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Reliability Panel Technical Standards Review- Issues Paper

The NGF appreciates the opportunity to provide comment on the AEMC Reliability Panel Technical Standards Review Issues Paper. This submission provides responses to the questions raised in the issues paper.

It is the view of the NGF that technical standards for generators need to be focused on the technical characteristics of plant that are required to support the power system standards. The technical standards that were established at market start were based on the characteristics of a large steam turbine plant rather than power system standards and have progressively been modified to more closely meet the true need.

In the view of the NGF this work is not yet complete.

In addition, the market is evolving with newer technologies and different approaches to the delivery of market services such as ancillary services. The NGF believes that technical standards for connected participants, including registered performance standards for generators, should be:

- clearly linked to the power system standards and set at a level that is appropriate for the nature of the connected parties and their contribution to the maintenance of that standard;
- cover only those aspects of plant performance which cannot be provided as services to the market. Ancillary services and energy are both included in markets or contracted purchases managed by NEMMCO other services (reactive power and inertia) could be provided in this manner and should not then be defined in performance standards;
- established at the time a connection agreement is finalised. This includes registering the actual capability of generators that had connection agreements prior to the standards being adopted;
- only changed where there is agreement between NEMMCO, the relevant NSPs and the connected participant; and

- reset only the applicable standard/s when the parts of the plant are upgraded.

It is therefore timely that the Reliability Panel proposes to review the technical standards in the Rules. We agree that the focus should be broad and include the drafting, scope and levels of the various standards applied to generators. A case in point is the fault ride through provisions in the standards that need to be expressed in a form that can be applied to a variety of technologies connecting to the grid and be at a level that is appropriate to support the system standards, and be relevant to that part of the system to which the plant is connected.

The NGF believes that in the introduction to the Review document the objective of the automatic standard is incorrectly stated. The automatic standard if met will generally provide a level of service in excess of that required to ensure no degradation of the system performance. In many cases it represents an elevated performance against which NEMMCO can find no fault and must accept.

During the review of the technical standards for the integration of wind generation, many of the automatic standards where lifted. NEMMCO elevated them in many areas, they argued convincingly to do so, as they were forced to accept this level of connection. The increase in these standards has been accepted by generators on the basis that there is a framework by which generation proponents can negotiate their performance appropriately.

In some areas NEMMCO recognised that the mandated standards as they were had to become negotiated standards, as the system performance varied widely from the standard in question. This is clearly the case with the overvoltage standard.

The negotiated standard is a standard at which generators camn connect in order to not harm the system or it is understood and studied to demonstrate that the harm is not material. The due diligence process ensures that the system security assessment is thorough. It is also required to ensure that the standard is worded in an acceptable form to provide for the development of a compliance program.

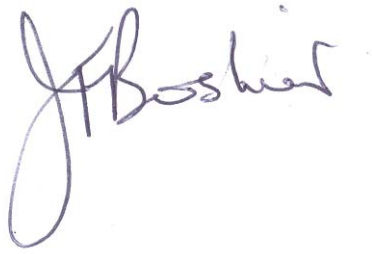
We request that Panel consider carefully the implications of assuming that the automatic standard represents ‘no degradation’. If this were truly the case then as a result of the negotiated standards currently being accepted we should be seeing a degradation of the system. The system performance has been maintained and in a large number of areas there have been improvements in performance through diversified generation technologies.

In our experience there are few if any generators capable of meeting all the current automatic standards.

The NGF’s response to the questions posed by the AEMC is attached. We have provided both a high level and a technical response.

If you have any questions in relation to the comment provided by the NGF please do not hesitate to call Mr. Frank Elsworth on (02) 9285 2706.

Yours faithfully,



John Boshier
Executive Director

Reliability Panel Technical Standards Review- Issues Paper NGF Response to Questions

3.1- Are the current standards of the correct form?

