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Australian Energy Market Operator
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via email: 2024_security_consultations@aemo.com.au

2 August 2024

RE: Amendments to the Inertia Requirements Methodology

Dear AEMO,

Tesla Motors Australia, Pty Ltd (Tesla) welcomes the opportunity to provide a response to the Amendments to the Inertia Requirements Methodology consultation (the Methodology).

Tesla's mission is to accelerate the transition to sustainable energy. A key aspect of this will be using smart, grid-forming inverters to support increased penetration of variable renewable energy (VRE) in the grid. We believe that battery energy storage system (BESS) assets, particularly Tesla Megapacks operating with our virtual machine mode (VMM) technology, will be integral to providing a scaled, cost-effective system strength solution in all Australian jurisdictions.

Tesla remains actively engaged in the associated AEMC led work on Improving Security Frameworks and Essential System Services reforms noting their criticality to connecting and operating GFM BESS.

Tesla is encouraged by AEMO's proposals and processes outlined in the Methodology and supports:

1. AEMO's use of new tools to underpin system security procurement frameworks.
2. AEMO's framings and processes within section 3.1 NER Requirement: System-wide inertia level and inertia sub-network allocation.
3. Definitions introduced in new clauses 5.20B.2(b)(1), 5.20B.2(b)(2), and 5.20.4(d1).
4. Work conducted by AEMO to identify and expand on the relationship between inertia and fast frequency response (FFR). We encourage further exploration on this issue to better understand how inertia requirements could be substituted by procuring 1-second FCAS. As noted by the AEMC, non-network solutions such as GFM can currently provide inertia support as "other inertia support activities" such as procurement of FFR to address shortfalls.[1] The effectiveness of this approach was demonstrated during the 12 November 2022, with FFR being effectively provided by both Hornsdale Power Reserve (HPR) and Tesla's SA virtual power plant (SAVPP) based on procured capacity with ElectraNet.

We also note that AEMO have previously published an "Application of Advanced Grid-scale Inverters in the NEM" White Paper which highlights equivalent inertia capability from grid forming BESS assets as with synchronous machines[2].

[1] https://www.aemc.gov.au/sites/default/files/2023-08/ERC0290%20%E2%80%93%20Improving%20security%20frameworks%20for%20the%20energy%20transition.pdf
[2] https://aemo.com.au/-/media/files/initiatives/engineering-framework/2021/application-of-advanced-grid-scale-inverters-in-the-nem.pdf

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Table 2 Performance comparison of grid-connected generation

Service/capability	Grid-following inverter system	Grid-forming inverter system	Synchronous machines
Can contribute to system strength		✓	✓[A]
Can have positive disturbance withstand (active power oscillation damping)		✓	✓
Can have positive disturbance withstand (fault ride-through capability)	✓	✓	✓
Can contribute to system inertia		✓[B]	✓
Can contribute to FFR	✓	✓	
Can contribute to primary frequency response	✓	✓	✓
Can support a power system island with supply balancing and secondary frequency response	✓	✓	✓
Can initiate or support system restoration	✓[C]	✓	✓

A. Synchronous machines can usually contribute to system strength much more than IBR due to their higher overload capacity.
B. A grid-forming inverter system requires energy storage to deliver inertia. See Section 2.4.
C. Grid-following inverters can support but not initiate system restoration.

Quantification of synthetic inertia

Tesla is aligned with AEMO's description and parameters for synthetic inertia within section 3.3.3. While AEMO refers to synthetic inertia as an emerging area within the consultation paper, we note that there is a steady and growing body of evidence of grid-forming BESS providing synthetic inertia.

For example, AEMO identified an inertia shortfall in its December 2018 National Transmission Network Development Plan and noted that the South Australian grid requires 6,000 megawatt-seconds (MWs) to maintain a secure operating level of inertia. It was anticipated that HPR, when expanded could provide up to 3,000MWs of inertia.

Tesla welcomes AEMO's exploration into various approaches to quantify the amount of inertia that could be provided by grid-forming BESS. Based on Tesla's extensive experience in this area, we are **most supportive of method *(1)(b) Quantifying synthetic inertia using the swing equation – 'indirect approach'*.** This approach has been successfully utilised on actual IBR assets, with this being the approach that AEMO uses to verify the Hornsdale Power Reserve (HPR) inertia contribution. Tesla notes that historically speaking, (1)(b) has been relatively the most reliable in correctly assessing inertia contributions. Tesla is still relatively supportive of method *(1)(a) Quantifying synthetic inertia using the swing equation – 'direct approach'*, as this method has been widely adopted by industry and AEMO itself. Conversely, Tesla raises concern with proposed method *(2) Probing frequency injection method*, as it presents much greater complexity and difficulty in implementation, in addition to being less widely adopted.

Tesla looks forward to continued engagement and actively participating in ongoing discussions.

Kind regards,

Tesla Energy Policy Team

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