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21st October 2024

Australian Energy Market Operator Limited (AEMO)

Subject: SMA Response to Draft Inertia Requirements Methodology Consultation

Dear AEMO,

We are writing to provide our feedback on the 'Amendments to the Inertia Requirements Methodology, Draft Report – Standard consultation for the National Electricity Market' published on 25 September 2024. We appreciate the opportunity to contribute to this important consultation process and commend AEMO for its thorough and detailed approach.

1. System-Wide Inertia Level and Sub-Network Allocation

We support AEMO's proposed methodology for calculating the system-wide inertia level and allocating it among inertia sub-networks. However, SMA agrees with Transgrid comments recommending AEMO to consider the following:

- Assessing line contingencies with associated transfer tripping schemes, such as the Wagga – Darlington Point 330 kV line.
- Testing the network's ability to withstand non-credible contingency events and confirming the adequacy of under-frequency load shedding or over-frequency generator tripping schemes.

1.1. Inertial response based on voltage angle deviation

We acknowledge that the stability of voltage waveform is covered under the System Strength Framework, and we consider this separation appropriate and would like to express the importance of establishing a robust framework for voltage waveform stability support.

2. Process for Determining Sub-Network Islanding Risk

We agree with the principles proposed by Shell Energy for determining sub-network islanding risk and support a pragmatic approach based on identifying weak network edges and potential high power flows that could cause trips, leading to island formation. We consider AEMO's conclusion to be appropriate and fit for purpose for identification of sub-network islanding risk.

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3. Inertia Network Services Specification

We support the inclusion of a new inertia network service specification. We would like to make the following remarks:

- We recommend using the 'direct approach' for quantifying synthetic inertia, as we consider this a more robust assessment methodology, providing better insight on the equipment's response during some critical RoCoF events.
- We consider it critical to include requirements for testing for loss of last synchronous generator.
- We support AEMO's comment on including tests for active phase jump power in case of sudden voltage angle changes.
- Testing inertial response under a range of RoCoF conditions and charge/discharge levels to ensure robustness.
- Testing requirements for qualification of equipment seems to be very focused on simulation studies, although we agree this is necessary, SMA recommends requirements for laboratory testing of the actual equipment to ensure satisfactory performance under islanding conditions as well as headroom performance under different temperature and operating conditions to ensure equipment will behave as expected.

3.1. Process and Requirements for AEMO to approve equipment – damping factor and inertia constant

We agree with the overall test conditions to ensure robustness of inertial response as well as understanding of behaviour across a range of different operational conditions. We would request for some clarity around the criteria to determine pass/fail.

3.2. Process and requirements for AEMO to approve equipment – other

SMA agrees with AEMO's and Transgrid's observations that PFR and FFR functions should be disabled when conducting the tests.

We also agree with the inclusion of voltage and frequency disturbance happening simultaneously as it is a likely scenario.

Reading Transgrid's observation on some grid codes banning the virtual impedance function, SMA's understanding on this issue is that the definition section of the original Legal Text in the Grid Code (Developed by GC0137) the impedance was defined as "physical".

This was shortly after amended by GC0163: GB Grid Forming (GBGF) - Removal of Virtual Impedance restriction | National Energy System Operator (neso.energy). The relevant change is shown in Figure 1

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Internal Voltage Source or **IVS**	For a **GBGF-S**, a real magnetic field, that rotates synchronously with the **System Frequency** under normal operating conditions, which as a consequence induces an internal voltage ~~-~~(which is often referred to as the Electro Motive Force (EMF)) in the stationary generator winding that has a real impedance. In a **GBGF-I**, switched power electronic devices are used to produce a voltage waveform, with harmonics, that has a fundamental rotational component called the **Internal Voltage Source (IVS)** that rotates synchronously with the **System Frequency** under normal operating conditions. For a **GBGF-I** there must be an internal impedance ~~with only real physical values~~, between the **Internal Voltage Source** and the **Grid Entry Point** or **User System Entry Point**. ~~For the avoidance of doubt, a virtual impedance, is not permitted in GBGF-I.~~

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Figure 1 - Changes to the definition of IVS

SMA would welcome feedback should there be other instances of banning virtual impedance we may have missed

3.3. Required capabilities of synchronous and synthetic inertia service providers

SMA Acknowledges AEMO's need to remain technology agnostic and ensure innovative solutions are not restricted by being overly prescriptive in the requirements. We would nonetheless remark on the risk of using technology that may revert to current control during critical events and therefore not provide the expected grid support service when these may be needed the most.

3.4. AEMO's conclusion

We agree that most of the feedback focuses on GFM inverters as these are the dominating technology relevant to this assessment methodology, and it would be important to cater for all non-synchronous technologies. This requires from more robust assessment to ensure performance of the proposed technology; therefore, we insist on our position to use 1(a) 'direct approach' for quantifying synthetic inertia to ensure technology's performance.

4. Conclusion

SMA supports the majority of AEMO's proposed amendments to the Inertia Requirements Methodology. We appreciate the comprehensive approach taken and the inclusion of stakeholder feedback. We believe that with the suggested enhancements, particularly in the areas of synthetic inertia quantification and

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equipment testing, the methodology will be robust and effective in ensuring grid stability. We look forward to continued collaboration with AEMO to refine and implement these critical requirements

Best regards,

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