956-BB67A284B54DB65E "Integrating Wind Farms into the National Electricity Market, Discussion Paper, March 2005" Appendix A
[3] http://www.aemc.gov.au/electricity.php?r=20060324.143345 Attachment A of NEMMCO's rule change proposal. Appendix B

Definitions

The definitions proposed by the review report are inconsistent with the definitions used by NEMMCO throughout the TRSG for both the minimum and automatic standards.

System Standards

The system standards have been established as an over lay on the physical system. As each region has been developed over time through the different states, the different engineering approaches and designs have led to variations across the now integrated NEM. The system standards are therefore an agreed tolerance of performance and while it is a reasonable concept, they cannot be upheld as being fully met in all areas of the network all the time. The purpose in S5.1a.1 clearly acknowledges that system standards may not be met at all places, all of the time in the system.

S5.1a.1 Purpose

> " A *Registered Participant* should not, by virtue of this schedule, rely on *system standards* being fully complied with at a *connection point* under all circumstances. However, a *Registered Participant* should expect to be reasonably informed of circumstances where the standard of *supply* at its *connection points* will not conform to the *system standards*."

It should be acknowledged that these are a reasonable set of standards, but that the system does not always conform to these standards. Pacific Hydro considers that the TNSPs should be obligated to be more transparent and open when they have a part of the network that does not meet the system standards. For example, it is possible that protection clearing times do not conform. It is also possible for over voltage events to be lower and last longer than the profile in S5.1a.4. It is further reasonable to expect frequency to recover from 47 Hz quicker than the allowed recovery time of 2 minutes.

System standards to this extent provide an area of tolerance within which we expect the majority of the system to perform and an area to which we expect the network service providers to plan to maintain. It also sets the framework with which the collective response of most facilities connected to the system will operate through and remain connected. There is no obligation described in S5.1 requiring the TNSPs to comply with the system standards and there is no obligation on the TNSP to inform a registered participant when the network does not conform. Conversely, there is an expectation on connecting generators to ensure that the system standards are not infringed.

Pacific Hydro also asserts that there is a significant imbalance in the negotiation process that enables TNSPs to upgrade networks at the expense of the connecting generator.

Automatic Access Standard

Pacific Hydro does not agree with the definition given for the automatic standard. Relating the access standard to degrees of certainty of 'system security' being delivered, fails to recognise that the maintenance of system security is

delivered through the collective response of all facilities connected on the network and not solely through the actions of a single generator. While a single large enough generating unit connected in a critical location could have a significant impact on system security, failure of its performance would result in it tripping off (e.g.: for unstable operation), prior to system security being infringed.

An automatic standard represents a high level of generator performance against one particular physical characteristic of electricity generation. A generator meeting the automatic standard with that particular electrical characteristic contributes strongly towards the collective response, helping to drive the system to remain within the technical envelope.

The RP draft report has proposed: "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."

Currently a proponent that proposes an automatic access standard cannot be denied access and is automatically accepted for that particular standard. The use of the words 'should be' seems to infer that a TNSP could deny access and ask for higher performance. In consideration of when a TNSP assesses a connection to ensure that the network capability is there for the particular generator seeking connection, this is a power transfer capability assessment not a technical standards issue.

The power to deny access (or seek network augmentation) is already with the TNSP. Giving further powers to TNSPs to request the equivalent of network support services from generators, through ever increasing levels of automatic standards, will lead to a significant reduction in the number of affordable generator projects, or a significant increase in the cost of connection, and hence electricity prices.
Pacific Hydro's analysis of the proposed definition, suggests that it would lead to an extremely high automatic standard, one that could only be met by one generator in one location on the network.

The definition of an automatic standard, as discussed and used in the TSRG, meant that an automatic standard was set at a performance level at which connection was automatic, and hence an NSP or NEMMCO could not request a higher level of performance than the automatic standard for that characteristic.

Automatic Standard; is the level of performance necessary for automatic access for connection, it is also a level that cannot be made higher by a TNSP or NEMMCO in the connection process.

Minimum Access Standard

The minimum access standard is defined in the draft report as:

> "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."

Pacific Hydro is concerned that this definition is not consistent with current practice, nor with the concept of a minimum standard in general. The minimum standard is actually, the "performance level below which there is a high degree of certainty ... etc." Leaving out the words "below which" may be inadvertent- simply an oversight in drafting- however, it is important that in such a highly critical area, definitions are worded precisely and are supported by logic.

The existing minimum standards already aim to ensure that system security is not impacted by a connection. It is the lowest acceptable standard to which a generator is allowed to negotiate. Studies are under taken on any negotiated standard and assessed against the standard and the general requirements for the standard. For example, the minimum standard in S5.2.5.5 (c)(1)(ii)(C) states: if NEMMCO and the NSP agree that "there is unlikely to be a material adverse impact on power system security".