In relation to the form of the current standards;

- The philosophy and structure that allows a standard to be negotiated is correct. As the network varies in standard from place to place it is most efficient to allow the TNSP and the Generator to work together to develop an appropriate standard for connection.
- The form and structure of the current technical standards may need some further refinement in order to ensure that compliance programs can be developed as a result fo the wording of the agreed standard.. A number of generators have experienced difficulties developing their compliance obligations with their existing agreed standards. In many cases these are the standards that were formed based on version 10 of the NER. under the current form of the technical standards.
- The newer standards (post version 12) create a much better basis on which to formulate a compliance program, however there are still areas that could be improved. The industry went to concerted effort in order to rewrite the performance standards in a manner that allowed for technology neutrality. In some cases it has to be recognised that different technologies may need special recognition, it should not preclude them from connecting.
- The NGF assumes the initial focus of the review will look at schedules 5.1, 5.2 and 5.3.
- The NGF believes that the form of the all the technical standards should be consistent with the standard set during the review of the integration of Wind technical standards.

Please refer to Appendix one for recommendations relating to the form of specific current technical standards.

3.2 - Are the current standards set at appropriate levels?

In relation to the appropriate levels set by the current standards;

- The standards (post version 12) are set at appropriate levels that describe the minimum standard as a do no harm standard, and the automatic standard as one that NEMMCO can not reject. The overall level of automatic standard has been elevated, the negotiated standard area represents the area in which the generator meets the no degradation level.

- The appropriate level of the current standards should be aligned with the power system standards. There are a number of areas where the automatic standard if met, will exceed the performance of the local network.
- Location issues – generators need to be able to connect plant at any location within the NEM, while doing no harm to the local network but not being obligated to resolve the local networks issues at the cost of the generation project.

Please refer to Appendix two for recommendations relating to the appropriate levels of the specific current technical standards.

3.3 - Is the scope of the technical standards appropriate?

In relation to the scope of the technical standards;

- There was a concern at market start that there was insufficient reactive power available so it was included in the automatic standard. This issue is not relevant today given the advance in control systems.
- The NGF has a view that Reactive Power standards can be removed from the rules, with voltage support procured by NSP's.
- Reactive power can be treated as a service and generators should be paid for that service. Generators should not be made responsible for supporting all the reactive demands of the system when it is actually a service that they can provide.
- A generator ought only be required to provide adequate reactive export or import to meet the do no harm philosophy in the local area to which it is connected. This goes for both dynamic and steady state support.
- The reactive requirements of load areas must be met by the planning processes of the TNSPs, obligating generators to provide large amounts of reactive regardless of their location in the network comes at a great cost to energy projects and is contrary to the NEM objective.
- The same issues exist for Inertia as reactive power, if generators are providing a service they should be contracted for it.
- With increasing installation of new low inertia technologies it is worth considering establishing inertia as a new ancillary service.
- There are NER requirements for generators around control devices including approval to use or omit (e.g. PSS), models (settings & accuracy), compliance tests etc. There are minimal or no equivalent requirements for NSP control devices (e.g. SVC's, FACTS devices) that can have capabilities equivalent to AVR and PSS.

3.4 - Are the technical standards well structured in the Rules?

In relation to the structure of the technical standards;

- Ambiguities in the current rules make it difficult to develop appropriate compliance programs for example with Fault Ride through.
- A more administrative matter is that over time clause numbers in the Rules have changed, which can create a lack of clarity on the meaning of other instruments that refer to the Rules (eg. Connection agreements, Jurisdictional license requirements etc.). It would be useful if this problem could be addressed – potentially by requiring performance standards to be referenced to a particular version of the Rules.

3.5 - Are the obligations between NSPs and network users consistent?

In relation to the consistency between the obligations of NSP and Network users;

- The NGF believes the obligations on generators and TNSP are not balanced. Generators have obligations and TNSP's have best endeavours. While the TNSPs cannot be responsible for matters outside of their control, neither can generators – yet generators are required to ride through (all manner of) network faults.
- The NGF believes that TNSPs should have obligations for the performance of their plants in the same way that generators do and they should also be required to have and use compliance plans.
- In some instances generators are exposed to obligations under the Rules, for assets which are actually under the control of NSP's (eg. Connection type assets). There appears to be an underlying assumption (experience shows a poor one) that generators will be able to contract with NSP's to cover this exposure. A principle that the asset operator should be responsible for assets under their control should be clarified in the Rules to ensure that they impose obligations on those who can best manage them.

