NEMMCO

National Electricity Market Management Company Limited
ABN 94 072 010 327
Sydney

24 November 2006

Dr John Tamblyn
Chairman
Australian Energy Market Commission
PO Box H166
Australia Square NSW 1215

Dear Dr Tamblyn,

Submission on Draft National Electricity Amendment (Technical Standards For Wind And Other Generator Connections) Rule 2006

Thank you for the opportunity to comment on the Commission's draft determination on the above Rule. NEMMCO agrees with the main conclusions of the draft determination. We would like to draw the Commission's attention to two main areas of refinement to the operation of the new Rule that would improve the operation of and transition to the new Rule, including the:

- **Provision of Dynamic Models**: We support the dual-model concept in the draft, and suggest improvements to address issues of confidentiality and fitness for purpose of the models, and to generally improve the process of supplying the less detailed model; and
- **Transitional Arrangements**: We have raised some issues and possible improvements that arise from the proposed transitional arrangements.

We have also identified a number of minor drafting issues. The Addendum contains further details on these issues and Attachment A contains proposed amendments to the draft Rule. For further details, please contact Jennifer Crisp, Planning Specialist, Power System Planning and Development on (07) 3347 3907.

Yours sincerely

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ADDENDUM

Provision of Dynamic Models

The provision of dynamic models by Generators is important for NEMMCO in fulfilling its functions as these models are necessary to assess power system security for both online and offline analysis. In addition to this, they are also used:

- to assess the impact of proposed new connections, both for developing performance standards and for assessing the impact on power transfer capability of the network;
- for developing settings on power system stabilisers and other power system control equipment;
- for developing limit equations, which are then translated into constraints in dispatch; and
- for developing transmission augmentations.

For the past few years, NEMMCO has experienced difficulty in obtaining appropriate models, especially for wind farms, because the development of the current Rules did not contemplate that non-scheduled or intermittent generation could be of sufficient size or significance on the power system as to impact power system security. The current Rules are therefore not sufficiently clear as to the requirements and timing of provision of models by non-scheduled generation.

In its submission to the AEMC, NEMMCO focussed on clarifying and reinforcing the need for adequate models to be provided for all types of generation. It sought also to clarify the Rules that deal with the provision of modelling data to other parties, particularly Registered Participants, and Connection Applicants, who need to use these models to develop their connection applications. This has been recognised in the AEMC's Draft Determination, which also endeavours to balance these needs against the desire of wind generation manufacturers to protect intellectual property that might be revealed in the dynamic models. The AEMC has proposed that two levels of model be provided:

- a fully detailed model that would be kept confidential (available to NSPs and NEMMCO only); and
- a less detailed model that would be non-confidential and made available to other Registered Participants, Connection Applicants and third parties.

NEMMCO supports the concept of the dual model proposal, but suggests the following refinements:

Model confidentiality

Under the AEMC's proposed drafting there is some contradiction about the confidentiality of the model. Some clauses state that the information is confidential, and restrict its provision to other parties, while others describe the less-detailed model as 'non-confidential'. Non-confidentiality implies that the model could be published or provided to anyone, whereas the concept of confidentiality as defined in the current Rules allows the confidential information to be provided to others only as allowed under the Rules. Most of the existing model data falls under that category. NEMMCO considers that it would be better if both the detailed and less-detailed versions of the model were considered confidential and protected from public distribution. In practice NEMMCO would need to declare model information confidential when distributing it (for example, under 3.13.3(l)), because it would be impractical to separate those parts that were non-confidential from the rest. Having both models as confidential avoids some of the current drafting inconsistencies.

Fit for Purpose
Both the detailed and the less detailed models must be fit for purpose. The current drafting has no test for determining the adequacy of, or set minimum requirements for the models, and therefore, there is no basis for rejecting a less-detailed model, if for example, the performance it predicts differs significantly from that predicted by the detailed model for the same power system conditions. In such circumstances the release of the less-detailed model could be potentially misleading. NEMMCO proposes that both forms of the model must be consistent with the model guidelines, in order to ensure that an adequate standard of model is obtained.

Optional provision of less-detailed model (concept of 'restricted model information')
Provision of two different models (the detailed one and a less-detailed model) may cause unnecessary overhead for people intending to become Generators. NEMMCO proposes that if a prospective Generator chooses to provide only one model (the detailed one), that this model be used, as it currently is, for all purposes allowed under the Rules. If an acceptable less-detailed model is provided, this is substituted in modelling information provided to Connection Applicants and Registered Participants other than NSPs and NEMMCO.

To implement this concept NEMMCO has proposed a new defined term 'restricted model information' to identify:

- the more-detailed model (when an acceptable alternative model has been provided); and
- source code associated with both model forms.

Source Code for the less detailed model
Under the current drafting source code would be confidential, and only required to be provided to NEMMCO. NEMMCO suggests extending this to:

- a requirement for source code for the less-detailed model; and
- permit sharing of source code with NSPs.

Source code is needed to verify that the block diagrams accurately reflect the implementation of model in software, and is needed to recompile models every time the modelling software is updated to a new version. Currently many of the models in use have been developed by TNSPs and are their intellectual property. Current practice is that the source code for these models is shared between TNSPs and NEMMCO. The proposed change aims to ensure that the practice of sharing source code can be maintained in future. A departure from this approach would impose costs on the industry as multiple parties would need to develop their own source code versions.

Use of object code
Model object code is derived by compiling the model source code to a binary format. It has been NEMMCO's practice to provide on request to Registered Participants a library of object code for all the models (under clause 3.13.3(k)) so that Participants can run their own transient stability studies. This practice is based on a policy developed by NEMMCO shortly after market start, in consultation with NEM participants. It is an efficient way to provide the data in an industry-standard electronic format that protects the intellectual property in the model. The alternative would be for individual Participants to develop their own source code for each model from the block diagrams and compile this code to produce object code. This would be prohibitively expensive and inefficient. NEMMCO proposes to preserve the current arrangements by clarifying that object code (or equivalently encrypted models, used by

some software vendors) is not ‘restricted model information’ even though it is derived from source code that is ‘restricted model information’.

The table below lists clauses affected by these proposals:

Clause	Description	Required Change
3.13.3(k)	modelling information that may be requested from NEMMCO	S5.2.4 data, but excluding ‘restricted model information’
3.13.3(l)	request for information from Registered Participants	make subject to 5.3.8(a)
3.13.3(m)	requests for information from other parties	make subject to 5.3.8(a)
5.3.3(c)	Response to connection Enquiry (information to be provided)	refer to S5.2.4 for generation connections
5.3.4	Application to Connect (information on considered projects that the NSP must provide)	S5.2.4(b) excluding ‘restricted model information’
5.3.8	Provision of information (connections) – defines who can access information obtained under connection process and when	list 3.13.3(l) & (m) explicitly to allow information. Exclude ‘restricted model information’ from that given to a Connection Applicant
5.3.9	Procedure to be followed by a Generator proposing to alter a generating system	Allow for an alternative less-detailed model to be provided when updating models
S5.2.4	Provision of information (Generating plant)	Detailed and less-detailed models described. Mechanism for more-detailed model to become ‘restricted model information’ described including satisfying requirements of model guidelines. Provision of source code and clarification that object code, derived from source code is not ‘restricted model information.
11.5.2	Provision of S5.2.4 information in registration in application	see comments below.

The attached drafting also contains detailed comments and explanations of each of these changes.

Transitional Arrangements

Exemption from Provision of Model Information

Clause 11.5.2 states that the requirement to provide a model under S5.2.4 does not apply to a person who has commenced applying to be registered. NEMMCO disagrees with this proposal because a lack of models for some significant generating plant would reduce NEMMCO's capability to assess power system security as NEMMCO would have no model information to predict the impact of such plant on the capability of the power system. The model information is required for all significant plant, and there should not be an exception that allows a Generator to avoid this obligation.

The obligation currently clearly exists for Scheduled Generators (under clause S5.2.4) and is applied by NEMMCO as a condition of registration (using clause 2.2.3) for all non-scheduled generating systems of 30 MW or greater.

If model information is not provided, the NSP or NEMMCO would have the ability to require tests under clause 5.7.6 at any time, but this would be an expensive exercise for both the Generator and the NSP, and inefficient if the information is already available by other means.

NEMMCO does not require changes to plant, but only the provision of information which must exist because it is needed for studies to assess the proposed performance standards, so there is no additional cost in deriving it.

NEMMCO understands that the purpose of this clause was the protection of wind generation manufacturers' intellectual property. One possible solution, which will protect intellectual property while not restricting NEMMCO's access to models, is to allow the clause S5.2.4 information provided by the Generator under this transitional arrangement to be considered 'restricted model information' for a period (say six months) to allow the development of an alternative less-detailed model consistent with clause S5.2.4(g).

Negotiated access to 'old chapter 5' requirements

Clause 11.5.3 permits a connection applicant to use the old technical requirements (those requirements immediately in force prior to the commencement date) instead of the new ones if the 'negotiated access standard is subject of a negotiating process' at the commencement of the changes. NEMMCO understands that the aim of this provision is to minimise the impact of the new rules on existing generation investment proposals and the negotiation of associated connection agreements. However NEMMCO believes that the proposed rule may significantly delay the implementation of the new technical requirements (in the worst case 4 to 7 years[1]). This delay would reduce the effectiveness of the new standards in managing wind integration issues, because a high proportion of wind farms would not be required to comply with the new standards, and many of the existing standards can not be effectively applied to wind farms.

NEMMCO proposes that the appropriate criterion for the application of the 'old' technical standards is having a signed connection agreement at the commencement date of the new provisions, or at least an offer to connect. Once a connection agreement has been signed

[1] This estimate is derived from advice from two TNSPs regarding the times which may elapse from the start of a connection negotiation to commissioning of a new generator. While this time varies between generation proposals historical evidences demonstrates it can be significant (4 to 7 years).

the prospective Generator will have established the required performance of the plant and be in the process of establishing contracts with suppliers and undertaking detailed design. Until the connection agreement has been signed the performance requirements for the plant are not locked-down, and can be changed.

The proposed change should reduce the delay in implementing the new technical requirements by between 12 and 18 months while containing the impact on existing generation investment proposals to extending the connection agreement negotiations for those proposal that have commenced the negotiation process.

Application of clause 11.5.3 and subclauses 2.2.1(3) and (4)

Draft clause 2.2.1(3) requires the person registering as a Generator to satisfy NEMMCO that its generating units comply with the relevant technical requirements set out in Chapter 5. However, this clause in combination with clause 11.5.3 does not cover situations where:

- the connection agreement predates the previous technical standards changes in November 2003, and there has been no registration of a Generator for that plant. (NEMMCO knows of at least two such cases); or
- a person seeks to re-register plant for which there is a connection agreement that pre-dates the previous technical standards changes.

Typically re-registration occurs when a generating system changes ownership or there is a change of intermediary.

Application of the proposed clause 2.2.1(e)(3) may prevent NEMMCO from registering these Generators. Since proposed clause 2.2.1(e)(4) will require a Generator to have performance standards for its generating system, clause 2.2.1 (e)(3) is redundant and can be deleted.

The draft clause 2.2.1(4) will also be an obstacle to registration if the particular plant does not have performance standards, and seeks to re-register at some time in the future. In NEMMCO's original submission there was a clause that identified Generators that:

- had connection agreements predating the previous technical standards Code changes, and
- were registered since that time.

These Generators technically have no performance standards, because they were not required to develop them as part of the Chapter 4 process nor for the process in chapter 5. There needs to be a requirement for these Generators to develop performance standards, either under the current NGF Rule proposal for performance standards of existing Generators (currently under consideration by the AEMC) or under this Rule change proposal.

Other matters

NEMMCO has also identified a number of minor drafting corrections and enhancements in Attachment A.

Attachment 1: Comments and Suggested Drafting

General Notes

1. The term 'rule' seems to have been used as a substitute for 'clause' in some places in the proposed drafting but not in others. NEMMCO considers that this will lead to confusion and is inconsistent with the rules of interpretation in clause 1.7.1 which only recognise 'clause'. If the AEMC intends to use the term 'rule' in this way, does it intend to change all references throughout the Rules?

2. The use or lack of use of italics, bolding and quotes in local definitions appears to differ from that used elsewhere in the Rules. There are at least four different styles now used for local definitions in the Rules (see clauses 2.9.2 as proposed, S5.2.5.3 as proposed, S5.1a.4 and 3.15.6A, compared with existing S5.2.5.11). NEMMCO suggests that the AEMC could establish some style conventions that could be used by people developing draft Rules amendments.

3. In the technical requirements of chapter 5 the Commission has taken the view that the term '*generating system*' can also be used to apply to a generating unit within a generating system. This is consistent with the rules of interpretation 1.7.1(f) which say that a reference to a thing includes any part of that thing. However, on consideration NEMMCO believes that in regard to a generating system remaining in '*continuous uninterrupted operation*' it is not clear whether a plant would be compliant if at least part of it remained in continuous uninterrupted operation. What was intended is that the generating system and each of its generating units remains in continuous uninterrupted operation. We believe it is better to make this explicit. Note that the words '*generating system*' are also needed for completeness because some generating systems have additional facilities (such as reactive plant) that are required to be in service for the generating system to comply with its performance standards. This affects a number of clauses in Schedule 5.2, particularly S5.2.5.3 to S5.2.5.7.

4. Also in Schedule 5.2, the Commission has introduced headings in the clauses of S5.2.5. NEMMCO prefers 'General Requirement' to be used instead of 'General Access Standard' or 'General Access Standard Requirement' as proposed in the Draft Rule, as these headings are confusing in the context of these clauses, because they may lead the reader to believe there are three types of access standard – 'automatic access standards', 'minimum access standards' and 'general access standards'.

5. NEMMCO requests that the AEMC consider issuing future Draft Rules as Word documents rather than PDF. People submitting proposed changes to a Draft Rule need to be able to edit parts of the document, and conversion of a PDF to Word document often results in inconsistent formatting.

Clause by Clause Comments

2.2.1 Registration as a Generator

(e) To be eligible for registration as a *Generator*, a person must:

(1) obtain the approval of *NEMMCO* to classify each of the *generating units* that form part of the *generating system* that the person owns, operates or controls, or from which it otherwise sources electricity, as either a *scheduled generating unit* or a *non-scheduled generating unit;*

(2) classify the *generating units* in accordance with *NEMMCO's* ~~*approval*~~approval as referred to in subparagraph (1); and

~~(3) satisfy NEMMCO that those generating units and the connection points for those generating units comply with the relevant technical requirements set out in Chapter 5;~~

(3~~4~~) satisfy *NEMMCO* that each *generating system* will be capable of meeting or exceeding its *performance standards.*

- Italics on "approval" needs to be removed, as this is not part of a defined term
- Clause 2.2.1(e)(3) should be deleted as some of the plant for which registration is sought may not meet the current technical requirements of chapter 5, which are for negotiating new connections. This situation can arise when the technical requirements have changed, or when an older piece of plant is being re-registered. The transitional arrangement outlined in 11.5.3 does not fully cover this situation, as the connection agreement may have been executed at a time before the automatic access standards and negotiated access standards existed. In the case of the older piece of plant being reregistered, it may not be compliant even with the standards that existed at the time it was built.