A generator meeting a minimum performance standard in a particular electrical characteristic means it is more likely to respond in a gentler manner to the collective response and provides a small contribution to the system remaining within the technical envelope.

The current minimum standards have been drafted to allow for the different sizes of generation, from 5 MW to 750 MW+. There must be an allowance to study and resolve the connection requirements while still ensuring that 'system security' is maintained. Size and influence of a generator in the network is more likely to present the determining factors with respect to system security. More research and analysis is required to establish whether the current tolerance between minimum to automatic is sufficient. Without that analysis we run the risk of standards being increased beyond technical feasibility.

The definition that was proposed by NEMMCO in the TSRG inferred:
Minimum Standard; is a 'do no harm access standard' the level of performance is such that there is minor influence in the network and no harm done to others or the system.

Pacific Hydro considers that there is no need to alter that definition.

One standard fits all - technology neutrality

Not all generators have the same characteristic responses to system contingencies or events. The approach that the standards must be generic for all things on the network, fails to acknowledge that different generators and items of plant contribute differently to the overall recovery response or operation of the system. Setting a generic standard would be analogous to a set of vehicle standards that required all vehicles on our road network (e.g. motorcycles, passenger cars, and trucks) to operate according to an identical set of safety standards. This would result in either taking

motorcycles off our roads, or allowing cars to no longer be required to meet current frontal crash test performance standards. Similarly, if modern, efficient, gas turbines have trouble riding through very low frequency events, we should not be making it more difficult for them to connect to the network. These turbines provide important peaking services. Removing, or limiting the peaking service provided by gas turbines is just as problematic for the system as a low frequency event. A significant low frequency event is achieved managed through the combination of generator response and under frequency load shedding; it is through this balancing act that the system recovers. A stable and damped recovery from low frequency events is achieved through the setting of the under frequency load shed protection response. The access standards have to be developed such that various generation technologies with different characteristics can connect to the network and produce electricity safely and reliably.

The principles previously adopted by the TSRG have already addressed the issue of technology specific access standards, by acknowledging the variety of legitimate classes of technologies for producing electricity. A large amount of work has been performed to ensure that the current standards are technology neutral where possible. However it was found that it is not always possible to be technology neutral, therefore some standards have been delivered specifically in reference to synchronous or asynchronous technologies. It must be noted, however, that where this was done the standards for both where designed to fair and equal. The TSRG found while trying to adopt a fully neutral approach to the language in a standard, the result was likely to dilute the standards for all technologies and this was not a desirable outcome.

Assessment of standards

The report assumes that participants aim to achieve the lowest standard possible in their connections, and this creates a bottom up approach. Yet experience in dealing with the versions 13 (and after) of the NER is to the contrary. NEMMCO currently assesses standards in such a way that there is upward pressure on the wording and approval of a standard to be as 'close as possible to automatic".

To verify this, NEMMCOs template for performance standards (provided on the registration page) is evidence that they expect the starting point to be at the automatic level. A participant has to work to redraft the document to achieve an appropriately negotiated standard. This requires a significant volume of studies and careful consideration of the plant capability to ensure that it meets an appropriately negotiated standard.

NEMMCO does not remove or reduce the right for a participant to negotiate, but the assessment is from the top down. The draft report also assumes that failure to meet the automatic standard in all cases means that cost will be added to other network users for a "future shortfall[4]", however, it would be difficult to predict what is required in the future or how the shape of the network will transpire. It is also difficult to understand what sort of characteristics are being referred to here, unless it is reactive support. The connection process already provides the TNSP with a significant platform for requiring that various network augmentation works are paid for by a connecting party. Allowing for an unknown future shortfall would enable TNSPs to ask for equipment capability (reactive support, communications bandwidth and upgrades, replacement of relays, earth wire, extra switching station equipment and land etc) that may or may not

