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Mr Michael Gatt
Chief Operations Officer
Australian Energy Market Operator
GPO Box 2008
MELBOURNE VIC 3001

Via email: PSMGReview@aemo.com.au

Dear Michael

SUBMISSION ON DRAFT POWER SYSTEM MODEL GUIDELINES

Powerlink Queensland (Powerlink) welcomes the opportunity to provide input on the Australian Energy Market Operator's (AEMO's) draft Power System Model Guidelines (PSMG). Our submission reflects our commitment to continue to provide safe, secure, reliable and cost-effective transmission services to our five million Queensland customers.

As highlighted in our response to the consultation paper, Powerlink supports AEMO's approach for:

- load model requirements to be included in the PSMG. In Powerlink's view, modelling requirements for the Inverter Based Loads (IBL) should be similar to asynchronous generator models and will be required in both Root Mean Square (RMS) and Electromagnetic Transient (EMT) domains.

- small signal models for Inverter Based Resources (IBR). We also consider that the format for small signal models should be either Small-Signal-Analysis-Tool (SSAT) model or the block diagram required to develop the SSAT model as agreed with Network Service Provider (NSP) and AEMO. It is important that the format of the small signal models is consistent across the NEM so that NEM wide analysis can be performed.

Large IBL and non-IBL loads can have an impact on power quality due to presence of harmonics. Therefore, we suggest that Power Quality Model Requirements as defined in section 4.6 of the existing PSMG are also applicable to loads.

Detailed feedback on the draft report of Power System Model Guidelines is provided in Attachment A.

33 Harold Street, Virginia
PO Box 1193, Virginia, Queensland 4014, Australia
Telephone: (07) 3860 2111 Facsimile: (07) 3860 2100
www.powerlink.com.au

If you have any questions in relation to this submission or require further clarification, please contact Sachin Goyal.

Yours sincerely

Stewart Bell
EXECUTIVE GENERAL MANAGER NETWORK AND BUSINESS DEVELOPMENT

Enquiries: Sachin Goyal, Manager Power System Performance and Connections
Telephone: (07) 3866 1119 Email: sachin.goyal@powerlink.com.au

Attachment A – Feedback for Draft Power System Model Guidelines

Section 3.2 Network Users and loads

It is likely that a network user or load facility with inverter based load could have a non-inverter load component as well. Under these scenarios, the hybrid modelling approach (i.e. combination of both composite and detailed model types) would be more appropriate when developing a model for the whole facility. Therefore, the model for a load could be of either category defined under section 3.2 of the draft PSMG or a combination of both categories. Furthermore, both RMS and EMT models are required, irrespective of the load model category (IEEE/composite or detailed). Powerlink suggests that this requirement clearly be stated in section 3.2. Powerlink supports the requirement for a RUG for both RMS and EMT load models.

Section 4.3.2 Requirement for detailed load models

Powerlink supports the requirement for a detailed load model when a load needs to demonstrate compliance with relevant performance standards or a load connection presents a significant impact on power system operation.

Section 4.5.1 Format (small-signal model)

To perform the meaningful NEM wide small signal stability analysis, a consistent approach towards the small signal modelling is essential. If some plants are represented by frequency response data, certain details (e.g. participation of states) and the root cause of the potential control interactions/instabilities could be missed. Therefore, we suggest that small-signal models should be obtained in a consistent format of SSAT or the block diagrams required to develop the SSAT models.

Section 4.6 Power quality model requirements

Powerlink suggests that an adequate model of reticulation system for large IBL and non-IBL loads should be provided in a format that is compatible with the harmonic analysis software nominated by the Network Service Provider (NSP).

Section 5.3 Small signal stability model documentation

Powerlink suggests that benchmarking results also be included as part of the small signal model documentation. Benchmarking of results (e.g. time domain step test or frequency response) will depend on the small signal model format selected through the discussion with AEMO and the NSP.

Section 6.1 Accuracy locations

Powerlink suggests that demonstration of model accuracy for IBL models can occur at a different location than at the connection point when a load model comprises with both detailed IBL model and composite load model (i.e. hybrid model). Obtaining accuracy of a composite load model might not be as practical as for the detailed model. This can then impact the overall accuracy of the load model. Therefore the model accuracy for IBL model can be demonstrated at a different location such as medium voltage bus where IBL model aggregation is considered.

Section 6.3.2 Pre-connection model confirmation

Powerlink supports the view to include accuracy guidance of RMS and EMS model benchmarking within the PSMG. Powerlink agrees that divergences between model responses should be expected, and that some of these divergences may exceed 10%. However, Powerlink also suggests that a 10% margin between RMS and EMT model is not appropriate for many simulations. For example, both RMS and EMS models should provide effectively (to within calculation tolerances) identical responses for a voltage reference step.

If a 10% accuracy requirement between RMS and EMS is maintained for pre-connection model confirmation tests, then Powerlink notes that such accuracy requirement is not relevant after connection; after connection, only accuracy between the models to field data is relevant.

Section 6.3.3 Post-connection model validation (R2)

Powerlink suggests that detailed IBL models should also be validated by comparing model response with plant response data collected during commissioning and that should be considered as R2 model validation.

Also for non-IBL loads, sufficient data should be captured during commissioning and testing of the plants for model validation. The parameters of composite load model should be adjusted accordingly to represent a reasonable plant response.

Appendix C Modelling component requirements

Powerlink considers that for large non-IBL type loads, it is also very important to capture and model control and protection functions (e.g. voltage and frequency protection) that can affect the continued operation of a load. Therefore, load loss during a transient disturbance and its recovery from a fault can be accurately represented for non-IBL load model.

Appendix C.1.1

Additional protection functions which might be applicable for loads include:

- Loss of Mains detection (e.g. for data centres) – Control and protection systems which are sensitive to grid disturbance should be appropriately modelled in both RMS and EMT domain models
- Under frequency load shedding
- Under voltage load shedding