2.9.2 Registration as a Registered Participant

(a) In this clause:

receiving date means the date on which *NEMMCO* receives:

(1) an application for registration referred to in clause 2.9.1;

(2) further information or clarification referred to in clause 2.9.1(b); or

(3) in respect of registration as a *Generator*, the information requested under clause S5.2.4(b),

whichever is the later.

(b) *NEMMCO* must within 15 *business days* of the receiving date, determine that an applicant is to be registered in the category of *Registered Participant* applied for if *NEMMCO* is reasonably satisfied that:

(1) ~~an~~the applicant meets the eligibility requirements specified for the category of *Registered Participant* to which the application relates;

(2) if the application relates to registration in one of the categories of *Market Participant,* the applicant is and will be able to fulfil the applicable financial obligations under Chapter 3 of the *Rules;* and

(3) ~~an~~the applicant ~~has demonstrated a commitment to~~ will be able comply with the *Rules* .

(c) If *NEMMCO* determines that an applicant does not satisfy the requirements referred to in paragraph (b), *NEMMCO* must determine that the applicant is not qualified to be registered as a *Registered Participant* in the relevant category and provide reasons for that determination.

- We suggest adding the qualifier 'in respect of registration as a *Generator*' in paragraph (a)(3) because the information described in clause S5.2.4(b) is only relevant to a Generator.
- In clause 2.9.2(b), references to "an applicant" should be "the applicant" because the assessment needs to be made regarding the particular person who is making the application.
- We accept the Commission's decision not to include "and will continue to be able to comply" in the draft Rule clause 2.9.2(b)(3). However as participation in the market occurs immediately upon registration, NEMMCO needs to be satisfied the participant can comply with all the relevant parts of the Rules, which could include technical as well as bidding, dispatch, settlement, prudential and metering requirements. The draft Rule would only allow NEMMCO to check a Participant's commitment but not their ability to comply. Given this and the Commissions views on NEMMCO original proposal, we suggest using the current wording in the Rules.

3.13.3(k) Standing Data

(k) ~~Subject to rule 5.3.8(a),~~ A *Registered Participant* may request from *NEMMCO:*

(1) *registered bid and offer data;*

(2) information that is reasonably required by the *Registered Participant* to carry out *power system* studies (including, without limitation, *load* flow and dynamic simulations) for planning and operational purposes including:

(i) historical information relating to the operating conditions of the *power system;*

(ii) information and data provided to *NEMMCO* under paragraphs (f) and (g) and clause S5.2.4~~(g)~~, except for *restricted model information*; and

~~(iii) information and data described in the Generating System Model Guidelines, Generating System Design Data Sheet in accordance with clause S5.2.4(g)~~

(iii~~v~~) information and data described in schedules 5.5.3 and 5.5.4; and

(3) operation and maintenance procedures and practices for *transmission network* or *distribution network* operation, developed for the purposes of schedule 5.1 sufficient to enable the *Registered Participant* to carry out *power system* modelling under normal, *outage* and emergency conditions,

(l) Subject to clause 5.3.8(a), where *NEMMCO* holds information requested under paragraph (k), it must be provided to the *Registered Participant* as soon as practicable.

(m) Subject to clause 5.3.8(a), *NEMMCO* may provide information of the type described in paragraph (k) to persons other than *Registered Participants* on request, for the purpose of undertaking research or providing advice to *Registered Participants* or potential investors in the *power system.*

(n) Where special approvals or exemptions have been granted by *NEMMCO,* including approval to aggregate *generating units, market network services* or *loads* for *central dispatch,* or exemptions from *central dispatch,* details of such special arrangements must be *published* by *NEMMCO.*

(o) *NEMMCO* must determine and *publish intra-regional loss factors* in accordance with clause 3.6.2 by 1 April each year and whenever changes occur.

(p) *Network Service Providers* must advise *NEMMCO* of their *distribution loss factors,* duly authorised by the appropriate *Jurisdictional Regulator,* and *NEMMCO* must *publish* such *distribution loss factors* in accordance with clause 3.6.3(i).

(q) *NEMMCO* must *publish* on a quarterly basis details of:

(1) *interconnector* transfer capability; and

(2) the discrepancy between *interconnector* transfer capability and the capacity of the relevant *interconnector* in the absence of *outages* on the relevant *interconnector* only,

for each day of the preceding quarter for all *interconnectors.*

- Add term ‘excluding *restricted model information*’ to be consistent with principle of Generators providing detailed and less-detailed dynamic simulation models, one for use by NEMMCO and TNSPs, the other for general use. This formulation is necessary because existing information is from a range of sources including TNSPs (through (f) and (g) and Generators through S5.2.4 and Schedules 5.5.1 and 5.5.2) so drafting can’t just refer to S5.2.4(g). (see also notes under S5.2.4)
- The phrase ‘subject to clause 5.3.8(a)’ in 3.13.3(k) would be better located prefixing 3.13.3(l) and 3.13.3(m), because it is the provision of information that is limited under 5.3.8(a), rather than the requesting of it.
- In clause 3.13.3(k)(2), the word ‘load’ should not be italicised.

5.2.5 Obligations of Generators~~generators~~

(a) A *Generator* must plan and design its *facilities* and ensure that they are operated to comply with:

(1) the *performance standards* applicable to those *facilities;*

(2) subject to subparagraph (1), the *connection agreement* applicable to those *facilities* ~~with a *Network Service Provider;*~~ and

(3) subject to subparagraph (2), the *system standards.*

(b) A *Generator* must:

(1) submit an *application to connect* in respect of new *generating plant* owned, operated or controlled by the *Generator,* or to be owned, operated or controlled by the *Generator,* and enter into a *connection agreement* with a *Network Service Provider* in accordance with clause~~rule~~ 5.3 prior to that *generating plant* being *connected* to the *network* of that provider;

(2) comply with the reasonable requirements of the relevant *Network Service Provider* in respect of design requirements of *generating plant* proposed to be *connected* to the *network* of that provider in accordance with clause~~rule~~ 5.4 and S~~s~~chedule 5.2;

(3) provide *generation* forecast information to the relevant *Network Service Provider* in accordance with clause~~rule~~ 5.6;

(4) permit and participate in inspection and testing of *facilities* and equipment in accordance with clause~~rule~~ 5.7;

(5) permit and participate in commissioning of *facilities* and equipment which are to be *connected* to a *network* for the first time in accordance with clause~~rule~~ 5.8; and

(6) give notice of intended voluntary permanent *disconnection* in accordance with clause~~rule~~ 5.9.

In paragraph (a)(2) we suggest a clarification that relates the particular connection agreement to the relevant facilities, since separate agreements for separate generating systems is common.

5.3.3(c) Response to a connection enquiry

(3) a list of the technical data to be included with the *application to connect*, which may vary depending on the *connection* ~~connection~~ requirements and the type, rating and location of the *facility* to be *connected* ~~connected~~ and will generally be in the nature of the information set out in S~~s~~chedule 5.5 and, for *generating system connections*, S5.2.4, but may be varied by the *Network Service Provider* as appropriate to suit the size and complexity of the proposed *facility* to be *connected*.

This change is necessary to implement the dual model arrangements proposed in S5.2.4, because, in order for these to work, the model information must be received under S5.2.4 rather than Schedule 5.5, and the S5.2.4 information must be received at the time of submission of the connection application, so that the detailed model information can be used to analyse the connection application and the less detailed information (if any) can be provided to other connection applicants under 5.3.4(g).

5.3.4 Application for connection

(g) For the purposes of clause 5.3.2(f), where the performance or operation of *plant* ~~that is the subject of~~ for which an *application to connect* is being developed could in the reasonable opinion of the *Network Service Provider*, be materially affected by another project (that is a *generation* project), the *Network Service Provider* must provide to the *Connection Applicant* the following information about the other project sufficient to identify the extent of the impact:

(1) if an *application to connect* has been received in respect of the other project, information of the types specified in schedule 5.4 but not clauses S5.4(d) or S5.4(i), consistent with the *application to connect* of the other project; and

(2) if an *offer to connect* has been made in respect of the other project, information, other than *restricted model information*, of the types specified in clauses S5.2.4 (b)(4) and (g) and schedule~~S~~ 5.5, consistent with the *offer to connect* of the other project.

- The change in subparagraph (1) is to clarify that the information described is required in order to develop an application to connect, rather than after the application to connect is submitted. The Connection Applicant will need to undertake studies to establish the levels it will propose for its negotiated access standards, taking into account considered projects (as required under S5.2.5). It would be inefficient to provide the relevant information only after the application to connect had been submitted thereby requiring repetition of the simulation studies. Note that NEMMCO had originally proposed this clause to be included in clause 5.3.2.

- The phrase 'that is a generation project' has been included because the information listed is specific to generation, but the clause is general to all types of connection. (It is conceivable that connection of a load or market network service facility could be affected by connection of generating plant, so it is appropriate to keep the clause as general as possible.)
- The inclusion of 'S5.2.4 (b)(4) and (g), excluding *restricted model information'* in subparagraph (2) is necessary to be consistent with the proposed principle of having a detailed and less-detailed dynamic simulation model for generating plant. (see notes under S5.2.4).
- In subparagraph (2), the word 'schedule' needs to be written in full (consistent with normal usage in the Rules).

5.3.4A Negotiated access standards

(a) For the purposes of this clause 5.3.4A:

***NEMMCO* advisory matter** means any matter that relates to *NEMMCO's* functions under the *National Electricity Law* and any matter identified as a matter on which *NEMMCO* is required to advise in schedules 5.1, 5.2, 5.3 and 5.3a.

(b) A *negotiated access standard* must:

(1) be no less onerous than the corresponding *minimum access standard* specified by the *Network Service Provider* under clause 5.3.3 (b 1)(2);

(2) be set at a level that will not adversely affect *power system security;*

(3) be set at a level that will not adversely affect the quality of *supply* for other *Network Users;* and

(4) in respect of *generating plant:*

(i) be set at a level that will not adversely affect *reliability* of *supply* to the extent specified in schedule 5.2; and

(ii) in respect of *generating plant,* meet the requirements applicable to a *negotiated access standard* in clauses S5.2.5, S5.2.6, S5.2.7 and S5.2.8.

(c) A *Network Service Provider* must, following the receipt of a proposed *negotiated access standard* under clause 5.3.4(e)or paragraph (h) consult with *NEMMCO* in relation to *NEMMCO* advisory matters for that proposed standard.

(d) *NEMMCO* must, within 20 *business day*s following the submission of a proposed *negotiated access standard* under clause 5.3.4(e) or paragraph (h), respond to the *Network Service Provider* in writing in respect of any *NEMMCO* advisory matters.

(e) A *Network Service Provider* must, within 30 *business days* following the receipt of a proposed *negotiated access standard* in accordance with clause 5.3.4(e) or paragraph (h)(3), accept or reject a proposed *negotiated access*

standard.

(f) The *Network Service Provider* must reject the proposed *negotiated access standard* if that *connection,* or alteration of the *generating plant* (as the case may be), at the *negotiated access standard* proposed by the *Connection Applicant* would:

(1) on *NEMMCO's* advice:

(i) adversely affect *power system security;* or

(ii) in respect of the *connection* of *generating plant,* adversely affect *reliability* of *supply* beyond the extent specified in schedule 5.2;

(2) in the *Network Service Provider's* opinion, adversely affect quality of *supply* for other *Network Users;*

(3) in the opinion of *NEMMCO* or the *Network Service Provider,* in respect of a *NEMMCO* advisory matter or a matter allocated to the *Network Service Provider,* respectively, be lower than the corresponding *minimum access standard;* or

(4) in respect of the *connection* of *generating plant,* in *NEMMCO's* opinion, not satisfy subparagraph (~~a~~b)(4)(ii).

(g) If a *Network Service Provider* rejects a proposed *negotiated access standard,* the *Network Service Provider* must, when rejecting the proposed *negotiated access standard,* advise the *Connection Applicant* of a *negotiated access standard* that the *Network Service Provider* will accept.

(h) The *Connection Applicant* may, in relation to a proposed *negotiated access standard* advised by a *Network Service Provide*r in accordance with paragraph (g):

(1) accept the proposed *negotiated access standard;*

(2) reject the proposed *negotiated access standard;*

(3) propose an alternative proposed *negotiated access standard* to be further evaluated in accordance with the criteria in paragraph (b~~a~~); or

(4) elect to adopt the relevant *automatic access standard* or a corresponding *plant standard.*

(i) An *automatic access standard* or, if the procedures in this clause 5.3.4A have been followed, a *negotiated access standard* that forms part of the terms and conditions of a *connection agreement,* is taken to be the *performance standard* applicable to the *connected plant* for the relevant technical requirement.

This clause needs corrections to cross-references in paragraphs (f) and (h).

5.3.8 Provision and use of information

(a) The data and information to be provided under clause~~rule~~ 5.3 must:

(1) be prepared, given and used in good faith;

(2) be treated as *confidential information;* and

(3) not be disclosed or made available by the recipient to a third party except in the circumstances set out in ~~clauses 5.3.2(c), and~~ paragraphs (b),(c) and (d).

(b) The data and information to be provided under this clause~~rule~~ 5.3 may be disclosed between ~~a~~ *Network Service Provider*s and *NEMMCO* for the purpose of enabling *Network Service Providers* or *NEMMCO* to:

(1) assess the effect of the proposed *facility* or proposed alteration to *generating plant* (as the case may be) on the performance of the *power system* or another proposed *facility* or another proposed alteration;

(2) assess proposed *access standards*;

(~~2~~3) determine the extent of any required *augmentation* or *extension;* or

(~~3~~4) advise *NEMMCO* of services described in clause 3.11.3(j).

(c) Where a technical requirement in clauses S5.2.5, S5.2.6, S5.2.7 or S5.2.8 requires a *Network Service Provider* or a *Generator* (who is the *Connection Applicant)* to take into account a *considered project* when negotiating a *negotiated access standard*, the data and information to be provided under this clause~~rule~~ 5.3 on the *considered project* may be disclosed by the *Network Service Provider* to the *Connection Applicant*, except for *restricted model information*, to the extent reasonably necessary for the *Connection Applicant* to determine a proposed *negotiated access standard* for that technical requirement.

(d) *NEMMCO* may provide information received under clause 5.3 to third parties under clauses 3.13.3(l) and 3.13.3(m) only after commissioning of the relevant *plant*.

(e) Except where the disclosure is to a *Transmission Network Service Provider* or *NEMMCO*, the data and information to be provided under clause~~rule~~ 5.3 may ~~only~~ be disclosed by the recipient to a third party ~~the disclosure is not to a *Transmission Network Service Provider*,~~ only if it does not contain data and information from which the load characteristics described in ~~clause~~Schedule~~S~~ 5.5.5 could be derived as an identifiable component.

(f) A person intending to disclose information under paragraph (b) must first advise the relevant *Connection Applicant* of the extent of the disclosure.

(g) If a *Connection Applicant* or *Network Service Provider* becomes aware of any material change to any information contained in or relevant to an *application to connect* ~~then~~ it must promptly notify the other party in writing of that change.

(h) A *Registered Participant* or person who intends to become a *Registered*

Participant must, within 5 *business days* of becoming aware that any information provided to *NEMMCO* in relation to a *performance standard*, dynamic models and *control system* settings or ~~other~~ information of a kind required to be provided to *NEMMCO* under clauses 5.3.7(g)(~~1)or~~ ~~5.3.7(g)(2)~~ is incorrect, advise *NEMMCO* of the correct information.