Please refer to Appendix three for recommendations relating to the consistency between obligations of the NSP vs. network users.

3.6 - Which aspects of the technical standards need more urgent review?

In relation to which aspect of the technical standards need more urgent review;

The NGF is of the view that the following areas that require urgent review are:

1. Reactive power;
2. Fault ride through (relevant for all forms) in relation to form and level taking into account different technologies in the NEM;
3. Frequency response – including over frequency events;
4. Whether the review is to include power system standards;
5. Dispute Mechanism for power system standards; and
6. In the instance that standards are increased – the obligations on existing plant should not be increased.

The NGF notes that an early review of the fault ride through standards could reduce the issues with the frequency standards in Tasmania.

Appendix one: Are the current standards of the correct form?

Rule Title (V20)	Comments for AEMC Reliability Panel Technical Standards Rule Title (V20) Review issued 9th May 2008	
	Principles	Areas for Improvement
S5.2.5.1 Reactive power capability	• Connection Point application or Machine Terminals not both. • The choice of application significantly alters the capability eg. Mt Piper capability shifts by >100MVAr towards the Import side by using Connection Point. Stanwell generators had derogation on leading and automatic standard on lagging at the generator terminals. At the connection point, meet automatic access on leading side and require negotiated standard on lagging side. • • Acknowledgement of modelling calculations (with errors of accuracy) if utilised to determine level at Connection Points (For large steam drive Units limits are normally defined at Unit Generator terminals) • Registered Operating diagrams	• With NEMMCO continuing to see no need to purchase Import RPAS in NSW, some competitors have an unfair competitive advantage using standards that are not set at the Connection Point. • Wording of standards is open to different interpretations – suggest a diagram be used as mentioned in the principles. • Wording of standard could be altered to reflect the “actual” Network requirement for the particular node eg. Some Units cannot utilise (or test) their presently listed capability because of Network limitations. • Continued operation outside the limits defined by Automatic Access Standard for a Generator require a direction in accordance with Rule 4.8.9 OR should be subject of a Network Control Ancillary Service contract. The limitations of any direction or contract commitment are the technical capabilities of the installed equipment and AVR parameters defined by the registered operating diagram of each Unit.

	• Responsibility of NEMMCO (by rule 4.9.4) to dispatch the Unit to an operating point should be referenced – some ownership by the Operator is required to ensure Units don't stray outside the Performance Standard limits. • Variations in system conditions may result in short term excursions outside the Performance Standard limits.	• Some generators have transformer ended feeder connections and cannot measure the power on the HV side of the generator transformer to prove compliance with a connection point standard.
S5.2.5.2 Quality of electricity generated	• The application of plant standards requires definitions for unsynchronised representations for "constant voltage" and "balanced voltage".	• "constant voltage" is interpreted as <0.1% variation in any phase over a two minute period when the generator is excited but unsynchronised with the NEM. This definition was proposed by TransGrid in Jan. • "balanced phase voltages" is interpreted to mean there is <0.1% Negative Phase Component of the voltage signals in an analysis of a selection of high speed samples of the voltage during a two minute period when the generator is excited but unsynchronised with the NEM. This definition was proposed by TransGrid in Jan 07.

S5.2.5.6 Quality of electricity generated and continuous uninterrupted operation	• Clause appears to be a reduced and condensed form of S5.2.5.2, S5.2.5.3, S5.2.5.4 and S5.2.5.5.	• Delete clause or move to a sub clause of S5.2.5.2, S5.2.5.3, S5.2.5.4 and S5.2.5.5
S5.2.5.7 Protection of generating systems - Partial load rejection	• Response to over frequency should be included with reactive power in dealing with the issue of generators providing system support.	• Needs to be re-worded, proof of compliance with the requirements is also problematic.
S5.2.5.8 Protection of generating systems - power system disturbances	• Clause in Rules version 20 is substantially different to version 12 and now has some degree of crossover with S5.2.5.3 which is regrettable – No crossover with standards should be required. • Clause used to be about the declaration by a participant of the system conditions that might cause a unit to trip.	• Make S5.2.5.8 be about permitted responses if Units remain in service. • S5.2.5.8 should only be about tripping systems. If participants wish to remain in service then they should operate in accordance with S5.2.5.3.