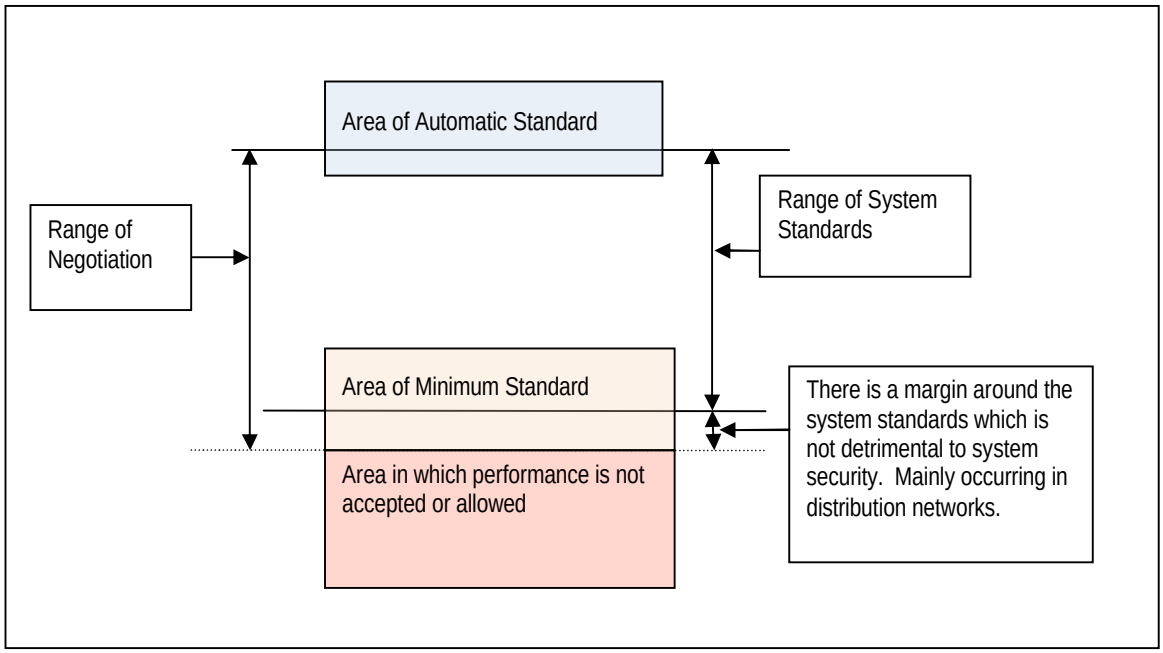
[4] Technical Standards Draft Report - Section 3.3.1 Grid Australia

actually be technically necessary. This condition could result in generators being required to unfairly subsidize the connections of other applicants into the future. It also creates the possibility of NSP's discharging their obligations under the Rules by placing additional open-ended requirements on connecting parties.

The criteria in S5.1a.4 is an example of future proofing, as there is evidence to suggest that the system in many places could not reach such over voltages. The over voltage described in this standard is above the voltage tolerance design standards of most European and IEC equipment (120%). If the automatic standard is required, it adds cost to the connecting party, yet in many cases NEMMCO and the TNSP cannot provide the single credible contingency that would cause it. Self saturation levels are more likely to occur than the peak voltage as described in S5.1a4. In developing the current technical standard NEMMCO agreed that this standard should not be mandated and a tolerance of response was reasonable. The TSRG agreed (as did the AEMC) that to apply the cost onto connection applicants for events that may never occur is unreasonable and contrary to the NEO. This is why this standard became negotiable in the March '07 rule change.

In section 2.2 the panel has proposed a diagram to illustrate the minimum to automatic standard Pacific Hydro would like to propose an alternative view of the standards. The relationship between the Automatic and Minimum access standards to the System standards can be described in the following diagram:

Diagram 1 : Alternative view of Relationship between Access Standards and System Standards:



Maintaining the area of negotiation provides flexibility for all parties to enable cost efficient connection while still considering system security and performance. Meeting a higher level of performance is not simply a matter of throwing more money into a project, sometimes the performance is dictated by limitations of available technology. For example: many gas turbines cannot easily ride through low frequency events, yet they provide significant peaking services.

Reactive Power in the NEM

Pacific Hydro agrees strongly with the recommendation from the Reliability Panel for a review to be done on the delivery of reactive power in the NEM. We note that the cross subsidy in the NEM has existed since the market started in 1998 and that little has been done to properly design a true reactive power market mechanism, or to ensure adequate regional planning and delivery for local demands. It should be noted here that the current market design has always treated the delivery of reactive power from synchronous generators as the least cost method. This is reasonable, however it is not always the case for asynchronous technologies and as such mandating expected levels of reactive power from asynchronous generators is not economically efficient or optimal in solving the problem. It should be noted that the delivery of additional reactive power from an asynchronous generator (that does not have an inherent reactive capability) is just as expensive as it is for an NSP.

Conclusion

It appears that the review has interpreted 'review' as a need to change, rather than whether or not change is required to maximise efficiency. Pacific Hydro has provided its submission to argue that this review should proceed in a way that does not lead to significant re-drafting of the technical standards, and allows the industry time to work with the existing principles and standards for the urgent work of generator connections. Given the recent volume of change in the last three years it would be prudent to look for implementation issue resolutions rather than further redrafting. While there may be a call for further changes, these requests should be evaluated by a technical working group to determine issues are a drafting problem or an implementation issue. Such a group should be charged with working on and developing solutions to such issues and providing expert analysis for the Panel to consider, in order to fully satisfy Clause 8.8.1(a)(7).