- NEMMCO suggests deleting the reference to clause 5.3.2(c) in clause 5.3.8 (a) (3) and adding instead to clause 5.3.8(b) permission for information to be shared between Network Service Providers (that is, from one NSP to another) as well as between a Network Service Provider and NEMMCO. The link into 5.3.2(c) was intended to allow for the situation where NSPs have to share information about a connection enquiry or application, but the wording in 5.3.2(c) doesn't lend itself well to this usage. The proposed wording is clearer and keeps all the references to permitted usage of the information together in clause 5.3.8.
- The term "except for *restricted model information*" is needed for consistency with the principle of allowing a detailed and less-detailed dynamic simulation models for generating plant under S5.2.4.
- NEMMCO suggests adding to 5.3.8(b) specific allowance for providing information to a Network Service Provider or NEMMCO for the purpose of 'assessing proposed *access standards*', which is necessary for the NSP to carry out assessments consistent with 5.3.2(c) and NEMMCO in accordance with its obligations under 5.3.4A.
- It is suggested that clause 5.3.8(d) be included as this specifically allows for the provision of information under clauses 3.13.3(l) and (m), avoiding conflict with this clause, and also sets limits on when the information is to be provided under clauses 3.13.3(l) and (m). (This is a slightly modified version of NEMMCO's original submission of this sub-clause.)
- NEMMCO suggests rewording clause 5.3.8(d) (which is now 5.3.8(e) in NEMMCO's proposed drafting), to improve its clarity.
- In clause 5.3.8(h), NEMMCO suggests extending the requirement to a person 'intending to become a Registered Participant', as the person may have an executed connection agreement, but not yet have registered. The information about which NEMMCO is advised should include changes to dynamic models, control system settings and metering installations in addition to changes to performance standards and arrangements for updating models.
- In clause 5.3.8(h), the changes that NEMMCO needs to know about are broader than allowed under clause 5.3.7(g)(1) & (2).

5.3.9 Procedure to be followed by a Generator proposing to alter a Generating System

(a) This clause 5.3.9 applies where a *Generator* proposes to alter:

(1) a *connected generating system;* or

(2) a *generating system* for which *performance standards* have been previously accepted by *NEMMCO,*

in a manner that will affect the performance of the *generating system* relative to any of the technical requirements set out in clauses S5.2.5, S5.2.6, S5.2.7 and S5.2.8.

(b) A *Generator* must submit to the *Network Service Provider,* with a copy to *NEMMCO:*

(1) a description of the nature of the alteration and the timetable for implementation;

(2) in respect of the *generating system* as altered:

(i) details of the *generating unit* design data and *generating unit* setting data in accordance with schedule S5.5 or the *Generating System Model Guidelines, Generating System Design Data Sheet,* or *Generating System Setting Data Sheet;* and

(ii) the information described in clause S5.2.4(b), and may also provide information described under clause S5.2.4(g); and

(3) proposed amendments to the relevant *performance standard* being, for each relevant technical requirement for which the proposed alteration to the equipment will affect the performance of the *generating system:*

(i) the applicable *automatic access standard;* or

(ii) a proposed *negotiated access standard.*

(c) For the purposes of subparagraph (b)(3), clause 5.3.4A applies to a submission by a *Generator* under this clause 5.3.9.

(d) Without otherwise limiting subparagraph (b)(3), unless otherwise agreed by the *Network Service Provider* and *NEMMCO*, for the purposes of that clause, a proposed alteration to the equipment specified in column 1 of the table set out below is taken to affect the performance of the *generating system* relative to technical requirements specified in column 2, thereby necessitating a submission under subparagraph (b)(3):

Column 1 **(altered equipment)**	**Column 2** **(clause)**
machine windings	S5.2.5.1, S5.2.5.2, S5.2.~~9~~8

power converter	S5.2.5.1, S5.2.5.2, S5.2.5.5, S5.2.5.12, S5.2.5.13, S5.2.~~9~~8
reactive compensation plant	S5.2.5.1, S5.2.5.2, S5.2.5.5, S5.2.5.12, S5.2.5.13
excitation control system	S5.2.5.5, S5.2.5.12, S5.2.5.7, S5.2.5.13
voltage control system	S5.2.5.5, S5.2.5.12, S5.2.5.13
governor control system	S5.2.5.7, S5.2.5.11, S5.2.5.14
power control system	S5.2.5.7, S5.2.5.11, S5.2.5.14
protection system	S5.2.5.3, S5.2.5.4, S5.2.5.5, S5.2.5.7, S5.2.5.8, S5.2.5.9
auxiliary supplies	S5.2.5.1, S5.2.5.2, S5.2.~~8~~7
remote control and monitoring	S5.2.5.14, S5.2.6.1, S5.2.6.2

(e) The *Network Service Provider* may, as a condition of considering a submission made under paragraph (b), require payment of a fee to meet the reasonable costs anticipated to be incurred by it and any other *Network Service Providers* and *NEMMCO* in the assessment of the submission.

(f) The *Network Service Provider* must require payment of such a fee under paragraph (e) if so requested by *NEMMCO*.

(g) On payment of the required fee referred to paragraph (e), the *Network Service Provider* must pay such amounts as are on account of the costs anticipated to be incurred by the other *Network Service Providers* and *NEMMCO* as appropriate.

(h) If the application of this clause 5.3.9 leads to a variation to an existing *connection agreement* the *Network Service Provider* and the *Generator* must immediately jointly advise *NEMMCO*.

- NEMMCO suggests that in paragraph (d) the qualifier 'unless otherwise agreed by the *Network Service Provider* and *NEMMCO*' be inserted to the clause, to give some discretion to the NSP and NEMMCO on a case by case basis, to allow flexibility for unusual technologies.
- Since the AEMC has decided to leave the Partial Load Rejection technical requirement in schedule 5.2, the table in clause 5.3.9(d) needs to be updated to reflect this change (see proposed drafting for details).
- The Draft Rule also renumbers S5.2.8 and S5.2.9 to S5.2.7 and S5.2.8 respectively. The renumbering needs to be reflected in the table of clause 5.3.9(d).
- For consistency with the information provision proposals (see section on Information provision, above), reference to S5.2.4(g) needs to be changed to 'S5.2.4(b)' and allow the Generator to submit information under S5.2.4(g) only if desired. It is likely that an existing Generator will prefer to use its existing model (which is already in use by other Participants) if possible rather than developing an alternative model.

5.3.10 Acceptance of Performance Standards for Generating Plant that is Altered

(a) A *Generator* must not commission altered *generating plant* until the *Network Service Provider* has advised the *Generator* that

(1) ~~*NEMMCO*~~the *Network Service Provider* is satisfied in relation to the matters set out in paragraph (b); and

(2) *NEMMCO* is satisfied in relation to paragraph (b), for matters on which *NEMMCO* is required to advise in Schedule 5.2 and any matter that relates to *NEMMCO*'s functions under the *National Electricity Law*.

(b) Matters that must be considered under paragraph (a) are that~~NEMMCO must advise the Network Service Provider that is satisfied in relation to altered generating plant that~~:

(1) ~~that~~ the *Generator* has complied with clause 5.3.9; and

(2) ~~that~~ each amended *performance standard* submitted by the *Generator* either meets the *automatic access standard* applicable to the relevant technical requirement or, if the *performance standard* does not meet that standard, it would not be rejected if clauses 5.3.4A(b) and (f) were applied at the time of~~the~~ submission of the *performance standards* ~~is received by *NEMMCO*,~~ and

the *Network Service Provider* must advise the *Generator* that *NEMMCO* is satisfied in accordance with this paragraph (b).

This clause and clause 5.3.9 been altered to reflect the AEMC's view that the NSP should take the main role in negotiating performance standards changes. NEMMCO proposes some additional changes to make the clause more consistent with the AEMC's approach, and to improve clarity. In particular, it is suggested that the NSP needs to be satisfied that the Generator has complied with clause 5.3.9, and that NEMMCO needs only to be concerned with those matters allocated to it, consistent with 5.3.4A.

5.4.2 Advice of inconsistencies

(a) At any stage prior to commissioning the *facility* in respect of a *connection*, the *Registered Participant* or the person intending to become the *Registered Participant*~~be registered as a *Generator*~~ must advise in writing, any inconsistency between the proposed equipment and the:

(1) *connection agreement*, to the *Network Service Provider;*

(2) *performance standards*, to the *Network Service Provider* and *NEMMCO*,

and the parties must negotiate in good faith any necessary changes to the *connection agreement* (including *performance standards*), where

performance standard changes must be consistent with the criteria in clause 5.3.4A(b).

(b) If there is an inconsistency in a *connection agreement* including a *performance standard* identified in paragraph (a), the *Registered Participant* or the person intending to ~~be registered as a *Generator*~~become the *Registered Participant* and the *Network Service Provider* must not commission the *facility* in respect of a *connection* unless the *facility* or the *connection agreement* or *performance standard* has been varied to remove the inconsistency.

(c) Nothing in this clause 5.4.2 affects the operation of clause 5.3.6(c1).

- Clause 5.4.2(a) has been changed to reflect the Commission's views on the connection process, which differ from the process proposed by NEMMCO. One of the changes proposed by NEMMCO in its initial submission was to clarify that any negotiated change to the performance standards should be in accordance with the negotiating framework set out in this chapter, rather than just negotiated in good faith. This element of the proposal is still needed, because all changes need to be consistent with the criteria set out in 5.3.4A and the technical requirements in the relevant schedule. The clause needs to be referenced back to 5.3.4A, and NEMMCO needs to be involved if it is a matter that would affect power system security or reliability of supply. (Note that NEMMCO's original submission referenced clause 5.3.9 for the process that should be applied, because it dealt with modification of performance standards, but this clause is not broad enough, because it is particular to Generators, whereas 5.4.2 applies to all types of connections.)
- Clause 5.4.2(b) needs to refer to persons intending to become a Registered Participant rather than Generator because this is a general clause applying to all types of connections.

5.7.6 Tests of generating units requiring changes to normal operation

(a) A *Network Service Provider* may, at intervals of not less than 12 months per *generating unit*, require the testing by a *Generator* of *generating unit connected* to the *network* of that *Network Service Provider* in order to determine analytic parameters for modelling purposes or to assess the performance of the relevant *generating unit* for the purposes of a *connection agreement*, and the *Network Service Provider* is entitled to witness such tests.

(b) If *NEMMCO* reasonably considers that:

(1) the analytic parameters for modelling of a *generating unit* or *generating system* are inadequate; or

(2) available information, including results from a previous test of a generating unit or generating system are inadequate to determine parameters for an applicable model developed in accordance with the *Generating System Model Guidelines*, or otherwise

agreed with *NEMMCO* under clause S5.2.4(c~~b1~~)(2),

NEMMCO may direct a *Network Service Provider* to require a *Generator* to conduct a test under paragraph (a), and *NEMMCO* may witness such tests.

(c) Adequate notice of not less than 15 *business days* must be given by the *Network Service Provider* to the *Generator* before the proposed date of a test under clause 5.7.6(a).

(d) The *Network Service Provider* must use its best endeavours to ensure that tests permitted under this clause 5.7.6 are conducted at a time ~~which~~ that will minimise the departure from the *commitment* and *dispatch* that are due to take place at that time.

(e) If not possible beforehand, a *Generator* must conduct a test under clause 5.7.6 at the next scheduled *outage* of the relevant *generating unit* and in any event within 9 months of the request.

(f) A *Generator* must provide any reasonable assistance requested by the *Network Service Provider* in relation to the conduct of tests.

(g) Tests conducted under clause 5.7.6 must be conducted in accordance with test procedures agreed between the *Network Service Provider* and the relevant *Generator* and a *Generator* must not unreasonably withhold its agreement to test procedures proposed for this purpose by the *Network Service Provider*.

(h) A *Generator* must provide the test records obtained from a test under paragraph (a) to the *Network Service Provider*, who must derive the analytical parameters for the applicable model developed in accordance with the *Generating System Model Guidelines*, or otherwise agreed with *NEMMCO* under clause S5.2.4(c~~b1~~)(2) and provide them to *NEMMCO* and the relevant *Generator*.

(i) Each of the *Generator*, the *Network Service Provider* and *NEMMCO* must bear its own costs associated with tests conducted under this clause 5.7.6 and no compensation is to be payable for financial losses incurred as a result of these tests or associated activities.

This clause needs a couple of cross reference corrections, as shown, and a minor typographical correction.

S5.2.4 Provision of information

(a) A *Generator* or person who is negotiating a *connection agreement* with a *Network Service Provider* must promptly on request by *NEMMCO* or the *Network Service Provider* provide all data in relation to that *generating system*, specified in:

(1) schedule 5.5;

(2) the *Generating System Model Guidelines;*

(3) the *Generating System Design Data Sheet*, or

(4) the *Generating System Setting Data Sheet.*

(b) A *Generator*, or person required under the *Rules* to register as the *Generator* in respect of a *generating system* comprised of *generating units* with a combined *nameplate rating* of 30 MW or more, by the earlier of:

(1) the date on which proposed *performance standards* or amendments to *performance standards* are submitted ~~to *NEMMCO*~~ under clause 5.3.9(b)~~.~~ or an *application to connect* is made under clause 5.3.4(a);

(2) three months before commissioning of a *generating system* or planned alteration to a *generating system;* ~~or~~

(3) 5 *business days* before commissioning of ~~an unplanned alteration to~~ a *generating system* alteration that is the result of repairing *plant* after a *plant* failure, if *plant* performance after the alteration differs from that prior to the *plant* failure,

must provide:

(4) to *NEMMCO* and the relevant *Network Service Providers* (including the relevant *Transmission Network Service Provider* in respect of an *embedded generating unit)* with the following information about the *control systems* of the *generating system:*

(i) a set of functional block diagrams, including all functions between feedback signals and *generating system* output;

(ii) the parameters of each functional block, including all settings, gains, time constants, delays, deadbands and limits; and

(iii) the characteristics of non-linear elements,

sufficient for *NEMMCO* and *Network Service Providers* to perform load flow and dynamic simulation studies; and

(5) to *NEMMCO,* ~~simulation~~ model source code associated with the model in subparagraph (b)(4), in an unencrypted form suitable for at least one of the software simulation products nominated by *NEMMCO* and in a form that would allow conversion for use with other software simulation products by *NEMMCO*~~,~~

~~sufficient for *NEMMCO* and *Network Service Providers* to perform load flow and dynamic simulation studies.~~

(c) The information provided under paragraph (b) must:

(1) encompass all *control systems* that respond to voltage or frequency disturbances on the *power system,* and which are either integral to the *generating units* or otherwise part of the *generating system,* including, without limitation, those applying to *reactive power* equipment that forms part of the *generating system;*

(2) conform with the applicable models developed in accordance with the *Generating System Model Guidelines,* or an alternative model agreed with *NEMMCO* to be necessary to adequately represent the *generating plant* to carry out load flow and dynamic simulations.

(d) The *Generator* must update the information provided under paragraph (b)

within 3 months after commissioning tests or other tests undertaken in accordance with clause 5.7.3 are completed.