	• If clause is returned to such a form, the occurrence of listed conditions should override the obligations of a participant to Rules S5.2.5.3, S5.2.5.2, S5.2.5.3, S5.2.5.4 and S5.2.5.5. • Use of designed tripping curves that present the characteristic of a trip function e.g. A diagram of the tripping characteristic of a Unit's Negative Phase Sequence relay.	• Reword to return the standard to a declared list of protection that a participant has that might respond to system disturbances
S5.2.5.9 Protection systems that impact on power system security	• The following sentence from clause S5.2.5.9 of the National Electricity Rules Version 12 is considered to be applicable: "Protection solely for Generator risks is at the Generator's discretion." Such protection could operate at times of market stress and shall be considered a reasonable credible contingency by system operators and transmission network service providers in their activities of maintaining system security.	• Permit the participant to trip Units by protection solely for Generator's risks. This happens anyway. The majority of trips in steam fired plant are from mechanical reasons.
S5.2.5.11 Frequency control	• The word "capable" is considered to imply potential response and a Unit need not reach that potential during every event (ie 100% of events).	• Consider creating a new Rule purely for "adequate damping" that can be inclusive of individual element damping as determined by modelling work and overall Unit damping as determined from in-service testing.

	• More definitions are needed for the application of this rule. • Ramping direction of dispatch needs to be considered because it can affect whether a Unit conforms or doesn't. • Statistical accuracy of measured MWs needs to be considered and can be as high as +-3MW as Unit controls adjust to fuel quality, ambient conditions and transient load changes. • Determining a Unit is "adequately damped" using in-service testing for the purposes of this Rule is problematic because damping of a Unit is effected by a combined action of governor, DCS controls, AVR and PSS action. No one of these can be isolated easily in in-service testing. Such testing is the domain of mathematical modelling calculations only	• "pre-disturbance level" is interpreted to be the average of 20ms samples of the output level between 4s and 2s prior to the event trigger. • "frequency recovering gradually" is interpreted to mean that the frequency takes longer than 2.5 minutes to return to the normal operating frequency band. This period was chosen as it is 50% of the normal dispatch period. • Sub-item (2)(ii)(A) is interpreted as a calculation as follows: **(0.2 * PMAX * (f – 50.15)/50.15 *100)** where f is the measured frequency extreme and PMAX is the "maximum operating level" defined by the Standard. Without the "*100" multiplier the value is so small as to not make sense and would always apply. • Sub-item (2)(ii)(B) is interpreted as a calculation as follows: **(0.1 * PMAX)** where PMAX is the "maximum operating level" defined by the Standard.

		• Sub-item (2)(ii)(C) is interpreted as a calculation as follows: **(if (MWprefault – PMIN) > 0 then (MWprefault – PMIN) else 0**
S5.2.5.11 (C)(2) Frequency Control – Power Reduction	• the Minimum Access Standard for Power reduction on a drop in frequency (S5.2.5.11(c)(2)) is largely not able to be met by most large gas turbines. This is dependent on ambient conditions, but there is no provision to allow exceptions based on environmental conditions. • This also leads to another situation, particularly applicable to peaking generators. The standards require compliance over all operating conditions. In many cases for a peaker, some of the standards have to be negotiated down or are below the minimum only over a very small part of the operating range. It is easy to manage compliance with a higher standard by not operating (making the unit unavailable) over this rare event. The standards do not allow for this to happen.	

S5.2.5.12 Impact on network capability **&** **S5.2.5.13 Voltage and reactive power control**	• Standards can be supported by modelling studies targeting stability of major protection systems. • Acknowledge inherent accuracy values of Modelling. • Acknowledge the accuracy of measurement devices needed for the assessment.	• Separates items that need to be determined by modelling from items that can be specifically tested for. • Acknowledgement of the reality that modelling studies contain inherent inaccuracy arising from the assumptions and theory used to create the model. • Acknowledgement of the reality that due to the level of accuracy and complexity of applied models and assumptions, it is possible that some installed control and protection systems exist that present an unidentified risk of non-compliance with this standard. • Requirements for a 5% on-line step and a 5% voltage step into the limiters are excessive. • Ceiling voltage ratio and ceiling voltage rise time are usually based on measurements of main field voltage. It is unclear how to interpret ceiling voltage requirements for brushless excitation systems where it is not possible to take main field voltage measurements. Suggest a plant standard be developed for brushless exciters.