There are some standards that call for tests that are difficult, costly and problematic to do, such as partial load rejection or fault ride through. Solutions for commissioning and compliance monitoring methods need to be indentified and agreed so that practical and accepted methods are adopted by the industry stakeholders. If such a working group were established it could address both the technical standards issues and the compliance implementation issues that have arisen. The group should report to the Reliability Panel periodically on all matters concerning the technical standards.

Summary of Recommendations

- The review should recognise the existing principles, and weigh up the benefit or cost of making further changes to the basis on which the current standards for generator access have been written. The existing definitions that have been used to form the access standards are workable and should not be discarded lightly;
- A working group of technical experts should be formed from across the industry to formally provide advice to the Reliability Panel concerning matters related to access standards, implementation and efficacy for reviews such as that required by Clause 8.8.1 (a)(7);

- Calls for changes to technical standards need to be assessed as to whether the issue is to do the wording of the standard or an implementation problem;
- Singular technical standard rule changes should not be made in isolation, but should be assessed appropriately in context of existing rules; and
- A review of the processes for delivery of, and services for, reactive power is overdue in the NEM and should be commenced as soon as possible.

Appendix 1: Principles in Detail

Proposed Reliability Principles

Generally this set of principles provides over arching statements that provide little practical value in giving guidance as to how a technical standard should be drafted. Some of these principles could lead to extended debate as they could be interpreted by either side of the industry as placing cost on the other side.

	RP Proposal	Comment
Principle 1	Access standards should be aligned with the system standards wherever appropriate.	Alignment is not always a desired outcome - see diagram concerning standards, access standards over lap the system standards. Also, systems standards are not always met all the time in all places - negotiation on local performance is necessary. Eg: Drafting a stability obligation on all generators to align with the system stability would degrade the current level of overall damping in the system.
Principle 2	Access standards should support the efficient operation of the power system.	The argument presented in 3.1.3 (2) disagrees with the first principle. Access standards cannot always align with the system standards as described above. Further development of this principle is required, the NEO already includes the requirement that a rule is assessed on efficiency, why should there be a need to place an explicit principles when primarily standards are to do with performance and connection. Access standards already support the operation of the power system, in particular this area has been significantly enhanced in the 15 March 2007 Rule change.
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.	The definition of the minimum standard provided here is incorrect. It should read: "The existing minimum standard denotes the performance level below which there is a high degree ... etc. The current situation is that access is assessed on meeting or exceeding the proposed minimum performance standard. Current practice is to reject a connection application if it fails to meet the minimum standard. Implying that the minimum standard does not provide any level of system

		security- as the wording of this definition does- is contrary to many of the existing minimum standards. Minimum standard is a DO NO HARM standard which provides for the maintenance of system security in its assessment. The logic in this principle would lead to an infinitely low minimum standard, given that any technology, (small enough) on certain locations that are strong enough, could have no performance and not affect the system security. In the interest of the power system security we disagree.
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.	Disagree - see previous comment. An automatic standard denotes the level of performance that is granted automatic acceptance; a TNSP or NEMMCO cannot request a higher level of performance than an automatic standard. There will always be a point in the system where if you connected a large enough item (of any technology) to that particular location you could adversely impact system security - hence this leads one to think that this is an infinitely high automatic standard.
Principle 5	A connection applicant may negotiate an access standard below the level of the automatic access standard, but above the level of the minimum access standard, where this does not adversely impact system security, the quality of supply to other network users, or where relevant, the operation of the power system in accordance with the system standards. A negotiated access standard must reflect the technical capability of the equipment to be connected, and connection applicants must prove why	The minimum standard is still an acceptable standard. A participant is allowed to negotiate to meet or exceed the minimum standard. The minimum level is still assessed against system security see S5.2.5.5 (c)(1)(ii)(C). Technical capability is already reflected in the standards as the standard is designed on plant and network studies. Some onus must go back on NSPs to show network performance and to demonstrate that the network at the connection point meets the systems standards. The commitment and