(e) For the purposes of clause 5.3.~~4~~2(~~g~~f), the technical information that a *Network Service Provider* must, if requested, provide to a *Connection Applicant* in respect of a proposed *connection* for a *generating system* includes:

(1) the highest expected single phase and three phase fault levels at the connection point with the generating system not connected;

(2) the clearing times of the existing *protection systems* that would clear a fault at the location at which the new *connection* would be *connected* into the existing *transmission system* or *distribution system;*

(3) the expected limits of *voltag*e fluctuation, harmonic *voltage* distortion and *voltage* unbalance at the *connection point* with the *generating system* not *connected;*

(4) technical information relevant to the *connection point* with the *generating system* not *synchronised* including equivalent source impedance information, sufficient to estimate fault levels, voltage fluctuations, harmonic voltage distortion (for harmonics relevant to the *generating system)* and voltage unbalance; and

(5) information relating to the performance of the *national grid* that is reasonably necessary for the *Connection Applicant* to prepare an application to *connect*, including:

(i) a model of the *power system* excluding *restricted model information* and including relevant *considered projects* and the range of expected operating conditions, sufficient to carry out load flow and dynamic simulations; and

(ii) information on *inter-regional* and *intra-regional power transfer capabilities* and relevant *plant* ratings.

(f) All information provided under this clause S5.2.4 must be treated as *confidential information.*

(g) ~~Any person required to provide information under paragraphs (a) and (b)(4) must also provide that information in a non confidential form for the purposes of clause 3.13.3(k) and 5.3.4(g)(2)~~Information provided under paragraphs (a) and (b)(4) may be classified as *restricted model information* if:

(1) equivalent information is provided that:

(i) is not *restricted model information;* and

(ii) meets the requirements set out in the *Generating System Model Guidelines*, and

(2) model source code is provided in accordance with paragraph (h).

(h) If an equivalent model is provided under paragraph (g) the corresponding model source code, consistent with subparagraph (b)(5), must also be provided to *NEMMCO*.

(i) Compiled information (object code) or encrypted information derived from model source code for a model that is not *restricted model information*, is not *restricted model information*.

- Rather than having the less detailed model as non-confidential, it should be retained as confidential, but the Rules should distinguish between the two models by means of a defined term 'restricted model information'. Having both models confidential is consistent with other clauses in the Rules such as clauses S5.2.4(f) and 5.3.8(a)(2), which state that the information is *confidential information*. It is also consistent with the status of existing modelling information received under clause 3.13.3(f) or (g) or S5.2.4(b). Labelling some modelling information as non-confidential would effectively make it publishable or available in an unrestricted form to anyone, whereas leaving it confidential allows for it to be given to the parties only for the purposes allowed under the Rules.
- The less detailed model must also be fit for purpose, which means it must meet the requirements in the model guidelines for such models. (There could be different requirements for model detail, but performance requirements will be similar for both detailed and less-detailed model versions.)
- If a less detailed model is not provided, then the detailed model should be made available for use by other parties than NEMMCO and the NSPs, as allowed under the Rules. In many cases (particularly for traditional generation technologies) the manufacturer is unlikely to want to provide a second model, and would consider this an unnecessary cost.
- Simulation model source code will also be necessary for the less detailed model, but this need not be made available to anyone but NEMMCO and the TNSPs.
- The proposed clause in paragraph (i) is added to clarify that even though source code is restricted model information, the object code derived by compiling it is not restricted model information because the compilation process protects the intellectual property. This is to preserve the current practice of distributing object code to Participants under clause 3.13.3(k), which is an efficient way of enabling Participants to perform simulations The alternative is that participants would have to write there own source code for each of the models from the block diagrams and then compile them in order to run the simulations. This would be extremely costly and impractical.
- Dynamic models need to be provided by the Connection Applicant at the time of submission of the connection application, so that analysis can be done by the NSP and NEMMCO of the proposed access standards. The same information needs to be made available to other Connection Applicants once an offer to connect has been made. Under existing Rules the models are provided as part of Schedule 5.5 for synchronous generating systems. Clause S5.2.4(b) is primarily used to obtain models for asynchronous plant such as wind farms, in conjunction with clause 2.2.3(d). However, in order for the proposed arrangements for two

levels of model (under clauses S52.4(b) and S5.24(g)) to work, the Connection Applicant will need to provide models under clause S5.2.4(g) and/or (b) at time of submission of their connection application – see proposed drafting in clause S5.2.4(b)(1).

- NEMMCO suggests amending paragraph (b)(3), to clarify its intent. The intent of the clause was to allow a shorter notification period if the alteration was the result of repairs following a plant failure. The suggested wording also clarifies that this information is only required if the alteration results in a change in plant performance.
- In paragraph (e), the cross reference should be to clause 5.3.2(f) because this information is needed to develop an application to connect. The information is required more generally than that specified in clause 5.3.4(g), which only relates to impacts from proposed new generation.

S5.2.5 Technical requirements

S5.2.5.1 Reactive power capability

Automatic access standard

(a) The *automatic access standard* is each *generating system,* operating at:

(1) any level of *active power* output; and

(2) any *voltage* at the *connection point* within the limits established under clause S5.1a.4 without a *contingency event,*

must be capable of supplying and capable of absorbing, continuously at its *connection point* an amount of *reactive power* of at least the amount the ~~rated~~*rated active power* of the ~~*generating unit* or~~ *generating system* and 0.395.

Minimum access standard

(b) The *minimum access standard* is no capability is required to supply or absorb *reactive power* at the *connection point.*

Negotiated access standard

(c) When negotiating a *negotiated access standard* the *Generator* and the *Network Service Provider:*

(1) must, subject to any agreement under paragraph (d)(4), ensure that the *reactive power capability* of the *generating system* is sufficient to ensure that all relevant *system standards* are met before and after *credible contingency events* under normal and planned *outage* operating conditions of the *power system,* taking into account at least existing and *considered projects;*

(2) may negotiate either a range of *reactive power* absorption and supply, or a range of *power factor,* at the *connection point,* within which the *plant* must be operated; and;

(3) may negotiate a limit that describes how the *reactive power capability* varies as a function of *active power output* due to a

design characteristic of the *plant.*

(d) If the *generating system* is not capable of the level of performance established under paragraph (c)(1) the *Generator*, depending on what is reasonable in the circumstances, must:

(1) pay compensation to the *Network Service Provider* for the provision of the deficit of *reactive power (supply* and absorption) from within the *network;*

(2) install additional equipment *connecting* at the *generating system's connection point* or another location, to provide the deficit of *reactive power (supply* and absorption), which equipment is deemed to be part of the *generating system;*

(3) reach a commercial arrangement with a *Registered Participant* to provide the deficit of *reactive power (supply* and absorption); or

(4) if the inability to meet the performance level only occurs for particular operating conditions, agree to and document as part of the proposed *negotiated access standard*, operational arrangements by which the *plant* can achieve an agreed level of performance for those operating conditions.

(e) The *Generator* may select more than one option referred to in paragraph (d).

General ~~access standard~~requirements

(f) An *access standard* must record~~,~~ the agreed value for *rated* ~~rated~~ *active power* and where relevant the method of determining the value.

~~(g) The value for rated *active power* under paragraph (f) for a *generating system* must take into account the system's in-service *generating units* and additional *reactive power* equipment that is part of the *generating system.*~~

(~~h~~g) An *access standard* for consumption of energy by a *generating system* when not supplying or absorbing *reactive power* under an *ancillary services agreement* ~~are~~is to be established under clause~~rule~~ S5.3.5 as if the *Generator* were a *Market Customer.*

In clause S5.2.5.1(a):

- reference to '*generating unit*' is confusing and should be removed, since the clause now only deals with generating systems.
- 'rated' needs to be italicised here as it is part of the defined term '*rated active power*'.

In paragraph (f), delete the comma and italicise 'rated' in '*rated active power*'.

Paragraph (g) can be deleted as it is not required, because the defined term '*rated active power*' deals with the requirement to take 'in-service *generating units*' into account.

S5.2.5.3 Generating unit response to frequency disturbances

(a) For the purposes of this clause S5.2.5.3:

'normal operating frequency band'; 'operational frequency tolerance band'; or **'extreme frequency excursion tolerance limits'** is a reference to the widest range specified for that term for any condition (including an "island" condition) in the *frequency operating standards* that apply to the *region* in which the *generating unit* is located.

'stabilisation time' and **'recovery time'** mean the longest times allowable for *system frequency* to remain outside the *operational frequency tolerance band* and the *normal operating frequency band,* respectively, for any condition (including and "island" condition) in the *frequency operating standards* that apply to the region in which the *generating unit* is located.

'transient frequency limit' and **'transient frequency time'** mean the values of 47.5 Hz and 9 seconds, respectively, or such other values determined by the *Reliability Panel.*

Automatic access standard

(b) The *automatic access standard* is each *generating system* and each of its ~~including all operating~~ *generating units* must be capable of *continuous uninterrupted operation* for any *power system* disturbance during which *frequency* varies within ~~*frequencies* in~~ the following ranges:

(1) the lower bound of the *extreme frequency excursion tolerance limits* to the lower bound of the *operational frequency tolerance band* for at least the stabilisation time;

(2) the lower bound of the *operational frequency tolerance band* to the lower bound of the *normal operating frequency band,* for at least the recovery time including any time spent in the range under subparagraph (1);

(3) the *normal operating frequency band* for an indefinite period;

(4) the upper bound of the *normal operating frequency band* to the upper bound of the *operational frequency tolerance band,* for at least the recovery time including any time spent in the range under subparagraph (5); and

(5) the upper bound of the *operational frequency tolerance band* to the upper bound of the *extreme frequency excursion tolerance limits* for at least the stabilisation time,

~~provided that~~unless the rate of change of *frequency* is ~~between~~ outside the range -4 Hz to~~and~~ 4 Hz per second for more than 0.25 seconds.

[**Note:** The ~~automatic access standard~~*automatic access standard* is illustrated in the following diagram. To the extent of any inconsistency between the diagram and paragraph (b), paragraph (b) prevails.]

Minimum access standard

(c) The *minimum access standard* is each *generating system* ~~including all~~and each of its ~~operating~~ *generating units* must be capable of *continuous uninterrupted operation*~~,~~ for any *power system* disturbance during which

frequency varies within ~~*frequencies* in~~ the following ranges, unless the rate of change of *frequency* is ~~between~~ outside the range -1 Hz to~~and~~ 1 Hz per second for more than one second:

(1) the lower bound of the *extreme frequency excursion tolerance limits* to the transient frequency limit for at least the transient frequency time;

(2) the transient frequency limit to the lower bound of the *operational frequency tolerance band* for at least the stabilisation time;

(3) the lower bound of the *operational frequency tolerance band* to the lower bound of the *normal operating frequency band* for at least the recovery time including any time spent in the ranges under subparagraphs (1) and (2);

(4) the *normal operating frequency band* for an indefinite period;

(5) the upper bound of the *normal operating frequency band* to the upper bound of the *operational frequency tolerance band* for at least the recovery time, including any time spent in the ranges under subparagraph (e6), unless the *generating system* has a *protection system* to trip a *generating unit* if the *frequency* exceeds a level agreed with *NEMMCO*; and

~~(d)~~(6) ~~The minimum access standard~~ the upper bound of the *operational frequency tolerance band* to the upper bound of the *extreme frequency excursion tolerance limits* (including islanded conditions) for at least the transient frequency time, in respect of a *generating system* ~~including all operating generating units that~~:

(i) ~~is part of a *generating system* comprised of *generating units* with a combined *nameplate rating*~~ of 30 MW or more; ~~or~~and

(ii) that does not have a *protection system* to trip ~~the~~ a *generating unit* if the *frequency* exceeds a level agreed with *NEMMCO*.

[Note: The ~~minimum access standard~~*minimum access standard* is illustrated in the following diagram. To the extent of any inconsistency between the diagram and paragraph (~~d~~c), paragraph (~~d~~c) prevails.]

Negotiated access standard

(de) A *negotiated access standard* can be accepted by the *Network Service Provider* provided that *NEMMCO* and the *Network Service Provider* agree that:

(1) the *negotiated access standard* is as close as practicable to the *automatic access standard* while respecting the need to protect the *plant* from damage, and taking into account *frequency* disturbances (including under 'island' conditions) that could be reasonably expected to occur in the *region* in which the *generating system* is located;

(2) the *frequency* would be unlikely to fall below the lower bound

of the *operational frequency tolerance band* as a result of over-frequency tripping of *generating units;* and

(3) there would be no material adverse impact on quality of *supply* to other *Network Users* or on *inter-regional* or *intra-regional power transfer capability.*

(~~f~~e) *NEMMCO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.3.

- In clauses S5.2.5.3 (b) and (c), the wording "provided that the rate of change of *frequency* is between -4 Hz and 4 Hz per second for more than 0.25 seconds" does not achieve the intended purpose, which was to allow an exception to the requirement if the rate of change of frequency is outside of the indicated range for more than the indicated time. Alternative wording is proposed that will capture the intended meaning and includes the AEMC's elaboration of the range of frequency rates of change.
- In clauses S5.2.5.3(b) and (c), NEMMCO proposes to change the lead in words from "including all operating *generating units*" to "and each of its *generating units*" to be completely clear that the requirement applies to each unit severally and not just the generating system. The term "operating" is not needed because the standard needs to be set for all units, regardless of whether operating or not, and the term *continuous uninterrupted operation* includes the concept of only considering units operating at the time of the disturbance. The access standards also need to refer to a disturbance during which frequency varies.
- The Tasmanian frequency operating standard allows for over-frequency generation shedding for islanded conditions when the frequency is in the range 50-53 Hz. NEMMCO proposes modifying the minimum access standard in line with this, to allow additional flexibility in this range for generating systems to trip in accordance with the over-frequency generation reduction provisions in S5.2.5.8.
- In S5.2.5.3(c) & (d), having "The *minimum access standard* is …" in two separate clauses might be interpreted as either one or the other constitutes the whole requirement. The intention was that both would apply. NEMMCO proposes that these be recombined in one clause, as per original drafting.
- In the paragraph formerly (d) now (c)(6) the clauses should be joined by an 'and' not an 'or'. The intention was to only require this part of the minimum access standard for large generating systems that didn't have an over-frequency generation tripping arrangement with NEMMCO.
- In paragraphs (b)(2) and (c)(6), the missing word "least" needs to be inserted.
- In clause S5.2.5.3(e), the diagram needs amending for 9 seconds to match change to wording amended by the AEMC in (c). The diagram also needs "(lower limit)" to be removed and the definition of "H" reinstated to refer to the new term rather than 47.5 Hz.

- In clause S5.2.5.3(e), we suggest additional words to emphasise the need for rate of change of frequency to be consistent with expected rates of change of frequency in the particular region in which the plant is to be connected. The operating conditions in Tasmania are quite different from those on the mainland.
- Clause S5.2.5.3(f) appears to be unnecessary as the negotiated access standard can't be lower than the minimum access standard. (Also paragraph (c) and (d) are not alternatives, but both part of the minimum access standard.)
- It is not clear whether the italicised terms for the bands in the frequency standard should be used here, as the definitions are slightly different from the glossary terms, and the AEMC drafting seems to be using non-italicised terms for local definitions.

