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Australian Energy Market Operator

Lodged via email: contact.connections@aemo.com.au

AEMO's Draft report and Draft System Strength Impact Assessment Guideline

Transgrid welcomes the opportunity to respond to the Australian Energy Market Operator's (**AEMO**) consultation on the draft report and draft System Strength Impact Assessment Guideline (**SSIAG**). This consultation is a response to the Australian Energy Market Commission's (**AEMC**) final rule on the Calculation of system strength quantity that was released in February 2024.

As the jurisdictional planner, operator and manager of the transmission network in NSW and the ACT, Transgrid has a responsibility to operate and manage the transmission network safely, securely and efficiently in the long-term interests of consumers. To achieve this aim and remain consistent with the National Electricity Objective (**NEO**), Transgrid supports reforms that will ensure that the necessary levels of system strength are in place to deliver electricity to consumers in the least cost manner.

Transgrid is supportive of AEMO's objective and draft SSIAG, which addresses issues with the System Strength Quantity (**SSQ)** formula in the NER. The current formula, if remains unchanged, can significantly overstate the quantity of system strength required to support each connection.

Attachment One contains specific comments on several sections contained in the Draft SSIAG.

We appreciate the opportunity to provide a submission to the consultation on amendments to the System Strength Impact Assessment Guideline. If you would like to discuss this submission, please feel free to contact Malithi Gunawardana, Manager Network Connections, at Malithi.Gunawardana@transgrid.com.au.

Yours faithfully

Kasia Kulbacka
General Manager of Network Planning

Attachment One

Each of the tables below provide specific comments from Transgrid on several sections contained in the Draft SSIAG.

Comments related to Section 2 – Application

Sub-section number	Text from draft SSIAG	Transgrid comments
2.2	For clarity, it is noted that a load plant (other than a production unit) can only be an IBL if it also meets the criteria inherent in the NER definition of inverter- based load itself. That is, the load plant (other than a production unit) must be: i. supplied by power electronics, including inverters; and ii. potentially susceptible to inverter control instability	We understand that the SSIAG is required to provide criteria for the classification of IBL under the NER, however it does not appear as though the guidelines provide any more guidance than the Rules. (refer to sub-section 2.2). The following is not covered: • The classification of IBL is not included in the process diagrams. This may increase confusion, • what roles do TNSPs and AEMO have in making the classification of individual loads, • what information doe TNSPs and AEMO need to do this and, • how the classification is undertake. It appears that all the above points have not been covered. Therefore, we encourage AEMO to provide greater guidance on how a load should be classified in practice and included in the SSIAG as per the NER requirement.

Comments related to Section 3 – Concepts

Sub-section number	Text from draft SSIAG	Transgrid comments
3.4.3 (c)	AEMO acknowledges that the stability coefficient may vary on a case-by-case basis. depending on network limitations and connection point characteristics. A precise calculation accounting for wider power system characteristics requires the development of new tools and techniques and cannot be directly obtained from PSS®E studies, requiring a level of assessment that is beyond reasonable for a Preliminary Assessment	Considering the possibility of stability coefficients below 1.2 at certain network nodes and recognising the need for financial closure during the Connection Application Stage, upon signing the Connection Agreement, we encourage AEMO to consider the below recommendations. 1. NSPs be granted the flexibility to review and revise the alpha factor below 1.2 for relevant network nodes, while maintaining a maximum cap of 1.2. 2. The alpha value, where deemed to be less than 1.2, to be published by the relevant NSP and reviewed periodically to ensure sufficient level of system strength is available at the Connection Points, 3. The alpha value used to assess reduction in AFL & SSQ at the Connection Enquiry stage (as per item (b)) to be retained throughout the project's lifecycle, unless requested to be reviewed by the Connection Applicant.
3.4.3(e)	In addition, a review of existing NEM connections found that a value of 1.2 also corresponds to approximately the lowest Withstand SCR capability for grid-following inverters.	We believe this suggests that all grid-following inverters can operate in a stable manner down to the SCR of 1.2. However, it is not immediately clear if this consideration is at point of connection or the inverter terminals. Most grid following inverters may be capable of stable operation for SCR=1.2 at the terminal but this statement needs to be considered on a case-by-case basis for point of connection. We believe that it could be a more precise for grid following technology if the point of assessment is further clarified. Given this, we would encourage AEMO to replace the text contained in 3.4.3 (e) with the following: "*In addition, a review of existing NEM connections found that a value of 1.2 also corresponds to approximately the lowest Withstand SCR capability for grid-following inverters at their inverter terminals.*"