	their plant cannot meet an automatic access standard.	obligation to meet a particular standard does not physically withhold capability from the network, the obligation is to meet or exceed the performance standard. Demanding a matching of registered standard to capability is increasing the risk unnecessarily for a generator's compliance failures.
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.	This only leads to an increase in risk and would not be a bankable way to establish projects. Who justifies what the 'generator' ought to provide in the future? What defines "deemed necessary' and by whom? A TNSP would deem the automatic standard because it would allow them to future proof their network. This favours granting NSPs more power in what is already a lopsided negotiating platform. The only area this applies to is harmonic and voltage flicker standards where it is a problem that can be resolved if a problem develops.
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.	Agree - but this principle is already evident in the rules. This is embodied in the transitional arrangements for new rules and approach to 'grandfathering'. To a certain degree principle 6 undermines it.
Principle 8	Technical standards should be technology, size and location neutral.	Should be, but in reality cannot always be, neutral without diluting the requirement for either synchronous or asynchronous - see the principle 4 from the WETAG. The principle has not provided adequate guidance as to how this ought to be achieved.
Principle 9	Technical standards should apply to NEMMCO, NSPs, Market Network Service Providers, and Generators and Customers whose equipment is registered with NEMMCO.	NEMMCO does not have registered equipment, and it would be inappropriate for them to register their own equipment. NSPs have not got registered standards; there should be compliance items on certain system standards for NSPs. Technical standards do apply to equipment that is registered with NEMMCO

		this is already embodied in the rules.
Principle 10	Where market arrangements can replace a technical standard, then this should be considered.	This principle was outlined by NECA in its review - there should be a focus on the commercial provision of services to the market - however where a service is required because there is a demand in a particular location, regulated provision of that service is likely to be more effective and efficient. There is also a deeper philosophical problem, the frequency control ancillary services have been overlaid to pay for the response to contingencies - but that does not alter the technical standard (or capability) of a generator responding to a contingency. The FCAS market has not removed the obligation for all generators to respond to or control themselves through contingencies and it would be catastrophic if it did. Where market arrangements can fund a technical characteristic it should be investigated, but it cannot fully replace it. The problem here is to decide what is taken for free from generators versus what is not, and as the performance of the collective of generators is fundamental to the system security it is difficult to separate out the services.
Principle 11	Technical standards should be specific, clearly defined, unambiguous and consistent.	This is subject to issues with describing different technologies adequately. The NER itself should be specific, clearly defined, unambiguous and consistent, so this is a principle for all rule changes.
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.	While this principle might be reasonable for single physical items that can be measured, making all standards to fit this rule would limit the standards to immediate physically measureable items. Reliability of the system is not a singular measureable item yet we have an obligation in assessing a project to ensure that it is not affected. Once this item (S5.2.5.12) is assessed and accepted it remains a matter of maintaining the generator's control systems -

		(which is implied by other standard obligations as well). Measureable does not infer "testable" - some standards are necessary for system security - but cannot be readily tested. Fault ride through should be a standard that it is allowed to be demonstrated through monitored responses.
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).	Almost any additional cost on a connecting party could be justified under this statement in particular with reference to deeper network augmentations. This contributes to the lopsided negotiation process for connections that already exists.

WETAG Principles

Pacific Hydro wishes to present to the Panel the principles that were applied by NEMMCO and agreed to by the SCO for the review of the technical standards in 2006 - 07. NEMMCO provided comments in their rule change proposal Attachment A on how they had used the principle in the drafting of the rule. This is a key input to rule change proposal. We have tabled our comments in the fourth column

	EXISTING Principles	Detail on principle	PHL Comment
Principle 1	The technical standard must provide for adequate security, quality of supply and reliability.	The technical standards are intended to specify performance of plant such that: Power system security; Quality of supply; and Reliability of supply[5] are maintained at satisfactory levels into the future. The Code specifically requires that NEMMCO and the NSP to take into account security and quality of supply in their negotiations. Consideration of impacts on reliability of supply should extend only to generating units or systems, and not impacts from customers.	Strongly support this principle.
Principle 2	Minimum, automatic and mandatory standards should be defined so that performance requirements are consistent with the potential impact of generating plant on the power system.	This principle provides for the negotiated standard to be no more onerous on the generator seeking connection than is necessary. The technical standards cover two sets of standards - "system standards" and "access standards". System standards are defined to set a target performance level for the power system overall[6]. Consistent with achieving the required system standards, the Code allows for developers, NSPs and NEMMCO to negotiate a suitable level of technical performance for new connecting plant. In NECA's Review of Technical Standards	This encapsulates the full range of expectation and economic drivers for connection and performance delivery.

[5] Chapter 5 refers specifically to security and quality of supply, but at least one technical standard addresses reliability of supply (see clause S5.2.5.12).
[6] Ref. ACCC final determination on technical standards – February 2003.