S5.2.5.14 Active power control	• Not used in some generator's standards. • Signal Accuracy should be included. • Dispatch engine biasing to overcome short term errors should be specifically detailed and controlled	• The standard needs to recognise the accuracy of signals used in such control e.g. a 2 MW error can find that a Unit that is dispatched to 660MW and appears to be at 658MW on the remote indicator but is at 660MW on the Units control system will result in "non-conformances" • NEMMCO's Dispatch engine calculations for a Unit should not be biased by NEMMCO staff without formal advice and acceptance of the participant and a clear indication in the engine of the reason for the bias. Delta has experienced a situation where a manually applied bias had been entered into the NEMMCO AGC for one of our Units without knowledge of Delta and without clear indication of a reason available to NEMMCO officers trying to explain what it was there for. This should not be possible.
S5.2.6.1 Remote Monitoring	• Detail the path the signal can travel and link to S5.2.6.2.	• In many large NSW Generators, the Generator is responsible for the signals from the source transducer to the Remote Terminal Unit located on the Power Station site or in the Power Station Switchyard. The Remote Terminal Unit and the transmission of the signal to NEMMCO is the responsibility of the TNSP.

S5.2.6.2 Communications Equipment	• This standard is not applied to Delta's existing equipment probably because of the above point.	• See recommendation above (S5.2.6.1).
S5.2.7 Power station auxiliary supplies – and the subsequent S5.3.5 Power factor requirements	• Include for electrical protection clauses from S5.3.3. • Permit protection operations that are solely to protect Generator's plant. • Harmonic content, if applied in a standard, is only easily determined by desktop assessment. In service measurements are problematic without specialised instrument transformers	• Clause in version 20 appears to have lost some aspects from version 12 that should be reconsidered. Delta Electricity considers that the protection clauses of S5.3.3 and S5.3.4 should still apply for system security reasons but are happy to leave them out if this is preferred by others. • The following sentence from clause S5.2.5.9 of the National Electricity Rules Version 12 is considered to be applicable: "Protection solely for Generator risks is at the Generator's discretion." Such protection could operate at times of market stress and shall be considered a reasonable credible contingency by system operators and transmission network service providers in their activities that seek to maintain system security.

		• Delta's present standards and Connection Agreement require an assessment of harmonic content. The measurement of harmonics is presently limited to a desktop assessment because the available voltage signals initiate from capacitive voltage transformers installed in the revenue metering system at the connection point. It is reported by technical experts that CVTs have inferior transient and frequency responses compared to other high voltage instrument transformers.
S5.2.8 Fault current	• Design stage check only. • Rule should be linked to Rule 5.3.9 to prevent such changes happening without the knowledge of the TNSP.	• This standard is really a design check and a process control standard. As long as no equipment is changed, the fault level (as assessed by modelling calculations performed by TNSPs) should not change.

Appendix Two - Are the current standards set at appropriate levels?

Rule Title (V20)	Comments for AEMC Reliability Panel Technical Standards Rule Title (V20) Review issued 9th May 2008	
	Principles	Areas for Improvement
S5.2.5.8 Protection of generating systems from power system disturbances	• Existing clause appears to have lost the point of the previous versions of the Rules (see version 12). • The Rules of version 12 could be adopted with some additional inclusion for o AVR related trips that might see power system disturbances	• Review previous changes
S5.2.5.9 Protection systems that impact on power system security	• The clearance times stated in the standard have been determined in accordance with the Rules S5.1.9 (a)(1) and S5.1.9 (k) and(l) by assessment of two phase to earth short circuit fault at the external 330kV connections of the Generator Transformers. Faults of different types and/or at other electrical points will present variations above and below the times listed in the standard.	• Acknowledge the variants in actual times in the Rule

