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Energy Policy WA
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Via email: energymarkets@deed.wa.gov.au

15 December 2025

RE: Essential System Services Framework Review

Dear Jai,

Tesla Motors Australia, Pty. Ltd. (Tesla) welcomes the opportunity to provide a response to the Consultation Paper – Essential System Services Framework Review.

Tesla's mission is to accelerate the transition to sustainable energy. In WA, Tesla is proud to be supplying Neoen's Collie 1 and 2 Battery (560 MW/2240 MWh), and Muchea Battery (164 MW/905 MWh), as well as Atmos Renewables' Merredin BESS (100 MW/400 MWh). These BESS in the WEM are currently grid-following (GFL) due to the existing market settings. In the NEM, Tesla has a pipeline of 12 GWh+ grid-forming (GFM) BESS installed and under-development, with proven demonstration of synthetic inertia and other ESS to contribute to system security and reliability in the grid.

Energy Policy WA (EPWA)'s proposals are practical, logical progressions for ensuring that WA's ESS Framework is fit-for-purpose and suited for an evolving technology mix. Tesla is broadly supportive of adopting all five proposals put forward in this consultation. In this response, Tesla provides specific feedback and insights on the following areas of the paper:

1. **RoCoF Safe Limit** – supportive of increase; recommending that new limits are applied to existing facilities to be eligible for payments.
2. **Mandatory Primary Frequency Response (MPFR)** – balancing with Contingency Reserve Raise.
3. **Synthetic inertia** – details on technical capabilities and calculating costs and benefits.
4. **Supplementary ESS Mechanism** – exploring potential to bring on GFM capability.

We look forward to ongoing engagement within the ESS Framework Review and broader market reform to support WA's operation of a safe and secure power system, and its energy transition more broadly.

Yours sincerely,

Tesla Energy Policy Team

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0. General Comments

The proposals in the ESS Framework Review are a practical mix of areas for future research, and recommendations to implement for immediate ESS reform. It complements the broader work being undertaken in the WA Wholesale Electricity Market Reform, including reviewing the Power System Security and Reliability Standards Review.

Tesla has a minor aside in response to the statement that 'during periods of high renewable generation, there are often less synchronous generators online. This includes not only daytime periods of high rooftop solar production, but also periods of spring and autumn when operational demand is generally low, solar generation works most efficiently, and wind resources are high' (p. 28).

This is an issue not unique to WA, with risks of low operational demand occurring throughout the NEM, referred to as Minimum System Load (MSL). While WA has been successful in addressing the reliability risks of this grid evolution, with NCESS contracts to provide 'solar-soaking' services, Tesla notes the potential for these contracts to be expanded to also ensure system security during periods of low operational demand, avoiding the use of expensive directions, given GFM BESS are able to address system security issues while charging and acting as load. There is merit in discussing evolving the NCESS framework or considering using the Supplementary ESS Mechanism (discussed below), to support a GFL to GFM transition for existing WA BESS to address these needs.

1. RoCoF Safe Limit

Tesla is supportive of the proposal to increase the RoCoF Safe Limit from 0.25 Hz per 0.5 seconds to 0.75 Hz per second to reduce the need for AEMO interventions. Similarly, Tesla welcomes AEMO and EPWA's approach to monitoring existing generators to ensure that power system security is being met through adequate capability, and not taking a 'set and forget' approach. If the Limit is amended, Tesla highlights the importance of reviewing this testing to ensure facilities have the capability of meeting this.

Regarding the RoCoF Safe Limit, Tesla even suggests greater consideration for amending the limit to 1 Hz per second for one second, as the consultation paper notes is often set for other power systems (p. 29). While in the WEM, the largest disturbance has been 0.46 Hz per second for a loss of generation, in the NEM, the largest maximum RoCoF recorded since Q1 2020 was greater than 0.7 Hz per second.[1]

In response to the note on the Technical Rules, where facilities were considered to meet a 4 Hz per second requirement over an unspecified measurement period, Tesla encourages that this period is defined to enable appropriate plant tuning to meet this – for instance, for 250ms, as is in the NEM.

[1] AEMO "Frequency Monitoring Q4 2024", January 2025

2. Mandatory Primary Frequency Response (MPFR)

Tesla is supportive of considering MPFR contributions in accounting for the Contingency Reserve Raise procurement process, to allow for ensuring that there is adequate power system security in the WEM, while not artificially inflating market costs for WA consumers.

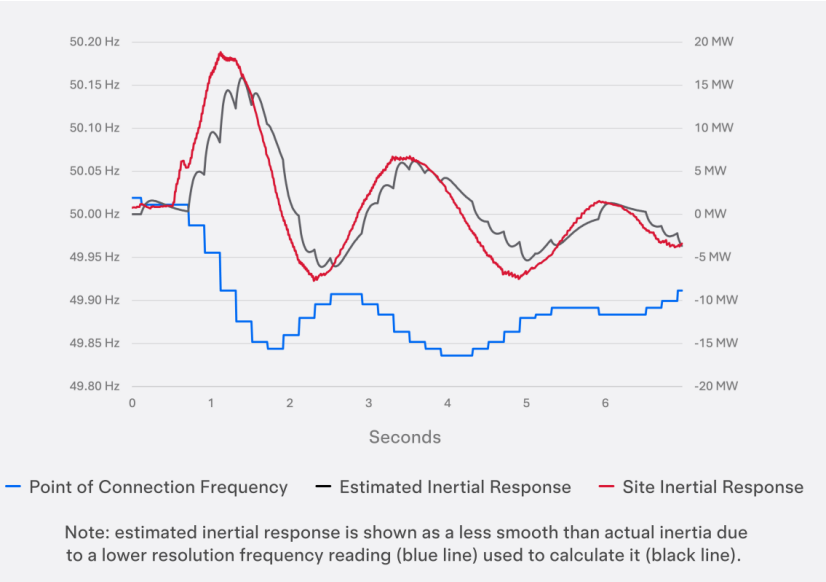
However, Tesla notes that the consideration for older synchronous machines to struggle with frequency droop settings when considering the trade off between MPFR and Contingency Reserve Raise headroom. Consequently, Tesla appreciates the twelve-month monitoring process by AEMO, to understand the amount of additional headroom and footroom available.