		(Dec 2001), NECA stated: "The range for those parts of the standards that can be negotiated should be defined between the automatic access standards and the lowest capability that is acceptable, called the minimum access standard. The lowest acceptable standard should normally be related to the level at which a risk to system security or of harm to other connected parties may arise." In a few instances, mandatory requirements have been placed on connecting parties, without scope for negotiation As a principle, the technical standards should be formulated in terms that provide for an automatic access standard and a minimum access standard. A review of the technical standards should determine whether: the minimum access standards are reasonable minima, considering the location and potential impact of the generating system within the network; and the mandatory requirements can be re-cast in terms of minimum and automatic standards, where the inability of a generator to meet the current mandatory level would not contravene Principle 1. automatic access standards are set at appropriate levels.	
Principle 3	Terminology used in the technical standards should support their appropriate application. Where technically appropriate, performance of generating plant should be measured at	Most of the technical standards are applied to generating units, but for distributed generating systems, such as wind farms, which are comprised of numerous small units, it is appropriate to consider performance requirements in terms of "generating systems", or the performance of the plant on the power system as measured at its connection point. Depending on the way the plant is controlled and the configuration of its connection, performance can be considered in some cases a function of the	This principle is used throughout the current standards with respect to where the technical standard applies, in particular whether it is a connection point measure or a single unit requirement.

	the connection point.	generating system[7], and in others a characteristic of the generating unit. The terminology used in the technical standards should therefore be specific, and appropriately support the standard's application, allowing flexibility to define combined performance in terms of generating systems, and take effect at the connection point where appropriate. The impact of a generating system on the power system security or quality of supply is generally governed by the laws of physics and not influenced by whether it is scheduled or non-scheduled, except through application of certain market rules (such as dispatch rules). Inappropriate use of the term "scheduled" in technical standards can have the consequence of excluding significant intermittent generation projects from the requirement to comply with some technical standards. When the technical standards are reviewed inappropriate use of the term "scheduled" should be avoided.	
Principle 4	Where reasonable, the technical standards should be written so that they are applicable to all technologies. Technology-specific terms should be used only where necessary to clarify requirements for particular technologies.	The technical standards must adequately cover all types of generator technologies. To the extent reasonably possible the technical standards should not treat one technology more favourably than another. While the technical standards might recognise the differences between technologies, the standards should aim to achieve an equivalent performance outcome. As new technologies may emerge over time, technical standards should be written, where possible, in a form that can be applied to all technologies. It is recognised that there may be some exceptions to this principle, for example, where a technology has established methods of specifying technical capability that simplify performance assessment or where the technical parameters for a	Discussion at the TSRG recognised that some technology specific wording was required where there is a fundamental difference between that of synchronous machines and asynchronous machines.

[7] The Code defines a generating system to be "a system comprising one or more generating units".

		technology are significantly different from those of other technologies.	
Principle 5	Where possible, the technical standards should provide clear guidance on the basis for negotiating access standards for each requirement.	To provide a fair and consistent basis for negotiation on a particular technical standard requirement, there should be no ambiguity in the intent of the clause or the factors that impact the level of acceptable performance. This can be achieved by the provision of clear guidance. Greater clarity on the intent of clauses and the basis for negotiation between automatic and minimum access standards will assist both NSPs and Generators in their negotiations, and will enhance the consistency of negotiated outcomes for technical standards.	The 'General Requirements' in the new standards are there to ensure that adequate consideration is given to all the aspects of the negotiation.
Principle 6	Changes to the technical standards must include appropriate transitional arrangements.	Consideration must be given to how the changes will apply to Registered generators (as at the date of commencement of the amendments); Plant not registered, but with Connection Agreements pre-dating the commencement date of amendments; Plant registered prior to the amendments coming into effect, but modified after this date (including whether the plant must comply with all new requirements or only those related to the modifications made). Non-committed projects that are in the process of negotiating connection agreements. In developing these transitional arrangements consideration must be given to the possible economic impact on all parties affected by the transitional arrangements, and in any case, the requirements of Principle 1 must not be compromised.	This principle is being over looked in the RP principles. It has a massive impact on generation projects that are progressing to construction or are in construction.
Principle 7	Changes to technical standards are to be technically justified	To provide adequate certainty to generators and intending generators the technical standards should only be changed if an appropriate industry body can demonstrate an adequate technical requirement for the change. The justification	This is very important - change for change sake must be avoided as it creates confusion,

		for this could include the need to correct an error or omission or to incorporate a new technology. In general, when changes are required to incorporate a new technology into the technical standards, contributions to the technical standards review should be sought from both power system experts and specialists from the new technology.	cost and inefficiencies in the delivery of projects.

