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Dear Mr Szabo

Draft Rule Determination: Generating System Model Guidelines

The Australian Energy Market Operator (AEMO) welcomes the opportunity to provide a submission on the Draft Rule and Draft Determination published by the Australian Energy Market Commission (AEMC) on 20 June 2017.

AEMO is generally supportive of the Draft Rule, however, considers that there are opportunities for further clarification and improvement as highlighted in this submission.

As outlined in AEMO's previous submission, AEMO relies on power system modelling and simulation to support the secure operation of the National Electricity Market (NEM). AEMO reiterates that any costs associated with additional modelling requirements would be significantly outweighed by the prevention of cascading events that may cost several tens or hundreds of millions of dollars if they are not correctly understood and mitigated through detailed power system modelling and simulation.

Furthermore, since initiation of AEMO's rule change proposal, the Final Report of the Independent Review into the Future Security of the National Electricity Market¹ has been published, which emphasises the significance of access to more detailed data and modelling information. For example, it states that "There should be a NEM-wide requirement that to be approved for connection new generators must fully disclose any software or physical parameters that could affect security or reliability".

Lastly, AEMO notes that this Rule change proposal is a critical enabler to achieve a successful outcome on several other concurrent Rule change proposals, including the System Security Market Framework Review, and the Rule change proposal AEMO is about to submit on Generator technical requirements.

Detailed comments are provided in the attached submission.

If you would like to discuss this submission further, please do not hesitate to contact Babak Badrzadeh on babak.badrzadeh@aemo.com.au or 03 9609 8344.

¹ <http://www.environment.gov.au/energy/national-electricity-market-review>
DRAFT RULE DETERMINATION: GENERATING SYSTEM MODEL GUIDELINES

Yours sincerely

Christian Schaefer

a/GM System Capability

Attachments: AEMO submission – Generating System Model Guidelines' Draft Rule

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1. Introduction

AEMO has reviewed the AEMC’s Draft Rule, Draft Determination, and Consultant Report. AEMO’s comments relate to the following areas:

- Model source codes
- Accepting a range of software simulation products and versions
- Third party access to simulation models other than the RMS-type models
- Timely and complete submission of all models and other information required under clause S5.2.4
- General comments on supporting documents
- Financial cost of model development
- Model confidentiality

2. Model source codes

The Draft Rule includes a number of references to clause 4.3.4, 5.2.4 and 5.3.1 that might be misinterpreted as far as the requirement for provision of source codes for RMS-type models is concerned. For example, proposed clause S5.2.4(b)(6) indicates that:

“to *AEMO*, where available, the model source code associated with the *power system* simulation model in subparagraph (5) in an unencrypted form suitable for at least one of the software simulation products nominated by *AEMO* in the *Power System Model Guidelines*, and in a form that would allow conversion for use with other software products by *AEMO* as nominated in the *Power System Model Guidelines*”

AEMO recommends the AEMC consider further clarification and a potential change to reinforce the mandatory provision of RMS-type model source codes.

3. Accepting a range of software simulation products and versions

Clause S5.5.7(c)(2) of the Draft Rule requires AEMO to: “use reasonable endeavours to accept a range of software simulation products and versions”.

At present, AEMO uses PSS/E and PSCAD/EMTDC simulation tools extensively for large-scale power system studies allowing the highest accuracy with the PSCAD/EMTDC software package, and fast simulation speed with the PSS/E simulation tool, as required for near real-time simulation, e.g. dynamic security assessment. AEMO’s experience indicates that these simulation tools are widely used amongst equipment manufacturers, which eliminates the need for new model development or model conversion that would be necessary if models are developed in less widely used simulation platforms.

Additionally, AEMO uses the MUDPACK simulation tool exclusively for small-signal stability assessment where no comparable, commercially available, product exists. Lastly, AEMO uses DlgSILENT Power Factory and VSAT for limited applications.

AEMO considers that the range of power system simulation tools used in the NEM is more diverse than those used by most international jurisdictions.

Utilising new simulation tools or extending the use of the above simulation tools compared to what they are currently used for must be carefully considered. AEMO notes that such an

increased diversity may not provide any tangible technical gain and will impose significantly higher costs to the market as a whole.

As highlighted in AEMO's previous submission, "the power system must be able to be analysed as a whole, and piecemeal assessment is not an option". For this reason, models provided in incompatible software products will likely slow down the connection application process, as AEMO's timely assessment of the impact of new connections is paramount to ensuring adequacy of supply, and meeting federal and state renewable energy targets.

Given the operational nature of this matter, AEMO recommends that a decision to accept a range of software simulation products and versions would need to be made by AEMO in consultation with Network Service Providers (NSPs), and suggests removing this sub-paragraph.

4. Third party access to simulation models other than the RMS-type models

AEMO welcomes the addition of clause 3.13.3(k1), which requires AEMO to "set out in the Power System Model Guidelines the circumstances in which AEMO will consider the information under clause 3.13.3(k)(2) to be reasonably required by a Registered Participant".

This provision will assist Registered Participants to access model and data beyond what is currently permitted in the NER, and is critical for the correct and sustainable design of the plant (in particular, power electronic interfaced plant) in the vicinity of other plant owned by other Registered Participants.

5. Timely and complete submission of all models and other information required under clause S5.2.4

The NER requires that AEMO consider any proposed performance standard that is based on a negotiated access standard and advise the connecting NSP as to whether the proposed standard adversely affects power system security or otherwise impacts on other matters for which it is responsible under the NER. Clause 5.3.4A(d) currently requires that AEMO respond to the relevant NSP within 20 business days following the submission of a proposed standard. The relevant NSP then has a further 10 business days to accept or reject the proposed standard.