S5.2.5.4 Generating system response to voltage disturbances

Automatic access standard

(a) The *automatic access standard* is each *generating system* ~~including all of its operating~~ and each of its *generating units* must be capable of *continuous uninterrupted operation* for any *power system* disturbance during which the ~~occurrence~~ voltage at the *connection point* varies within the ranges of:

(1) over-voltages for the durations permitted under clause S5.1a.4;

(2) 90% to 110% of *normal voltage* continuously;

(3) 80% to 90% of *normal voltage* for a period of at least 10 seconds; and

(4) 70% to 80% of *normal voltage* for a period of at least 2 seconds.

Minimum access standard

(b) The *minimum access standard* is each *generating system* including all operating *generating units* must be capable of *continuous uninterrupted operation* for any *power system* disturbance during which voltage~~s~~ at the *connection point* varies within the range of 90% to 110% of *normal voltage*, provided that the ratio of voltage to *frequency* (as measured at the *connection point* and expressed as percentage of *normal voltage* and a percentage of 50 Hz) does not exceed:

(1) 115% for more than two minutes; or

(2) 110% for more than 10 minutes.

Negotiated access standard

(c) In negotiating a *negotiated access standard*, each *generating system* and ~~including all of its operating~~each of its *generating units* must be capable of *continuous uninterrupted operation* for the ranges of voltages specified in the *automatic access standard* except where *NEMMCO* and the *Network Service Provider* agree that:

(1) the *negotiated access standard* is as close as practicable to the *automatic access standard* while respecting the need to protect the *plant* from damage;

(2) the *generating plant* that would be tripped, as a result of any voltage excursion within levels specified by the *automatic access standard* is not more than 100 MW or a greater limit based on what *NEMMCO* and the *Network Service Provider* both consider to be reasonable in the circumstances; and

(3) there would be no material adverse impact on the quality of *supply* to other *Network Users* or on *inter-regional* or *intra-regional power transfer capability.*

(d) In carrying out assessments of proposed *negotiated access standards* under this clause S5.2.5.4, *NEMMCO* and the *Network Service Provider* must take into account, without limitation:

(1) the expected performance of existing *networks* and *network* developments that are *considered projects;*

(2) the expected performance of existing *generating plant* and *generation* projects that are *considered projects*, and

(3) any corresponding *performance standard* (or where no *performance standard* has been registered, the *access standard*) that allows *generating plant* to trip for voltage excursions in ranges specified under the *automatic access standards.*

(e) *NEMMCO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.4.

General ~~access standard~~requirements

(f) The *access standard* must include any operational arrangements necessary to ensure the *generating system* ~~including all of its operating~~ and each of its *generating units* will meet its agreed performance levels under abnormal ~~network~~*network* or *generating system* conditions.

- In S5.2.5.4(b) and (c), we propose change to lead in words from "including all operating *generating units*" to "and each of its *generating units*" to be completely clear that the requirement applies to each unit severally and not just the generating system. The term "operating" is not needed because the standard needs to be set for all units, regardless of whether operating or not, and the term *continuous uninterrupted operation* includes the concept of operating units. The access standards also need to refer to a disturbance during which voltage varies.
- In paragraph (f), the word 'network' needs to be italicised, as the defined term is appropriate in this context.

S5.2.5.5 Generating system response to disturbances following contingency events

(a) In this clause S5.2.5.5.~~:~~

~~(1)~~ a fault includes without limitation:

(i) a fault~~*short circuit fault*~~ of the relevant type having a metallic conducting path; and

(ii) a fault of the relevant type resulting from reclosure onto a fault by the operation of *automatic reclose equipment*~~; and~~.

~~(2) **'fault type'** means one or more of the following:~~

~~(i) a three-phase fault;~~

~~(ii) a two phase to ground fault;~~

~~(iii) a phase to phase fault; and~~

~~(iv) a phase to ground fault.~~

Automatic access standard

(b) The *automatic access standard* is:

(1) E~~e~~ach *generating system* and each of its *generating units* must remain in *continuous uninterrupted operation* for any *power system* disturbance caused by an event that is:

(i) a *credible contingency event* ~~credible contingency event~~ other than a fault;

(ii) a three phase fault in a *transmission system* cleared by all relevant primary *protection systems;*

(iii) a two phase to ground, phase to phase or phase to ground fault in a *transmission system* cleared in:

(A) the longest time expected to be taken for a relevant *breaker fail protection system* to clear the fault; or

(B) if a *protection system* referred to in subparagraph (A) is not installed, the greater of the time specified in column 4 of Table S5.1a.2 (or if none is specified, 430 milliseconds) and the longest time expected to be taken for all relevant primary *protection systems* to clear the fault; ~~and~~or

(iv) a three phase, two phase to ground, phase to phase or phase to ground fault in a *distribution network* cleared in:

(A) the longest time expected to be taken for the *breaker fail protection system* to clear the fault; or

(B) if a *protection system* referred to in subparagraph (A) is not installed, the greater of 430 milliseconds and the longest time expected to be taken for all relevant primary *protection systems* to clear the fault,

provided that the event is not one that would disconnect the *generating system* or *generating unit* from the *power system* by removing *network elements* from service.~~; and~~

(2) Ssubject to any changed *power system* conditions or ~~*energy*~~energy source availability beyond the *Generator's* reasonable control, each *generating system* and each of its *generating units*, in respect of the ~~fault~~ types of fault described in subparagraphs (1)(ii) to (iv), must deliver to the *network:*

(i) to assist the maintenance of *power system* voltages during the application of the fault, capacitive reactive current of at least the greater of its pre-disturbance reactive current and 4% of the maximum continuous current of the *generating system* including all operating *generating units* (in the absence of a disturbance) for each 1% reduction (from its pre-fault level) of *connection point* voltage during the fault; ~~and~~

(ii) after *disconnection* of the faulted element, *reactive power* sufficient to ensure that the *connection point* voltage is within the range for *continuous uninterrupted operation* under clause S5.2.5.4; and

(iii) from 100 milliseconds after *disconnection* of the faulted element, *active power* of at least 95% of the level existing just prior to the fault.

Minimum access standard

(c) The *minimum access standard* is:

(1) Eeach *generating system* and each of its *generating units* must remain in *continuous uninterrupted operation* for ~~the~~any *power system* disturbance caused by an event that is:

(i) a *credible contingency event* ~~credible contingency event~~ other than a fault;

(ii) a single phase to ground, phase to phase or two phase to ground fault in a *transmission system* cleared in the longest time expected to be taken for all relevant primary *protection systems* to clear the fault unless *NEMMCO* and the *Network Service Provider* agree that:

(A) the total reduction of *generation* in the *power system* due to that fault would not exceed 100 MW;

(B) there is unlikely to be an adverse impact on quality of *supply*~~supply~~ to other *Network Users*; and

(C) there is unlikely to be a material adverse impact on *inter-regional* or *intra-regional power transfer capability*~~,~~; or

(iii) a single phase to ground, phase to phase or two phase to ground fault in a *distribution network*, cleared in the longest time expected to be taken for all relevant primary *protection systems* to clear the fault, unless *NEMMCO* and the *Network Service Provid*er agree that:

(A) the total reduction of *generation* in the *power system* due to that fault would not exceed 100 MW;

(B) there is unlikely to be an adverse impact on quality of *supply* to other *Network Users;* and

(C) there is unlikely to be a material adverse impact on *inter-regional* or *intra-regional power transfer capability*,

provided that the event is not one that would disconnect the *generating unit* or *generating system* from the *power system* by removing *network elements* from service.~~; and~~

(2) S~~s~~ubject to any changed *power system* conditions or ~~*energy*~~energy source availability beyond the *Generator's* reasonable control after ~~*disconnection*~~disconnection of the faulted *element*, each *generating system* must, in respect of the ~~fault~~ types of fault described in subparagraphs (1)(ii) and (iii), deliver to the *network*, *active power* and leading or lagging *reactive power* sufficient to ensure that the *connection point* voltage is within the range for *continuous uninterrupted operation* agreed under clause S5.2.5.4.

Negotiated access standard

(d) In carrying out assessments of proposed *negotiated access standards* under this clause S5.2.5.5, the *Network Service Provider* and *NEMMCO* must take into account, without limitation:

(1) the expected performance of:

(i) existing *networks* and *network* developments that are *considered projects;*

(ii) existing *generating plant* and *generation* projects that are *considered projects;* and

(iii) *control systems* and *protection systems*, including auxiliary systems and *automatic reclose equipment;* and

(2) the expected range of *power system* operating conditions.

(e) A proposed *negotiated access standard* may be accepted if the *connection* of the *plant* at the proposed access level would not cause other generating *plant* or loads to trip as a result of an event, when they would otherwise not have tripped for the same event.

(f) *NEMMCO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.5.

General ~~access standard~~ requirements

(g) The *access standard* must include any operational arrangements to ensure the *generating system* including all operating *generating units* will meet its agreed performance levels under abnormal *network* or *generating system* conditions.

(h) The *access standard* must fully document all fault locations and types of fault and conditions for which the *generating system* will not be capable of remaining in *continuous uninterrupted operation*.

NEMMCO suggests:

- removing definition of 'fault type' in paragraph (a)(2) because the faults covered in each case are described fully in the relevant clause. There is a glossary definition of fault type, which is similar to, but not the same as, usage here. To avoid confusion we suggest changing 'fault types' to 'types of fault' throughout this clause. Also, use of the defined term "short circuit fault" excludes faults within equipment, which not intentional, so the key requirement of a metallic conducting path needs to be stated explicitly to include this worst case condition.
- in S5.2.5.5(b) and (c), changing the lead in words from 'including all operating *generating units*' to 'and each of its *generating units*' to be completely clear that the requirement applies to each unit severally and not just the generating system. The term 'operating' is not needed because the standard needs to be set for all units, regardless of whether operating or not, and the term *continuous uninterrupted operation* includes the concept of operating units.
- adding of ' or generating system' to paragraphs (b) and (c) for consistency with the change described above.
- linking subparagraphs in paragraphs (b)(1) and (c)(1) with "or" rather than "and" so that the event only needs to satisfy one of the specified conditions, not all, as intended.
- italicising 'supply' in a couple of locations.
- making other minor changes to punctuation.

NEMMCO notes that the AEMC has inserted the conditions for which a small generating system may avoid a requirement remaining in continuous uninterrupted operation for a transmission fault. In its proposed drafting NEMMCO had previously allowed this concession only for a distribution fault. While we understand that the AEMC has inserted this additional clause for reasons of consistency between distribution and transmission faults, we have some concerns about whether this will result in greater efficiency for the NEM in the longer term. In the case of a distribution system fault, transmission connected generation is rarely affected, so plant that is unable to withstand a distribution fault would typically be distribution-connected. By the nature of distribution systems the scope for more than 100 MW of plant to be connected in any one area is limited, so there is low potential for the concession on distribution fault-ride-through to affect adversely significant amounts of other plant in the future. The case is different for a transmission-connected generating system that cannot ride through a transmission fault. In this case there is much higher potential for other generation to be connected electrically close to the plant for which a concession has been allowed. The impact will generally be to increase the connection cost of connections subsequent to the one for which the concession was allowed. (NEMMCO can

give an example of such a case, where a concession was allowed under the pre-November 2003 Code, and a subsequent connection applicant was faced with higher connection costs as a result.). This introduces another type of inter-generational inequity into the Rules. NEMMCO suggests that the AEMC consider whether allowing concessions on transmission fault ride-through really constitutes an overall benefit to the NEM.

In order to manage cases where a generating system cannot ride through distribution or transmission faults the connection application needs to document the particular fault locations and types of faults (and other conditions, such as prior outage conditions) under which this is permitted to occur. It would be quite unreasonable, for example for a plant in South Australia to be allowed to trip for a fault in Queensland.

NEMMCO proposes to modify paragraph (b)(1)(i) and (c)(1)(i) to exclude faults, as these are covered in, and limited by, the subsequent sub-clauses. This is required regardless of the decision on concessions on ride-through of transmission faults, because there is an inconsistency between Schedule 5.1 and clause 4.2.3(b) on whether a three phase fault in a transmission system is to be included as a credible contingency event. In this clause it was intended to include a three phase fault in the automatic access standard and exclude it in the minimum access standard.

In paragraph (c)(2), NEMMCO suggests adding the words 'leading or lagging' to clarify that the plant may need to either generate or absorb reactive power in order to ensure that it can remain in continuous uninterrupted operation following clearance of a fault.

S5.2.5.6 Quality of electricity generated and continuous uninterrupted operation

Minimum access standard

~~Each generating *plant* must be capable of *continuous uninterrupted operation* at distortion levels up to the maximum~~. The *minimum access standard* is a *generating system*, including each of its *generating units* and its reactive *plant*, must not disconnect from the *power system* as a result of the voltage fluctuation, harmonic voltage distortion ~~and~~or voltage unbalance conditions at the *connection point* varying within the levels outlined in S5.1a.5, S5.1a.6 and S5.1a.7 ~~S5.1a5, S5.1a6, and S5.1a7~~ of the *system standards.*

- The use of the term "continuous uninterrupted operation" does not apply in this case because the conditions might arise gradually and not because of a disturbance. The need for reactive plant to remain connected also needs to be recognised, and the connection point needs to be referenced as the point of reference.
- Clause references need to be corrected. (S5.1 a5 should be S5.1a.5 etc).
- NEMMCO also notes this clause, suggested by the AEMC, is not in the standard automatic/minimum access standard form, and there is no basis for negotiation. We suggest that the requirement at least be expressed as a

minimum access standard. Alternatively it could be the automatic access standard and a lower standard set as the minimum for situations where the quality of supply is much better than the system standards.

S5.2.5.7 Partial load rejection

(a) For the purposes of this clause S5.2.5.7, **'minimum load'** means ~~the *generating unit* output level measured in sent out megawatts (MW)~~minimum *sent out generation* for continuous stable operation.

Automatic access standard

(b) The *automatic access standard* is each *generating ~~unit~~ system* and each of its *generating units* must be capable of *continuous uninterrupted operation* during and following a ~~*loading level* reduction directly imposed from the *power system*~~*power system* load reduction ~~in less than 10 seconds from a fully or partially loaded condition provided that the *loading level* reduction is less than 30 percent of the *generating unit's nameplate rating* and the~~ of 30% from its predisturbance level or equivalent impact from separation of part of the *power system*, provided that the *generating unit's loading level* remains above minimum load.

Minimum access standard

(c) The *minimum access standard* is each *generating system* and each of its *generating units* must be capable of *continuous uninterrupted operation* during and following a ~~*loading level* reduction directly imposed from the *power system* in less than 10 seconds from a fully or partially loaded condition provided that the *load* reduction is less than~~*power system* load reduction of 5% ~~percent~~ or equivalent impact from separation of part of the *power system*, ~~of the *generating unit's nameplate rating* and the~~ provided that the *generating unit's loading level* remains above minimum load.

Negotiated access standard

(d) If, in accordance with clause 5.3.4A ~~of the *Rules*~~, the *Generator* and the *Network Service Provider* determine a *negotiated access standard* is to apply, the *Network Service Provider* must consult *NEMMCO* to ensure that the *negotiated access standard* does not materially adversely affect *power system security*.

(e) The *negotiated access standard* must be set at a level that would not prevent *continuous uninterrupted operation* for any *credible contingency event*, nor allow the *plant* to trip for loss of any *interconnector*, taking into account existing *network* and *considered projects*.