Appendix 2 TSRG Terms of Reference

NEMMCO

TECHNICAL STANDARDS REFERENCE GROUP

TERMS OF REFERENCE

PURPOSE

To provide a technical advisory service and industry reference point to assist the review of technical requirements for connection of Generators to the National Electricity Grid.

BACKGROUND

In November of 2004, with support from the Wind Energy Technical Advisory Group (WETAG), NEMMCO wrote to the Standing Committee of Officials (SCO) of the Ministerial Council on Energy through the Wind Energy Policy Working Group to request an immediate review of generating system technical standards. The SCO endorsed this request and asked NEMMCO to commence such a review, in conjunction with industry consultation.

SCOPE OF THE REVIEW

The scope of the review, as outlined in NEMMCO's letter to the SCO, is to address deficiencies in the current National Electricity Code provisions covering Conditions for Connection of Generators. The proposed review can be considered in two broad categories, that is, changes to improve the applicability of the technical requirements to technologies other than synchronous plant and more general changes to address issues that have arisen as a result of application of the current Code provisions. The focus is on wind generation in particular because of anticipated rapid increase in the number and size of wind farm connections to the National Grid.

In regard to wind farms the review will:

- improve the applicability of the technical requirements to wind generation by
    - removing technology-specific or commercially-specific words such as 'synchronous' or 'scheduled' where technically appropriate; or
    - adding equivalent requirements suited to wind technology and other asynchronous plant;
- where current minimum standards are excessively onerous, consider ways to relax them; and
- clarify the requirement for non-confidential dynamic models of wind farms for power system studies, and for verification of models.

More generally the review will address:

- errors or omissions, or wording that lacks clarity in provisions of Schedule 5.2;
- inclusion of supply reliability explicitly as a basis for negotiation of access standards;

- other issues arising from experience with application of the current technical standards to the registration of performance standards for existing generating units, development of new connection agreements and modifications to existing plant;
- current problems with the establishment and registering of performance standards, especially in relation to connection agreements signed prior to 16 November 2003 and where the registration process was not complete at that time; and
- application of transitional arrangements generally.

The WETAG developed a set of principles to guide this and future reviews of technical standards, which were included in its report submitted to WEPWG. These principles will be applied to the drafting of Code changes under this review. A copy of these principles is attached as an appendix with this document.

ROLE OF THE TECHNICAL STANDARDS REFERENCE GROUP

The role of the Technical Standards Reference Group in this review is to provide input and advice on draft Code changes proposed by NEMMCO, and assist in refinement of these Code changes to achieve outcomes that are technically appropriate, achievable and workable.

The Technical Standards Reference Group will not be a decision-making body. Differing views that become evident during the operation of the group will be considered in NEMMCO's final drafting of the proposed Code changes. The final drafting may not reflect a consensus outcome, but parties will have further opportunity to make comment during the Code review process.

PROCESS AND TIMETABLE

It is anticipated that:

- the Technical Standards Reference Group will meet approximately fortnightly, or as required up to the completion of review of Code change drafting;
- Meetings will be face to face in the early stages of the work, with some potential for this to be replaced by teleconferences as work progresses.

Members of this review group will be expected to liaise with the industry sector that they represent, and to bring the view or range of views from their sector to the group.

The proposed timetable for this group is

- initial review of Code change proposals completed by mid May
- presentation of submissions by manufacturers by End May
- submit final comments on Code change submissions by mid-June

NEMMCO aims to submit Code changes by early July.

MEMBERSHIP

At least one representative from each of the following industry sectors will be sought for membership of the WETAG:

- Wind Generation developers (prefer two);
- Renewable Energy developers (prefer one);
- Generators (prefer two);
- Retailers (prefer one);
- Transmission Network Service Providers (prefer two); and
- Distribution Network Service Providers (prefer one).

Wind turbine manufacturers will be invited to present their comments on the proposed Code changes to the Reference Group.

CONVENER

The review group will be chaired by NEMMCO.

Appendix Principles to be adopted for Technical Standards Code Changes

Following is a list of draft Technical Standards Principles, reprinted from the WETAG report, that are intended to guide the development of any changes to technical standards provisions. The headings are provided only for indication, and should be read only in conjunction with associated descriptions.

Principle 1:

The technical standard must provide for adequate security, quality of supply and reliability.

The technical standards are intended to specify performance of plant such that:

- Power system security;
- Quality of supply; and
- Reliability of supply[8]

are maintained at satisfactory levels into the future.

The Code specifically requires that NEMMCO and the NSP to take into account security and quality of supply in their negotiations. Consideration of impacts on reliability of supply should extend only to generating units or systems, and not impacts from customers.

Principle 2:

Minimum, automatic and mandatory standards should be defined so that performance requirements are consistent with the potential impact of generating plant on the power system.