3. Synthetic Inertia

Tesla strongly welcomes EPWA and AEMO's exploration of enabling synthetic inertia to contribute to the WEM, either through new facilities, or updating existing utility-scale BESS. Tesla notes that while this conversion from GFL to GFM is often time-intensive and costly due to the registration and grid-connection process, there is no actual hardware change to the site, rather requiring a firmware update and re-testing.

Tesla agrees with the findings of AEMO's study, that the contribution of synthetic inertia would substantially reduce the requirement for directions, and ultimately, market costs. The technical capabilities of synthetic inertia have been demonstrated in the NEM and beyond. In 2022, AEMO confirmed that the Hornsdale Power Reserve, following its 2020 grid-forming upgrade, could deliver approximately 2,000 MW-seconds of inertia, validating grid-forming batteries as a viable replacement for mechanical inertia in the NEM[2]. In 2025, as part of Tesla's White Paper on 'The Role of Grid-Forming Inverters in Providing Inertia'[3], this was validated further, with actual site data in figure 1 below:

Figure 1: Hornsdale Estimated and Measured Inertial Response, 4 August 2023



[2] ARENA, 'Neoen Hornsdale Project Summary Report – Full Inertia Trial', December 2023
[3] Tesla, 'The Role of Grid-Forming Inverters in Providing Inertia', August 2025

In addition to this submission, Tesla has attached the White Paper discussed as it presents further evidence that grid-forming batteries are technically capable of delivering reliable inertial responses in the NEM through simulation and site data. Similar reports that demonstrate the technological capability of grid-forming inverters in the NEM include ARENA's Grid-Forming Portfolio Report[4], which stated that 'all four projects were successfully enabled in grid-forming mode, and synthetic inertia capability has been demonstrated at multiple sites during real-world contingency events' (p. 3).

Tesla welcomes further technical assessment for power system analysis specific to the WEM if preferred. However, while the consultation paper considers the UK's Pathfinder project and the establishment of their verified performance criteria (p. 43), Tesla recommends AEMO's 'Quantifying Synthetic Inertia of a Grid-forming Battery Energy Storage System'[5] approach over Pathfinder.

On page 44, Tesla questions the source for the list of considerations for the costs for synthetic inertia. In particular, the suggestions that 'this requirement could limit the BESS participation in the RCM, which is the only fixed revenue stream', and 'reduced operating life as grid-forming BESS used for synthetic Inertia is expected to have a significantly shorter economic life (5-10 years)'. Tesla notes that BESS are typically designed to be slightly oversized, with a 20% short-term overload capability, that addresses these concerns. For Tesla's upcoming pipeline of grid-forming BESS in the NEM, Tesla offers a 15-20 year warranty for BESS with synthetic inertia capability.

Tesla also suggests that is further work done to understand the technical, quantifiable justifications for claiming 'the importance of a balanced sourcing of Inertia services, including both synchronous Inertia from generators or synchronous condensers, and synthetic Inertia from grid-forming BESS'. It would be helpful to understand what the engineering benefits for grid-control would be to apply technological ratios, and the assumptions for such conclusions.

Within Appendix B4., Tesla raises concern with the interpretation of the Wallgrove BESS's inertia response, in the Consultation Paper stating that there was 'some success supplying an Inertia-like response, albeit at the cost of potentially reduced fault-ride through capability.' The reason for such an outcome was not due to the GFM capability itself, but rather, by requiring the BESS to be tuned to replicate the legacy characteristics of a synchronous machine, rather than tuning for optimal power system security. The significant impact of tuning in the GPS has been discussed by ARENA in their grid-forming portfolio report (cited above).

Finally, Tesla appreciates EPWA's inclusion of its submission to the AEMC's Efficient Provision of Inertia submission. We welcome the opportunity for further engagement to share more detailed calculations for the calculating the projected costs of supplying synthetic

[4] ARENA, 'Lessons Learnt and Future Directions from ARENA's Grid-Forming Battery Portfolio', June 2025
[5] AEMO, 'Quantifying Synthetic Inertia of a Grid-forming Battery Energy Storage System', September 2024

inertia, noting that the provision of inertia is dynamic and does not have a fixed allocation of battery capacity.

4. Supplementary ESS Mechanism

Section 6 of the Consultation Paper, on the Supplementary ESS Mechanism (SESSM), is an promising opportunity to consider how new FCESS providers could contribute to alleviating system security issues in the WEM. Tesla encourages EPWA and AEMO to continue to investigate the SESSM framework, including the SESSM trigger, service specification, and procurement requirements.

As AEMO's research has confidently demonstrated throughout this consultation paper, there is a clear benefit to the WEM to enable a broader range of providers, including converting BESS from GFL to GFM, to contribute to the ongoing, costly challenges associated with a limited pool of RoCoF Control Service Providers, to reduce the need for directions and maintain power system security at an efficient level of cost.