General ~~access standard~~requirements

(f) The actual partial load rejection performance must be recorded in the ~~*connection agreement*~~*access standards*.

(g) *NEMMCO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.7.

- This clause has been reinstated by the AEMC in its original form, which doesn't work well for asynchronous plant, as they don't respond to loading level reductions imposed from the power system. We suggest alternative wording to make it more applicable to all types of plant.
- In paragraph (e) (now (f) following NEMMCO's proposed drafting changes) '*access standard*' should be substituted for '*connection agreement*' to emphasise that actual capability of the plant should form part of the performance standards (not something lower).
- A new definition for 'minimum load' has been suggested as the definition of minimum load is not correct as it currently exists in the Rules.
- NEMMCO has proposed a basis for negotiation for this clause in paragraph (e).
- Consistent with the current Rules, NEMMCO should advise on this matter as if many generating systems trip on loss of a load or an interconnector trip this could lead to a major under-frequency event.

S5.2.5.8 Protection of generating units from power system disturbances

Minimum access standard

(a) The *minimum access standard* is:

(1) subject to subparagraph~~s~~ (2) and paragraph (~~3~~e), for each *generating system* that is required by a *Generator* or *Network Service Provider* to be automatically *disconnected* from the *power system* in response to abnormal conditions arising from the *power system*, the relevant *protection system* or *control system* must not *disconnect* the *generating system* or any of its *generating units* for:

(i) conditions for which it must remain in *continuous uninterrupted operation;* or

(ii) conditions it must withstand under the *Rules;* and

(2) each *generating system* with a *nameplate rating* of 30 MW or more, or *generating system* comprised of *generating units* with combined *nameplate rating* of 30 MW or more, ~~connected~~ *connected* to a *transmission system* must have facilities to automatically and rapidly reduce its *generation:*

(i) by at least half if the *frequency* at the *connection point* exceeds a level nominated by *NEMMCO* (not less ~~that~~ than the upper limit of the *operational frequency tolerance band)* and the duration above this *frequency* exceeds a value nominated by *NEMMCO* where the reduction may be achieved:

(A) by reducing the output of the *generating unit* within three seconds, and holding the output at the reduced level until the *frequency* returns to within the *normal operating frequency band;* or

(B) by disconnecting the *generating unit* from the *power*

system within one second; or

(ii) in proportion to the difference between the *frequency* at the *connection point* and a level nominated by *NEMMCO* (not less than the upper limit of the *operational frequency tolerance band),* such that the *generation* is reduced by at least half, within three seconds of the *frequency* reaching the upper limit of the *extreme frequency excursion tolerance limits.*

Negotiated access standard

(b) *NEMMCO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.8.

General ~~access standard~~requirements

(c) *NEMMCO* or the *Network Service Provider* may require that an *access standard* include a requirement for the *generating system* to automatically *disconnect* whenever the part of the *network* to which it is *connected* has been disconnected from the *national grid,* forming an island that *supplies* a *Customer*.

(d) The *access standard* must include specification of conditions for which the *generating unit* or *generating system* must trip and must not trip.

(e) Notwithstanding clauses S5.2.5.3~~, S5.2.5.4, S5.2.5.5 and S5.2.5.6~~ to S5.2.5.7, a *generating system* may be automatically *disconnected* from the *power system* under any of the following conditions:

(1) in accordance with an *ancillary services agreement* between the *Generator* and *NEMMCO;*

(2) where a load that is not part of the *generating system* has the same *connection point* as the *generating system* and *NEMMCO* and the *Network Service Provider* agree that the *disconnection* would in effect be under-frequency ~~load shedding~~ *load shedding*;

(3) where the *generating system* is automatically *disconnected* under paragraph (a)(2)(i)(B) or clause S5.2.5.9;

(4) where the *generating system* is automatically *disconnected* under clause S5.2.5.10 due to a failure of the *generating plant;* or

(5) in accordance with an agreement between the *Generator* and a *Network Service Provider* (including an agreement in relation to an emergency control scheme under clause S5.1.8) to provide a service that *NEMMCO* agrees is necessary to maintain or restore *power system* security in the event of a specified *contingency event.*

(f) The *Network Service Provider* is not liable for any loss or damage incurred by the *Generator* or any other person as a consequence of a fault on either the *power system,* or within the *Generator*'s facility.

- There is no sub-paragraph (a)(3) – the cross reference in paragraph (a)(1) should be to paragraph (e).

- Since S5.2.5.7 has been reinstated, it needs to be cross referenced in paragraph (e).
- The term 'abnormal conditions' should not be italicised in this clause, as the defined term is not appropriate for use in this clause. Abnormal conditions in this clause are related to conditions outside those for which the plant is required to remain in continuous uninterrupted operation in S5.2.5.3 to 7, and power system conditions under which it would need to trip under S5.2.5.9.

S5.2.5.9 Protection systems that impact on power system security

Automatic access standard

(a) The *automatic access standard* is:

(1) subject to clauses S5.1.9(k) and S5.1.9(l), primary *protection systems* must be provided to disconnect from the *power system* any faulted element in the *generating system* and in protection zones that include the *connection point* within the applicable *fault clearance time* determined under clause S5.1.9(a)(1);

(2) each primary~~*primary*~~ *protection system* must have sufficient redundancy to ensure that a faulted element within its protection zone is disconnected from the *power system* within the applicable *fault clearance* ~~time~~ *time* with any single protection element (including any communications facility upon which that *protection system* depends) out of service; and

(3) *breaker fail protection systems* must be provided to clear faults that are not cleared by the circuit breakers controlled by the primary *protection system* within the applicable *fault clearance time* determined under clause S5.1.9(a)(1).

(b) In relation to an *automatic access standard* under this clause S5.2.5.9, the *Generator* must provide redundancy in the primary *protection systems* under paragraph (a)(2) and provide *breaker fail protection systems* under paragraph (a)(3) if *NEMMCO* or the *Network Service Provider* consider that a lack of these ~~facilities~~*facilities* could result in:

(1) a material adverse impact on *power system security* or quality of *supply* to other *Network Users;* or

(2) a reduction in *inter-regional* or *intra-regional power transfer capability,*

through any mechanism including:

(1) consequential tripping of, or damage to, other *network* equipment or *facilities* of other *Network Users*, that would have a *power system security* impact; or

(2) instability that would not be detected by other *protection systems* in the *network.*

Minimum access standard

(c) The *minimum access standard* is:

(1) subject to clauses S5.1.9(k) and S5.1.9(l), *protection systems* must be provided to disconnect from the *power system* any faulted element within the *generating system* and in protection zones that include the *connection point* within the applicable *fault clearance time* determined under clause S5.1.9(a)(2); and

(2) if a *fault clearance time* determined under clause S5.1.9(a)(2) for a protection zone is less than 10 seconds, a *breaker fail protection system* must be provided to clear from the *power system* any fault within that protection zone that is not cleared by the circuit breakers controlled by the primary *protection system* within the applicable *fault clearance time* determined under clause S5.1.9(a)(3).

Negotiated access standard

(d) *NEMMCO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.9.

General ~~access standard~~requirements

(e) The *Network Service Provider* and the *Generator* must cooperate in the design and implementation of *protection systems* to comply with this clause S5.2.5.9, including cooperation on:

(1) the use of *current transformer* and *voltage transformer* secondary circuits (or equivalent) of one party by the *protection system* of the other;

(2) tripping of one party's circuit breakers by a *protection system* of the other party; and

(3) co-ordination of *protection system* settings to ensure inter-operation.

(f) The *protection system* design referred to in paragraph (c) must:

(1) be coordinated with other *protection systems* already existing in the *power system* or to be provided as part of a *considered project;*

(2) avoid consequential ~~disconnection~~*disconnection* of other *Network Users' facilities;* and

(3) take into account existing obligations of the *Network Service Provider* under *connection agreements* with other *Network Users.*

- In paragraph (a)(2) 'primary protection system' is not a defined term – remove italics on 'primary'.; '*fault clearance time*' is a defined term – italicise 'time'
- In *paragraph* (f) "disconnection" should be italicised.

S5.2.5.11 Frequency control

(a) For the purpose of this clause S5.2.5.11:

'maximum operating level' means in relation to:

(1) a *non-scheduled generating unit*, the maximum *sent out generation* consistent with its *nameplate rating;*

(2) a *scheduled generating unit*, the maximum *sent out generation* (but not emergency *generation)* consistent with its registered bid and offer data;

(3) a *non-scheduled generating system*, the combined maximum *sent out generation* consistent with the *nameplate ratings* of its in-service *generating units;* and

(4) a *scheduled generating system*, the maximum combined *sent out generation* (but not emergency *generation)* of its in-service *generating units*, consistent with its *registered bid and offer data.*

'minimum operating level' means in relation to:

(1) a *non-scheduled generating unit*, its minimum *sent out generation* for continuous stable operation;

(2) a *scheduled generating unit*, its minimum *sent out generation* for continuous stable operation consistent with its *registered bid and offer data;*

(3) a *non-scheduled generating system*, the combined *minimum operating level* of its in-service *generating units;* and

(4) a *scheduled generating system*, the minimum combined *sent out generation* of its in-service *generating units*, consistent with its *registered bid and offer data.*

'system frequency' means the *frequency* of the *transmission system* or *distribution system* to which the *generating unit* or *generating system* is *connected;*

'pre-disturbance level' means in relation to a *generating unit* and a *frequency* disturbance, the *generating unit's* level of output just before the *system frequency* first exceeds the upper or lower limit of the *normal operating frequency band* during the *frequency* disturbance.

Automatic access standard

(b) The *automatic access standard* is:

(1) each *generating system's active power* transfer to the *power system* must not:

(i) increase in response to a rise in *system frequency;* or

(ii) decrease in response to a fall in *system frequency;*

(2) each *generating system* must be capable of automatically reducing its *active power* transfer to the *power system:*

(i) whenever the *system frequency* exceeds the upper limit of the *normal operating frequency band;*

(ii) by an amount that equals or exceeds the least of:

(A) 20% of its maximum operating level times the *frequency* difference between *system frequency* and the upper limit of the *normal operating frequency* band;

(B) 10% of its maximum operating level; and

(C) ~~subject to the *system frequency* recovering gradually,~~ the difference between the *generating unit's* pre-disturbance level and minimum operating level, but zero if the difference is negative; and

(iii) sufficiently rapidly for the *Generato*r to be in a position to offer measurable amounts of lower services to the *spot market* for *market ancillary services;* and

(3) each *generating system* must be capable of automatically increasing its *active power* transfer to the *power system:*

(i) whenever the *system frequency* falls below the lower limit of the *normal operating frequency band;*

(ii) by the amount that equals or exceeds the least of:

(A) 20% of its maximum operating level times the percentage *frequency* difference between the lower limit of the *normal operating frequency band* and *system frequency;*

(B) 5% of its maximum operating level; and

(C) ~~subject to the *frequency* recovering gradually,~~ one third of the difference between the *generating unit's* maximum operating level and pre-disturbance level, but zero if the difference is negative; and

(iii) sufficiently rapidly for the *Generator* to be in a position to offer measurable amounts of raise services to the *spot market* for *market ancillary services.*

Minimum access standard

(c) The *minimum access standard* is for each *generating system, active power* transfer to the *power system* must not:

(1) increase in response to a rise in *system frequency;* and

(2) decrease more than 2% per Hz in response to a fall in *system frequency.*

Negotiated access standard

(d) A *Generator* proposing a *negotiated access standard* in respect of paragraph (c)(2) must demonstrate to *NEMMCO* that the proposed increase and decrease in *active power* transfer to the *power system* are as close as practicable to the *automatic access standard* for that *plant.*

(e) The *negotiated access standard* must record the agreed values for maximum operating level and minimum operating level, and where relevant the method of determining the values ~~and the~~ such that those values for a *generating system* must take into account its in-service *generating units.*

(f) *NEMMCO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.11.

General ~~access standard~~ requirements

(g) Each *control system* ~~control system~~ used to satisfy this clause S5.2.5.11 must be *adequately damped.*

(h) The amount of a relevant *market ancillary service* for which the *plant* may be registered must not exceed the amount that would be consistent with the *performance standard* registered in respect of this requirement.

A submission to the consultation on NEMMCO's initial Rule change proposal questioned the meaning of the words "subject to the frequency recovering gradually". NEMMCO agrees that these words are unclear and considers them to be in the wrong location in the clause. NEMMCO understands that these words were intended to acknowledge that the response may not achieve its full effect before the frequency recovers because of the speed of response of the (governor or equivalent) control system. As the condition is within the automatic access standard, and is not an issue for plant with a rapid response capability, NEMMCO considers that these words are not required and should be deleted.

S5.2.5.12 Impact on network capability Automatic access standard

(a) The *automatic access standard* is each *generating system* must have *plant* ~~plant~~ capabilities and *control systems*, sufficient not to reduce any *inter-regional* or *intra-regional power transfer capability* below the level that would apply if the *generating system* were *disconnected*.

Minimum access standard

(b) The *minimum access standard* is the *generating system* must have *plant* ~~plant~~ capabilities and *control systems* and operational arrangements sufficient to ensure there is no reduction in:

(1) the ability to *supply Customer* load as a result of a reduction in *power transfer capability;*

(2) *power transfer capabilities* into a *region* by more than the combined *sent out generation* of its *generating units ;* and

(3) *power transfer capabilities* into another *region* by more than the lesser of 15% ~~per cent~~ of the combined *nameplate rating* of its *generating units* and 30 MW, unless *NEMMCO* considers that the *connection* of that *generating system* is likely to result in a

net improvement in *supply reliability* across all *regions*,

Negotiated access standard

(c) In carrying out assessments of proposed *negotiated access standards* under this clause S5.2.5.~~11~~12, the *Network Service Provider* and *NEMMCO* must take into account, without limitation:

(1) the expected performance of:

(i) existing *networks* and *network* developments that are *considered projects;*

(ii) existing *generating plant* and *generation* projects that are *considered projects;*

(iii) *control systems* and *protection systems*, including *automatic reclose equipment;* and

(2) the expected range of *power system* operating conditions.

(d) The *negotiated access standard* must include:

(1) reasonable provision of *control systems* to minimise any reduction in *power transfer capabilities*; and

(2) operational arrangements, including curtailment of ~~generation~~ the *generating system's* output if necessary, to the satisfaction of *NEMMCO*, to ensure that the *generating plant* is operated in a way that meets at least the *minimum access standard* under abnormal *network* and *generating system* conditions, so that *power system security* can be maintained.

(e) ~~A~~The *negotiated access standard* ~~under this clause S5.2.5.11~~ must detail the *plant* capabilities, *control systems* and operational arrangements that will be maintained by the *Generator*, notwithstanding that change to the *power system*, but not changes to the *generating system*, may reduce the efficacy of the *plant* capabilities, *control systems* and operational arrangements over time.

(f) *NEMMCO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.~~11~~12.

General ~~access standard~~requirements

(g) If a *Network Service Provider* considers that *power transfer capabilities* of its *network* would be increased beyond the level that would apply if the *generating system* were not *connected*, through provision of additional ~~control system facilities~~*control system facilities* to a *generating system* (such as a power system stabiliser), the *Network Service Provider* and the *Generator* may negotiate for the provision of such additional *control system* facilities as a commercial arrangement.