S5.2.5.10 Protection to trip plant for unstable operation	• Allowances are needed for some Field Failure protection systems that act to prevent pole-slipping for most but not all operating conditions.	• Acknowledge the variability of operating conditions upon the potential response.
S5.2.5.11 Frequency control	• Allowances for Dispatch ramping direction of a Unit are needed	• New wording required in the Rule
S5.2.6.2 Communications equipment	• Suggest a percentage accuracy of the communication channel in terms of any Monitoring or control point that travels on it.	• Include effect on the accuracy of measurements in travelling through the communication highway.
S5.2.7 Power station auxiliary supplies – and the subsequent S5.3.5 Power factor requirements	• The clearance times stated in the Delta standards arising from S5.3.3 have been determined in accordance with the Rules S5.1.9 (a)(1) and S5.1.9 (k) and (l) by assessment of two phase to earth short circuit fault at the external 330kV connections of the Generator Transformers. Faults of different types and/or at other electrical points will present variations above and below the times listed in the standard.	• Acknowledge the variants in actual times in the Rule.

Appendix three - Are the obligations between NSPs and network users consistent?

Rule Title (V20)	Comments for AEMC Reliability Panel Technical Standards Rule Title (V20) Review issued 9th May 2008	
	Principles	Areas for Improvement
S5.2.5.1 Reactive power	• NEMMCO dispatches the operating point.	• Include this responsibility as detailed in Rule 4.9.4
S5.2.5.2 Quality of electricity generated	• TNSP should have a Quality of connection point Rule.	• Review responsibility.
S5.2.5.3 Generating unit response to frequency disturbances	• TNSP and NEMMCO Performance Standard is required and should be communicated to Participants	• Review responsibility. • Consider the need for a Performance Standard for TNSPs and NEMMCO
S5.2.5.4 Generating system response to voltage disturbances	• TNSP and NEMMCO Performance Standard is required and should be communicated to Participants.	• Review responsibility. • Consider the need for a Performance Standard for TNSPs and NEMMCO.
S5.2.5.5 Generating system response to disturbances following contingency events	• TNSP and NEMMCO Performance Standard is required and should be communicated to Participants.	• Review responsibility. • Consider the need for a Performance Standard for TNSPs and NEMMCO.

S5.2.5.7 Partial load rejection	• TNSP and NEMMCO Performance Standard is required and should be communicated to Participants.	• Review responsibility. • Consider the need for a Performance Standard for TNSPs and NEMMCO.
S5.2.5.8 Protection of generating systems from power system disturbances	• TNSP and NEMMCO Performance Standard is required and should be communicated to Participants.	• Review responsibility. • Consider the need for a Performance Standard for TNSPs and NEMMCO.
S5.2.5.9 Protection systems that impact on power system security	• A Generator's response is often tied up with the performance of TNSP equipment, protection systems and Circuit breakers.	• Review responsibility.
S5.2.5.10 Protection to trip plant for unstable operation	• A poor operating point driven by NEMMCO dispatch and Network availability conditions will increase risk of pole-slip regardless of the protection system installed by a generator.	• Review responsibility.
S5.2.5.12 Impact on network capability	• TNSPs and/or NEMMCO should be responsible for Stability design as they have the 5 state modelling and expertise to perform the assessment regardless of who is responsible for the issue.	• Review responsibility.

S5.2.5.13 Voltage and reactive power control	• TNSPs have the industry experts in the application of this Rule in practice.	• Review responsibility.
S5.2.5.14 Active power control	• In many NSW generators, TNSPs owns the communication highway that delivers the raise and lower information.	• Review responsibility.
S5.2.6.1 Remote Monitoring	• In many NSW generators, TNSPs owns the communication highway that delivers the remote monitoring information.	• Review responsibility.
S5.2.6.2 Communications equipment	• In many NSW generators, TNSPs owns the communication highway.	• Review responsibility.
S5.2.7 Power station auxiliary supplies – and the subsequent S5.3.5 Power factor requirements	• A Generator's response is often tied up with the performance of TNSP equipment, protection systems and Circuit breakers. • The origin of Harmonic content problems are not easily detected.	• Review responsibility.