This principle provides for the negotiated standard to be no more onerous on the generator seeking connection than is necessary.

The technical standards cover two sets of standards – "system standards" and "access standards". System standards are defined to set a target performance level for the power system overall[9].

Consistent with achieving the required system standards, the Code allows for developers, NSPs and NEMMCO to negotiate a suitable level of technical performance for new connecting plant. In NECA's Review of Technical Standards (Dec 2001), NECA stated:

> "The range for those parts of the standards that can be negotiated should be defined between the automatic access standards and the lowest capability that is acceptable, called the minimum access standard. The lowest acceptable standard should normally be related to the level at which a risk to system security or of harm to other connected parties may arise."

In a few instances, mandatory requirements have been placed on connecting parties, without scope for negotiation

[8] Chapter 5 refers specifically to security and quality of supply, but at least one technical standard addresses reliability of supply (see clause S5.2.5.12).

[9] Ref. ACCC final determination on technical standards – February 2003.

As a principle, the technical standards should be formulated in terms that provide for an automatic access standard and a minimum access standard. A review of the technical standards should determine whether:

- the minimum access standards are reasonable minima, considering the location and potential impact of the generating system within the network; and
- the mandatory requirements can be re-cast in terms of minimum and automatic standards;
- automatic access standards are set at appropriate levels.

Principle 3:

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

Most of the technical standards are applied to generating units, but for distributed generating systems, such as wind farms, which are comprised of numerous small units, it is appropriate to consider performance requirements in terms of "generating systems", or the performance of the plant on the power system as measured at its connection point.

Depending on the way the plant is controlled and the configuration of its connection, performance can be considered in some cases a function of the generating system[10], and in others a characteristic of the generating unit. The terminology used in the technical standards should therefore be specific, and appropriately support the standard's application, allowing flexibility to define combined performance in terms of generating systems, and take effect at the connection point where appropriate.

The impact of a generating system on the power system security or quality of supply is generally governed by the laws of physics and not influenced by whether it is scheduled or non-scheduled, except through application of certain market rules (such as dispatch rules). Inappropriate use of the term "scheduled" in technical standards can have the consequence of excluding significant intermittent generation projects from the requirement to comply with some technical standards. When the technical standards are reviewed inappropriate use of the term "scheduled" should be avoided.

Principle 4:

Where reasonable, the technical standards should be written so that they are applicable to all technologies. Technology-specific terms should be used only where necessary to clarify requirements for particular technologies.

The technical standards must adequately cover all types of generation technologies. To the extent reasonably possible the technical standards should not treat one technology more favourably than another. While the technical standards might recognise the differences between technologies, the standards should aim to achieve an equivalent performance outcome.

As new technologies may emerge over time, technical standards should be written, where possible, in a form that can be applied to all technologies. It is recognised that there may be some exceptions to this principle, for example, where a technology has established methods of specifying technical capability that simplify performance assessment or where the

[10] The Code defines a generating system to be "a system comprising one or more generating units".

technical parameters for a technology are significantly different from those of other technologies.

Principle 5:

Where possible, the technical standards should provide clear guidance on the basis for negotiating access standards for each requirement.

To provide a fair and consistent basis for negotiation on a particular technical standard requirement, there should be no ambiguity in the intent of the clause or the factors that impact the level of acceptable performance. This can be achieved by the provision of clear guidance.

Greater clarity on the purpose of clauses and the basis for negotiation between automatic and minimum access standards will assist both NSPs and Generators in their negotiations, and will enhance the consistency of negotiated outcomes for technical standards.

Principle 6:

Changes to the technical standards must include appropriate transitional arrangements.

Consideration must be given to how the changes will apply to

(i) Registered generators (as at the date of commencement of the amendments);

(ii) Plant not registered, but with connection agreements pre-dating the commencement date of amendments;

(iii) Plant registered prior to the amendments coming into effect, but modified after this date (including whether the plant must comply with all new requirements or only those related to the modifications made).

(iv) Non-committed projects that are in the process of negotiating connection agreements.

In developing these transitional arrangements consideration must be given to the possible economic impact on all parties affected by the transitional arrangements, and in any case, the requirements of Principle 1 must not be compromised.

Principle 7: Changes to technical standards are to be technically justified

To provide adequate certainty to generators and intending generators the technical standards should only be changed if an appropriate industry body can demonstrate an adequate technical requirement for the change. The justification for this could include the need to correct an error or omission or to incorporate a new technology.

In general, when changes are required to incorporate a new technology into the technical standards, contributions to the technical standards review should be sought from both power system experts and specialists from the new technology.