Comments related to Section 6 – System strength charge

Sub-section number	Text from draft SSIAG	Transgrid comments
6.2.2	"*A Connecting NSP must calculate an indicative SSQ 6.2.46.2.5*". Contained in page 39 of the Draft SSIAG.	Editorial issue -we suggest putting a space and separator in the text to separate the two clauses "*6.2.46.2.5*"
6.2.4	Methodology for undertaking SSQ calculation. Contained in page 39 of the Draft SSIAG.	It is noted that for indicative SSQ there is a bold sub-section with inputs and assumptions (section 6.2.5). However, we believe that it would be beneficial to also highlight similar arrangement for the final SSQ calculation. It is understood that there is a generic sub-section (6.2.4) on the methodology to be adopted for calculation of SSQ. However, given that the revised document has separated indicative SSQ and final SSQ, we would encourage AEMO to include "inputs and assumptions" sub-sections for each of them i.e. separately for indicative SSQ and final SSQ. This would be beneficial and it would also provide consistency.

Comments related to Section 7 – Short circuit ratio

Sub-section number	Text from draft SSIAG	Transgrid comments
7.4.1	The purpose of the methodology is to ensure: a) A reasonable effort has been made to accurately demonstrate that the minimum access standard or negotiated access standard requirements can be met at the relevant Withstand SCR. Contained in page 43 of the Draft SSIAG.	We encourage AEMO to consider the following points: • As inferred from NER S5.2.5.15 (b), S5.2.5.15 (d), and the General Requirement under S5.2.5.15, further clarification of the intended purpose of 7.4.1(a) would be beneficial. That is, its intended purpose is to outline the requirements for NAS or MAS for S5.2.5.15 at the withstand SCR and it is not to require compliance with any other performance standards at this withstand SCR. • It would be beneficial if AEMO could provide further clarification and make it clearer that if the Generating System needs to adopt any Control/Protection Systems/Settings for S5.2.5.15, the only requirement for demonstrating compliance is to remain stably connected at the withstand SCR, and Generating Systems are not expected to demonstrate compliance with any other performance standards at the withstand SCR with these Control/Protection Systems/Settings.

Comments related to Appendix A and B

Sub-section number	Text from draft SSIAG	Transgrid comments
Appendix A A.1	AFL calculation Contained in page 53 of the Draft SSIAG.	Proxy thevanin impedence is not defined for inverters with a withstand SCR of 1.2. Using the formula provided: ΔAFL = (-SCRwithstand + α) x Prated for SCR windstand of 1.2 ΔAFL = 0 Using the calculation for ZAFL; ZAFL = abs(1/ΔAFL) ZAFL = NaN From the above, we can conclude that the proxy thevanin impedence becomes undefined for withstand SCR of 1.2 We encourage AEMO to include instructions on how to determine proxy Thevanin impedence for withstand SCR = 1.2, and consider providing an example for greater clarity.
Appendix A A.2	Obtained by running a short-circuit analysis in PSS®E using short circuit fault calculation with three phase fault and a voltage factor of unity. Contained in page 53 of the Draft SSIAG.	At a high-level, we believe it would be beneficial to provide greater clarity regarding which short-circuit calculation method should be used in the assessments (e.g., ANSI, IEC). To ensure consistency and clarity, we encourage AEMO to provide further guidance and define the short-circuit calculation method to be used in the assessment as different methods may yield varying results.
Appendix B	Appendix B Table 2 Contained in page 55 of the Draft SSIAG.	We encourage AEMO to provide further clarity on Table 2 of Appendix B as it is currently unclear whether Table 2 requires the tests to be done in PSCAD or PSSE. We note, that there is greater clarity on the requirement for Table 3 and Table 4.

		AS such, we encourage AEMO to consider adding the following text above Table 2: "*The tests listed in Table 2 apply to both PSCADTM/EMTDCTM and PSSE models."*

General comments

Comment topic	Transgrid comments
New terms without definition	Terms such as '*production unit*', '*distribution connected unit*', '*market network service facility*' and '*integrated resource system*' are not defined in the SSIAG or the NER. To provider greater clarity, we encourage AEMO to consider adding a footnote to explain that the new italicised terms are to be defined in the new rules which have not yet come into effect.
Proponents have tried to argue that harmonic filter can be removed for the purpose of S5.2.5.15 Withstand SCR testing.	We encourage AEMO to consider adding the following text to the appropriate section or a new section (whichever AEMO sees fit): "*Elements within the model of the generating system undergoing Withstand SCR testing must identical to the generating system undergoing negotiation for GPS. That is, the size of plant, number of inverters, filters etc should remain constant for the withstand SCR tests*"