To provide comprehensive advice, AEMO needs to conduct detailed modelling of the proposed connection arrangements which, in turn, requires the Connection Applicant to provide AEMO with models and information regarding the plant to enable AEMO to do so. In AEMO's experience, Connection Applicants do not always provide all the required information upfront or in a timely way. At times, AEMO has required further information, such as sufficient models from Connection Applicants to respond comprehensively on AEMO advisory matters. This causes delays.

It is, therefore, imperative that clause 5.3.4A(d) not set or create unrealistic expectations. AEMO is proposing that the clause include a requirement that appropriate models and supporting information be provided with the request for AEMO to consider a proposed negotiated access standard.

The NER should be updated so as to create a clear process and guidance around information requirements from Connection Applicants by amending clause 5.3.4A(d) & (e) as follows:

- (d) *AEMO* must within 20 *business days* following the submission of a proposed *negotiated access standard* under clause 5.3.4(e), clause 5.3A.9(f) or paragraph (h)(3), and the submission of all

models and other information required under clause S5.2.4 to enable AEMO to complete its investigations, respond to the *Network Service Provider* in writing in respect of any AEMO 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), clause 5.3A.9(f) or paragraph (h)(3), and the submission of all models and other information required under clause S5.2.4 to enable AEMO to complete its investigations, accept or reject a proposed *negotiated access standard*.

6. Comments on Draft Determination and Consultant’s Report

While insignificant to the Draft Rule as a whole, AEMO notes a number of inaccuracies in the Draft Determination and the Consultant’s Report, as highlighted below:

6.1. Draft determination

- Page 5 states that: *“EMT-type models are more complex and can be more detailed than RMS-type models. They can also provide a more realistic representation of power system operation under more extreme circumstances. However, EMT-type models may also be more costly and difficult to prepare than RMS-type models.”*
 - AEMO comment: With state-of-the-art modelling approaches, this statement is not often correct. This is because EMT-type models are generally a one-to-one translation of the actual control source code without the need for user intervention. Such models would therefore be easier to produce compared to the RMS-type models, which may require a complete user written model implementation necessitating extra time and effort.
- Page 27 states that: *“However it isn’t clear from the manufacturers’ perspective, when EMT-type models should be used and when RMS models should be used given that most studies are currently completed by AEMO in an RMS modelling tool.”*
 - AEMO comment: AEMO is currently using EMT-type models and tools for a large number of connection applications for asynchronous generation, and the use of such models is increasing significantly for the reasons highlighted in AEMO’s earlier submission. AEMO will further elaborate in Power System Model Guidelines the requirements and circumstances where each of the RMS- and EMT-type models will be required as indicated under the proposed clause S5.3.1(a1)(6) and clause S4.3.4(j)(6):
“...with sufficient detail for AEMO to perform power system simulation studies in accordance with the requirements and circumstances specified in the Power System Model Guidelines.”

6.2. Consultant’s Report

- Page 2 states that *“With regards to synchronous generators, it isn’t entirely clear if detailed and validated EMT type models of this technology provide any additional value with regards to the problems to be assessed, hence it would be prudent to understand if these models are required as it could entail substantial cost for existing proponents (especially given the number of existing synchronous generators in the NEM).”*
 - AEMO comment: As discussed in AEMO’s previous submission and reiterated in this submission, accurate and appropriate models of all power system components are necessary. Models of synchronous or asynchronous generation should not be considered in isolation but as part of the large-scale power system to which they are connected. Additionally, these models must

include a sufficient level of detail for the investigation of a particular phenomenon when they are used.

- Figure 2-6
 - AEMO comment: AEMO has developed a large number of models for various synchronous generator technologies, and considers that the figures quoted are incorrect by an order of magnitude. As an example, the most detailed models of synchronous generators comprising excitation system and turbine-governor generally takes 4-5 weeks to develop and validate. This casts doubts on the accuracy of the \$200-400k quoted in the Consultant's report. Additionally, PSCAD models of asynchronous generation are generally available from all major manufacturers. The quoted figures are therefore questionable and further empirical evidence to substantiate these should be sought.

7. Comments on model confidentiality

We note that Vestas has made a number of comments in its submission that relate to the confidentiality of models, source code and block diagrams. In response, we wish to point out that:

- Generators or persons negotiating a connection agreement have obligation to provide models, source code and block diagrams to AEMO and relevant NSPs under clause S5.2.4 of the NER.
- For some time now, and in order to accommodate the equipment manufacturers' (such as Vestas) need to maintain confidentiality by having lesser persons handle models, source code and block diagrams, AEMO has agreed with them to accept the submission of this information from the equipment manufacturers on behalf of those parties with the obligation to provide it.
- Clause S5.2.4(f) classifies this information is confidential information.
- Nevertheless, under clause 3.13.3(k) Registered Participants are entitled to seek this type of information from AEMO, which is still subject to confidentiality obligations (see clause 3.13.3(l)(3) & (l7)).
- Subject to a number of restrictions as to the types of information to be provided, AEMO may provide this information to Registered Participants, noting that TNSPs are entitled to more information than other types of information (see clauses 3.13.3(l) and (l3) to (l7)).

The NER represents the applicable law in each NEM jurisdiction, and so AEMO will not be entering into any non-disclosure agreement in respect of information it is entitled to obtain, regardless of whether it is being provided by Generators or persons negotiating a connection agreement, or the equipment manufacturer direct.