- References to S5.2.5.11 need to be corrected to S5.2.5.12, and some italicising required in paragraph (g). In paragraph (d)(2), 'curtailment of generation' should be changed to 'curtailment of the *generating system*'s output' to clarify that we are not talking about curtailment of other generation, only that of the particular generating system.
- NEMMCO accepts the removal of the 5% cap, and notes that the Commission believes that the NSP should recover the costs of ensuring that the network is able to maintain its transfer capability from the Generator. However, there does not seem to be anything in the drafting of this clause that would allow an NSP to recover costs of restoring power transfer capability. Removal of the proposed concept of minimising reduction in transfer capability, without a corresponding incentive on the Generator to minimise impact on transfer capability will, over time, lead to reduction of transfer capability of the network. In some cases there may even be some potential financial gain to the Generator from restricting power transfer capability. NEMMCO considers that there needs to be at least a minimal provision to prevent erosion of transfer capabilities and the consequential reduction in reliability of supply. NEMMCO has therefore proposed some alternative wording that limits the scope of expenditure to control systems, and only for the purpose of minimising a reduction in power transfer capability caused by the connection of the generating system to the power system.
- The provision of control systems that increase power transfer capability should only be at the cost to the NSP if the power transfer would be increased beyond the requirement of the automatic standard (ie beyond the levels that would exist if the generating system were not connected.)

S5.2.5.13 ~~Control systems and stability~~Voltage and reactive power control

(a) For the purpose of this clause S5.2.5.~~12~~13:

'settling time' means in relation to a step response test or simulation of a *control system,* the time measured from initiation of a step change in an input quantity to the time when the magnitude of error between the output quantity and its final settling value remains less than 10% of:

(1) if the sustained change in the quantity is less than half of the maximum change in that output quantity, the maximum change induced in that output quantity; and

(2) otherwise, the sustained change induced in that output quantity.

'rise time' means in relation to a step response test or simulation of a *control system,* the time taken for an output quantity to rise from 10% to 90% of the maximum change induced in that quantity by a step change of an input quantity.

'static excitation system' means, in relation to a *synchronous generating unit,* an *excitation control system* that does not use rotating machinery to produce the field current.

Automatic access standard

(b) The *automatic access standard* is:

(1) each *generating system* must have *plant* capabilities and *control systems* sufficient to ensure that:

(i) *power system* oscillations, for the frequencies of oscillation of the *generating unit* against any other *generating unit*, are *adequately damped;*

(ii) operation of the *generating system* does not degrade the damping of any critical mode of oscillation of the *power system;* and

(iii) operation of the *generating system* does not cause instability (including hunting of *tap-changing transformer control systems)* that would adversely impact other *Registered Participants.*

(2) each *control system* must have:

(i) for the purposes of disturbance monitoring and testing, permanently installed and operational, monitoring and recording facilities for key variables including each input and output; and

(ii) facilities for testing the *control system* sufficient to establish its dynamic operational characteristics.

(3) each *synchronous generating system* must have an *excitation control system* that:

(i) regulates voltage at the *connection point* or another agreed location in the *power system* (including within the *generating system)* to within 0.5% of the setpoint;

(ii) is able to operate the stator continuously at 105% of *nominal voltage* with *rated active power* output;

(iii) regulates voltage in a manner that helps to support *network* voltages during faults and does not prevent the *Network Service Provider* from achieving the requirements of clause S5.1a.3 and S5.1a.4;

(iv) allows the voltage setpoint to be continuously controllable in the range of at least 95% to 105% of *normal voltage* at the *connection point* or the agreed location, without reliance on a *tap-changing transformer;*

(v) has limiting devices to ensure that a voltage disturbance does not cause the *generating unit* to trip at the limits of its operating capability;

(vi) has an excitation ceiling *voltage* of at least:

(A) 2.3 times for a static excitation system, or

(B) 1.5 times for other *excitation control systems*,

the excitation required to achieve *generation* at *nameplate rating* for rated power factor, rated speed and *nominal*

voltage;

(vii) has *settling times* for a step change of voltage setpoint or voltage at the location agreed under subparagraph (i) of:

(A) generated voltage less than 2.5 seconds for a 5% voltage disturbance with the *generating unit* not *synchronised;*

(B) *active power, reactive power* and voltage less than 5.0 seconds for a 5% voltage disturbance with the *generating unit synchronised,* from an operating point where the voltage disturbance would not cause any limiting device to operate; and

(C) in respect of each limiting device, *active power, reactive power* and voltage less than 7.5 seconds for a 5% voltage disturbance with the *generating unit synchronised,* when operating into a limiting device from an operating point where a voltage disturbance of 2.5% would just cause the limiting device to operate;

(viii) is able to increase field voltage from rated field voltage to the excitation ceiling voltage in less than:

(A) 0.05 second for a static excitation system, or

(B) 0.5 second for other *excitation control systems*;

(ix) has a *power system* stabiliser with sufficient flexibility to enable damping performance to be maximised, with characteristics as described in paragraph (c); and

(x) has reactive current compensation settable for boost or droop; and

(4) each *generating system,* other than one comprised of *synchronous generating units,* must have a voltage *control system* that:

(i) regulates voltage at the *connection point* or an agreed location in the *power system* (including within the *generating system)* to within 0.5% of its setpoint;

(ii) regulates voltage in a manner that helps to support *network* voltages during faults and does not prevent the *Network Service Provider* from achieving the requirements of clauses S5.1 a.3 and S5.1 a.4;

(iii) allows the voltage setpoint to be continuously controllable in the range of at least 95% to 105% of *normal voltage* at the *connection point* or agreed location in the *power system,* without reliance on a *tap changing transformer;*

(iv) has limiting devices to ensure that a voltage disturbance does not cause the *generating unit* to trip at the limits of its operating capability;

(v) with the *generating system* connected to the *power system,* has

settling times for *active power*, *reactive power* and voltage due to a step change of voltage setpoint or voltage at the location agreed under clause subparagraph (i), of less than:

(A) 5.0 seconds for a 5% voltage disturbance with the *generating system connected* to the *power system*, from an operating point where the voltage disturbance would not cause any limiting device to operate; and

(B) 7.5 seconds for a 5% voltage disturbance with the *generating system connected* to the *power system*, when operating into any limiting device from an operating point where a voltage disturbance of 2.5% would just cause the limiting device to operate;

(vi) has *reactive power* rise time, for a 5% step change in the voltage set point, of less than 2 seconds;

(vii) has a *power system* stabiliser with sufficient flexibility to enable damping performance to be maximised, with characteristics as described in paragraph (c); and

(viii) has reactive current compensation.

(c) A *power system* stabiliser provided under paragraph (b) must have:

(1) for a *synchronous generating unit*, measurements of rotor speed and *active power* output of the *generating unit* as inputs, and otherwise measurements of *power system frequency* and *active power* output of the *generating unit* as inputs;

(2) two washout filters for each input, with ability to bypass one of them if necessary;

(3) sufficient (and not less than two) lead-lag transfer function blocks (or equivalent number of complex poles and zeros) with adjustable gain and time-constants, to compensate fully for the phase lags due to the *generating plant;*

(4) an output limiter, which for a *synchronous generating unit* is continually adjustable over the range of -10% to +10% of stator voltage;

(5) monitoring and recording facilities for key variables including inputs, output and the inputs to the lead-lag transfer function blocks; and

(6) facilities to permit testing of the *power system* stabiliser in isolation from the *power system* by injection of test signals, sufficient to establish the transfer function of the *power system* stabiliser.

Minimum access standard

(d) The *minimum access standard* is:

(1) each *generating system* must have *plant* capabilities and *control systems*, including if appropriate, a *power system* stabiliser, sufficient to ensure that:

(i) *power system* oscillations, for the frequencies of oscillation of the *generating unit* against any other *generating unit*, are *adequately damped;*

(ii) operation of the *generating unit* does not degrade:

(A) any mode of oscillation that is within 0.3 nepers per second of being unstable, by more than 0.01 nepers per second; and

(B) any other mode of oscillation to within 0.29 nepers per second of being unstable; and

(iii) operation of the *generating unit* does not cause instability (including hunting of *tap-changing transformer control systems)* that would adversely impact other *Registered Participants;*

(2) each *generating system* comprised of *generating units* with combined *nameplate rating* of 30 MW or more must have *facilities* for testing its *control systems* sufficient to establish their dynamic operational characteristics.

(3) each *generating unit* or *generating system* must have facilities:

(i) where the *connection point nominal voltage* is 100 kV or more, to regulate voltage in a manner that does not prevent the *Network Service Provider* from achieving the requirements of clauses S5.1a.3 and S5.1a.4;

(ii) where the *connection point nominal voltage* is less than 100 kV, to regulate voltage or *reactive power* or power factor in a manner that does not prevent the *Network Service Provider* from achieving the requirements of clauses S5.1a.3 and S5.1a.4,

and sufficient to achieve the performance agreed in respect of clauses S5.2.5.1, S5.2.5.2, S5.2.5.3, S5.2.5.4, S5.2.5.5, S5.2.5.6 and S5.2.5.12;

(4) each *synchronous generating unit*, that is part of a *generating system* comprised of *generating units* with a combined *nameplate rating* of 30 MW or more, must have an <u>*excitation control system*</u> ~~excitation control system~~ that:

(i) regulates voltage ~~at the *connection point* or an agreed location in the *power system* (including within the *generating system)*, to within 0.5% of its setpoint or, where the *connection point nominal voltage* is less than 100 kV~~, <u>power factor or *reactive power* as agreed with the *Network Service Provider* and *NEMMCO;*</u>

(ii) has excitation ceiling voltage of at least 1.5 times the excitation required to achieve *generation* at the *nameplate rating* for rated power factor, rated speed and *nominal voltage ;*

(iii) subject to coordination under paragraph (i), has a *settling time* of less than 5.0 seconds for a 5% voltage disturbance with the *generating unit* synchronised, from an operating point where such a voltage disturbance would not cause any limiting device to operate; and

(iv) has over and under excitation limiting devices sufficient to ensure that a voltage disturbance does not cause the *generating unit* to trip at the limits of its operating capability; and

(5) each *generating system* comprised of *generating units* with combined *nameplate rating* of 30 MW or more and which are not *synchronous generating units* ~~synchronous generating units~~, must have a *control system* that:

(i) regulates voltage ~~at the *connection point* or an agreed location in the *power system* (including within the *generating system)* to within 0.5% of its setpoint or, where the *connection point nominal voltage* is less than 100 kV~~, power factor or *reactive power* as agreed with the *Network Service Provider* and *NEMMCO;*

(ii) subject to coordination under subparagraph (i), has a settling time less than 7.5 seconds for a 5% voltage disturbance with the *generating unit* electrically connected to the *power system* from an operating point where such a voltage disturbance would not cause any limiting device to operate; and

(iii) has limiting devices to ensure that a voltage disturbance would not cause the *generating unit* to trip at the limits of its operating capability.

Negotiated access standard

(e) If a *generating system* cannot meet the *automatic access standard,* the *Generator* must demonstrate why that standard could not be reasonably achieved and propose~~d~~ a *negotiated access standard.*

(f) The *negotiated access standard* proposed by the *Generator* under paragraph (e) must be the highest level that the *generating system* can reasonably achieve, including by installation of additional dynamic *reactive power* equipment, and through optimising its *control systems.*

(g) *NEMMCO* must advise on matters relating to *negotiated access standards* under this clause S5.2.5.13.

General ~~access standard~~requirements

(h) A limiting device provided under paragraphs (b) and (c) must:

(1) not detract from the performance of any *power system* stabiliser; and

(2) be coordinated with all *protection systems.*

(i) The *Network Service Provider* may require that the design and operation of the *control systems* of a *generating unit* or *generating system* be

coordinated with the existing voltage *control systems* ~~control systems~~ of the *Network Service Provider* and of other *Network Users*, in order to avoid or manage interactions that would adversely impact on the *Network Service Provider* and other *Network Users.*

(j) Any requirements imposed by the *Network Service Provider* under paragraph (i), must be recorded in the *access standard.*

(k) The assessment of impact of the *generating units* on *power system* stability and damping of *power system* oscillations shall be in accordance with the *power system* stability guidelines established under clause 4.3.4(h).

- NEMMCO suggests that the heading for this clause be changed to "Voltage and Reactive Power Control" for consistency with clauses S5.2.5.11 and S5.2.5.14.
- References to S5.2.5.12 need to be changed to S5.2.5.13.
- NEMMCO proposes changing excitation ceiling voltage references and rise time to ceiling voltage in accordance with VENCorp's submission to the first AEMC consultation on this Rule change proposal. (Note that AEMC's Draft Determination agreed to these changes but did not propose wording.) For NEMMCO's proposed implementation, a new locally defined term 'static excitation system' is also required.
- NEMMCO proposes changing the minimum access standard for voltage regulation in both synchronous and asynchronous sections of this clause to remove reference to 0.5% regulation, in response to TransGrid's submission to the first AEMC consultation on this Rule change proposal. NEMMCO understands that TransGrid agrees with this change. (Note that AEMC's Draft Determination proposes that NEMMCO and TransGrid to work together to address this issue.)

S5.2.5.14 Active power control

(a) The *automatic access standard* is a *generating system* comprised of *generating units* with a combined *nameplate rating* of 30 MW or more, must have an *active power control system* capable of:

(1) for each *scheduled generating unit* or, if subject to aggregation approved by *NEMMCO* under ~~rule~~clause 3.8.3, the *scheduled generating system:*

(i) maintaining and changing its ~~*active power*~~ active power output in accordance with its *dispatch instructions;* and

(ii) ramping its ~~*active power*~~ active power output linearly from one dispatch level to another, and

(2) subject to the *energy* source availability, for each *non-scheduled generating unit* or *non-scheduled generating system:*

(i) automatically reducing or increasing its ~~*active power*~~

active power output within five minutes, at a constant rate, to below the level specified in an instruction electronically issued by a *control centre*, subject to subparagraph (iii),

(ii) automatically limiting its ~~*active power*~~ active power output, to below the level specified in subparagraph (i); and

(iii) not changing its active power output within five minutes by more than the raise and lower amounts specified in an instruction electronically issued by a *control centre.*

Minimum access standard

(b) The *minimum access standard* is a *generating system* comprised of *generating unit*s with combined *nameplate rating* of 30 MW or more, must have an ~~*active power*~~ active power *control system* capable of:

(1) for each *scheduled generating unit* or, if subject to aggregation approved by *NEMMCO* under clause 3.8.3, the *scheduled generating system*, maintaining and changing its ~~*active power*~~ active power output in accordance with its *dispatch instructions;*

(2) for each *non-scheduled generating system:*

(i) reducing its ~~*active power*~~ active power output, within five minutes, to or below the level required to manage *network* flows that is specified in a verbal instruction issued by the *control centre;*

(ii) limiting its ~~*active power*~~ active power output to or below the level specified in subparagraph (i);

(iii) subject to energy source availability, ensuring that the change of ~~*active power*~~ active power output in a five minute period does not exceed a value specified in a verbal instruction issued by the *control centre;* and

(iv) being upgraded to receive electronic instructions from the *control centre* and ~~respond~~ fully implement them within five minutes.

Negotiated access standard

(c) A *negotiated access standard* may provide that if the number or frequency of verbal instructions becomes difficult for a control centre to manage, *NEMMCO* may require the *Generator* to upgrade its facilities to receive electronic instructions and ~~act~~ fully implement them within five minutes ~~of those instructions~~.

(d) The *negotiated access standard* must document to *NEMMCO's* satisfaction any operational arrangements necessary to manage *network* flows that may include a requirement for the *generating system* to be operated in a manner that prevents its output changing within five minutes by more than an amount specified by a *control centre.*

(e) *NEMMCO* must advise on matters relating to *negotiated access standards*

under this clause S5.2.5.14.

General ~~access standard~~ requirements

(f) Each *control system* used to satisfy the requirements of paragraphs (a) and (b) must be *adequately damped.*

NEMMCO suggests a change to the words ‘act within 5 minutes’ and ‘respond within 5 minutes’ to ‘fully implement them within 5 minutes’ to emphasise that the action must be progressed to completion over the 5 minute interval, consistent with dispatch requirements.

Active power should not be italicised in this clause. For scheduled generating units (with a few exceptions), it is gross generation (ie at machine terminals) that is controlled in accordance with dispatch instructions. See clause 3.8.6(c). Non-scheduled units and "semi-scheduled" units should be dispatched on a consistent basis. The glossary term "active power" is defined to be the power flow at the connection point (not machine terminals), so the glossary definition is not appropriate.

S5.2.6.1 Remote Monitoring

Automatic access standard

(a) The *automatic access standard* is each:

(1) *scheduled generating unit;*

(2) *non-scheduled generating unit* with a *nameplate rating* of 30 MW or more; or

(3) *non-scheduled generating system* with a combined ~~nameplate rateing~~ *nameplate rating* of 30 MW or more,

must have remote monitoring equipment to transmit to *NEMMCO's control centres* in realtime in accordance with clause ~~rule~~ 4.11, the quantities that *NEMMCO* reasonably requires to discharge its ~~market~~ *market* and *power system security* functions set out in Chapters 3 and 4.

(b) The quantities referred to under paragraph (a) that *NEMMCO* may request include:

(1) in respect of each *scheduled generating unit* or *non-scheduled generating unit* with a *nameplate rating* of 30 MW or more:

(i) current, *voltage*, *active power* and *reactive power* in respect of *generating unit* stators or power conversion systems (as applicable);

(ii) the status of all switching devices that carry the *generation*, tap-changing *transformer* tap position; and

(iii) aggregate *active power* if subject to aggregation approved by *NEMMCO* under ~~rule~~ clause 3.8.3;

(2) in respect of each *non-scheduled generating system* that includes a *generating unit* with a *nameplate rating* of less than 30 MW:

(i) its connected status, *tap-changing transformer* tap position and voltages;

(ii) *active power* and *reactive power* aggregated for groups of identical *generating units;* and

(iii) either the numbers of identical *generating units* operating or the operating status of each non-identical *generating unit;*

(3) in respect of each auxiliary supply system with capacity of 30 MW or more associated with a *generating unit* or *generating system, active powe*r and *reactive power;*

(4) in respect of *reactive power* equipment that is part of a *generating system* but not part of a particular *generating unit,* its *reactive power,*

(5) in respect of each wind farm:

(i) wind speed;

(ii) wind direction; and

(iii) ambient temperature; and

(6) any other quantity that *NEMMCO* reasonably requires to discharge its *market* ~~market~~ and *power system security* functions as set out in Chapters 3 and 4.

Minimum access standard

(c) The *minimum access standard* is each:

(1) *scheduled generating unit* or,

(2) *scheduled generating system,* if subject to aggregation approved by *NEMMCO* under clause 3.8.3; or

(3) *non-scheduled generating system* with a combined *nameplate rating* of 30 MW or more,

must have remote monitoring equipment to transmit to *NEMMCO's control centres* in realtime:

(1) the *active power* output of the *generating unit, scheduled generating system* or *non-scheduled generating system* (as applicable);

(2) if *connected* to a *transmission system,* the *reactive power* output of the *generating unit, scheduled generating system* or *non-scheduled generating system* (as applicable); and

(3) if a wind farm:

(i) number of units operating;

(ii) wind speed; and

(iii) wind direction,

in accordance with clause ~~rule~~ 4.11.

Negotiated access standard

(d) *NEMMCO* may advise on matters relating to *negotiated access standards* under this clause S5.2.6.1.

minor typographical corrections as shown

S5.5.4 – S5.5.7 Technical Details to Support Application for Connection and Connection Agreement

S5.5.4 Schedules 5.5.3 to 5.5.5 cover the following data areas:

(a) schedule 5.5.3 - Network Plant Technical Data. This comprises fixed electrical parameters.

(b) schedule 5.5.4 - Plant and Apparatus Setting Data. This comprises settings which can be varied by agreement or by direction of the *Network Service Provider* or *NEMMCO.*

(c) schedule 5.5.5 - Load Characteristics. This comprises the estimated design parameters of loads.

The documents and schedules applicable to each class of *Registered Participant* are as follows:

(a) *Generators:* the *Generating System Model Guidelines, Generating System Design Data Sheet* and *Generating System Setting Data Sheet;*

(b) *Customers* and *Network Service Providers:* schedules 5.5.3 and 5.5.4; and

(c) *Customers:* schedule 5.5.5.

S5.5.5 A ~~Generator~~ *Generator* that *connects* a *generating system*, that is not a ~~synchronous generating unit~~*synchronous generating unit*, must be given exemption from complying with those parts of the *Generating System Model Guidelines Generating System Design Data Sheet* and *Generating System Setting Data Sheet* that are determined by the ~~Network Service Provider~~*Network Service Provider* to be not relevant to such ~~generating systems~~*generating systems*, but must comply with those parts of schedules 5.5.3, 5.5.4, and 5.5.5 that are relevant to such ~~generating systems~~*generating systems*, as determined by the ~~Network Service Provider~~*Network Service Provider*.

S5.5.6 A *Generator* that connects a ~~*synchronous*~~ *generating unit* equal to or smaller than 30 MW or a number of ~~*synchronous*~~ *generating units* totalling less than 30 MW to a *connection point* to a *distribution network* will usually be required to submit less registered system planning data and less registered data than is indicated in the *Generating System Model Guidelines Generating System Design Data Sheet* and *Generating System Setting Data Sheet.* In general these data will be limited to confirmation of the preliminary system planning data, marked (S), but other data must be supplied if required by the *Network Service Provider* or *NEMMCO.*

Codes:

S = Standard Planning Data

D = Detailed Planning Data

R = Registered Data (R1 pre-*connection*, R2 post-*connection)*

There is some italicising needed in clauses S5.5.5, and in S5.5.6. NEMMCO suggests removing the term 'synchronous' where used, to make this clause more general.

8.6.2(m) (Confidentiality exceptions)

(m) <u>deleted</u>

This clause can be deleted if NEMMCO's proposed changes on information provision are adopted.

Chapter 10 Glossary

considered project

(a) In respect of a *generating system*, a project that meets the following criteria:

(1) an *offer to connect* has been made and the *Network Service Provider* considers in its reasonable opinion that if the *offer to connect* were accepted that the project might materially affect ~~the~~ <u>another</u> *Connection Applicant's* proposed *generating system;* or

(2) a *connection agreement* has been entered into.

(b) In respect of a *transmission network augmentation*, a project that meets the following criteria:

(1) the *Network Service Provider* has acquired the necessary land and easements;

(2) the *Network Service Provider* has obtained all necessary planning and development approvals;

(3) as applicable:

(i) the *augmentation* project has passed the *regulatory test;* or

(ii) in respect of a *new small transmission network asset*, an intention to proceed with the project has been published in the *Network Service Provider's Annual Planning Report;* or

(iii) in respect of a *funded augmentation* the arrangements have been made for its funding; and

(4) construction has either commenced or the *Network Service Provider* has set a firm date for it to commence.

(c) In respect of a *distribution network augmentation*, a project that meets the following criteria:

(1) the *Network Service Provider* has acquired the necessary land and easements;

(2) the *Network Service Provider* has obtained all necessary planning and development approvals; and

(3) construction has either commenced or the *Network Service Provider* has set a firm date for it to commence.

In paragraph (a)(1) the word 'the' should be changed to 'another' because it is a material impact on another Connection Applicant's project that is of importance.

continuous uninterrupted operation

In respect of a *generating system* ~~including all operating~~or *generating unit*~~s~~ operating ~~during~~ immediately prior to a *power system* disturbance, not ~~*disconnecting*~~ disconnecting from the *power system* except under its *performance standards* established under clauses S5.2.5.8 and S5.2.5.9 and, after clearance of any ~~associated~~ electrical fault that caused the disturbance, only substantially ~~delivering~~ varying its *active power* and *reactive power* ~~in accordance with~~as required by its *performance standards* established under clauses S5.2.5.11, S5.2.5.13 and S5.2.5.14, with all essential auxiliary and reactive *plant* remaining in service, and responding so as to not exacerbate or prolong the disturbance or cause a subsequent disturbance for other *connected plant*.

- NEMMCO notes that the AER submission has made a number of comments concerning the enforcement of the provisions that use this term. NEMMCO has addressed these concerns.
- NEMMCO considers it important that the term recognise that active and reactive power levels are usually required or at least permitted to vary during a disturbance, and plant that legitimately trips off because the initial electrical fault was in its own protection zones should not be technically in breach.

- Consistent with usage in clauses S5.2.5.3 to S5.2.5.6, this term needs to apply to either generating systems or generating units according to the circumstances.
- The qualification "operating during a power system disturbance" would be better expressed as "operating immediately prior to a power system disturbance" as continued operation is the matter being assessed.
- The word "disconnecting" should not be italicised because the defined term has a narrower meaning that would not be appropriate for generating units sharing a connection point.
- The exclusion "except under its *performance standards* established under clause S5.2.5.8 and S5.2.5.9" is needed so that if the plant trips under

conditions permitted under these performance standards the Generator should not be in breach.

- The words "associated fault" should be clarified by reference to the fault that caused the disturbance.
- Permitted variations of active and reactive power should be referenced specifically to clauses S5.2.5.11, S5.2.5.13 and S5.2.5.14 because these may require or allow variation to support the power system. This also avoids circular reference of a performance standard referring to itself.

restricted model information

Simulation model information described as *restricted model information* in clause S5.2.4(g) and model source code provided under clauses S5.2.4(b)(5) and S5.2.4(h).

This new definition is required to allow for a prospective Generator to submit two models for generating plant, one of which can be kept as restricted model information. (see notes under S5.2.4.)

11.5 Rules consequent on making the National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connection) Rule 2006

11.5.1 Definitions

Subject to this ~~rule~~ clause 11.5, in this ~~rule~~ clause 11.5:

Amending Rule means the National Electricity Amendment (Technical Standards for Wind Generation and other Generator Connection) Rule 2006.

commencement date means the date on which the Amending Rule commences operation.

new Chapter 5 means Chapter 5 of the *Rules* immediately in force after the commencement date.

old Chapter 5 means Chapter 5 of the *Rules* immediately in force prior to the commencement date.

11.5.2 Provision of information under S5.2.4 in registration in application

(a) ~~The Amending Rule that requires~~ For a person who is applying to be a *Registered Participant* in the category of *Generator* ~~Registered Participant to submit information in relation to clause S5.2.4 for the purposes of clause 2.9.2 does not apply to any person who has, in accordance with clause 2.9.1~~ who has:

(1) submitted an application to be registered as a *Registered Participant* under clause 2.9.1*;*

(2) commenced a process for submitting further information in relation to the application referred to in ~~subparagraph (1)~~clause

2.9.2(1); or

(3) has submitted further information in relation to the application referred to in ~~subparagraph (1)~~clause 2.9.2(1),

and, at the commencement date, has not been registered by *NEMMCO* in accordance with clause 2.9.2 as a *Registered Participant*, information provided under S5.2.4(b) shall be *restricted model information* until the earliest of:

(4) the date that the *Generator* or person intending to become a *Generator* indicates that a dynamic model will not be provided under clause S5.2.4(g);

(5) the date when a model is provided and accepted under clause S5.2.4(g); and

(6) six months from the date of registration of the *Generator*.

~~(b) A person registered in accordance with this clause 11.5.2 is taken to be registered in accordance with the requirements of the Rules as amended by the Amending Rule.~~

- Clause 11.5.2 states that the requirement to provide a model under S5.2.4 does not apply to a person who has commenced applying to be registered. NEMMCO strongly disagrees with this proposal. The model information is required for all significant plant, and there should not be an exception that allows a Generator to avoid this obligation. For some significant generating plant not to have appropriate models potentially harms NEMMCO's capability to assess power system security.
- The obligation currently clearly exists for scheduled Generators (under S5.2.4) and is applied by NEMMCO as a condition of registration (using clause 2.2.3) for all non-scheduled generating systems of 30 MW or greater.
- The information for S5.2.4 must exist because it is needed for studies to assess the proposed performance standards, so there is no additional cost in deriving it. If the AEMC is concerned about the protection of wind manufacturers' IP then one possible solution is to allow the S5.2.4 information to be considered 'restricted model information' for a period (say six months) to allow the development of an alternative less-detailed model consistent with S5.2.4(g).

11.5.3 Access standards made under the old Chapter 5

(a) Any *automatic access standard* or *negotiated access standard* that applied to a *generating unit or generating system* under the old Chapter 5 continues to apply to that system or unit as if the Amending Rule had not been made.

~~(b) Unless a Generator and a Network Service Provider otherwise agree, a *negotiated access standard* that is the subject of a negotiating process as at the commencement date, is to be negotiated in accordance with the old~~

~~Chapter 5, as if the Amending Rule had not been made.~~

Clause 11.5.3 permits a connection applicant to use the old technical requirements (those requirements immediately in force prior to the commencement date) instead of the new ones if the 'negotiated access standard is subject of a negotiating process' at the commencement of the changes. This requirement would effectively delay the implementation of the new technical requirements by 1 to 2 years. This delay would reduce the effectiveness of the new standards in managing wind integration issues, because a high proportion of wind farms would not be required to comply with the new standards, and many of the existing standards can not be effectively applied to wind farms.

NEMMCO proposes that that the appropriate criterion for the application of the 'old' technical standards is having a signed connection agreement at the commencement date of the new provisions. Once a connection agreement has been signed the prospective Generator will have established the required performance of the plant and be in the process of establishing contracts with suppliers and undertaking detailed design. Until the connection agreement has been signed the performance requirements for the plant are not locked-down, and can be changed.

11.5.4 Modifications to plant by Ggenerators

A *Generator* ~~Generator~~ who at the commencement date has proposed to modify a *plant* ~~plant~~ and has commenced negotiations with a *Network Service Provider* under the old Chapter 5 is to continue the negotiating process in accordance with the old Chapter 5 as if the Amending Rule had not been made, unless otherwise agreed with the *Network Service Provider*.

- Application under the old Chapter 5 provisions requires a Generator to bring all his performance standards up to the standard required under the technical requirements of the old Chapter 5.
- It may be preferable to the Generator to apply the new Chapter 5 provisions which require only those performance standards affected by the change to be reassessed, but to the new provisions.
- NEMMCO doesn't have a strong view on which approach is better, but suggests the Generator and the NSP be given some discretion as to which is applied.
- Note that there is some italicising required in this clause.