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Alexandria NSW 2015,
Australia

Ms Victoria Mollard
EGM, Economics and System Security
Australian Energy Market Commission
PO BOX A2449
Sydney South NSW 1235

7 August 2025

Dear Ms Mollard,

Re: Tesla Submission – Efficient Provision of Inertia Draft Determination

Tesla Motors Australia, Pty Ltd (Tesla) welcomes the opportunity to provide the Australian Energy Market Commission (AEMC) with our submission to the Efficient Provision of Inertia Draft Determination.

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 the increased penetration of variable renewable energy in the grid. Battery energy storage systems (BESS), with grid-forming capability, are highly flexible and can value stack across a multitude of services, including energy arbitrage, Frequency Ancillary Control Services (FCAS), and Essential System Services (ESS) like inertia and system strength. In Australia, Tesla has a pipeline of 4.5 GW / 12 GWh+ of grid-forming batteries installed or under development across Australia, including the globally acclaimed Hornsdale Power Reserve (HPR) in South Australia which successfully demonstrated its synthetic inertia capability in a 2023 ARENA trial.[1]

As such, Tesla does not support the position in the Draft Determination to not pursue the operational procurement of inertia. The AEMC's decision to not further advance a spot market for inertia fails to advance the National Electricity Objective (NEO), due to risking higher costs for consumers, stifling innovation for non-network option technologies, and potentially delaying coal closure dates due to an overreliance on network-procured synchronous condensers, risking system security.

Comparatively, operational procurement for inertia through a real-time inertia market would provide transparent price signals that incentivise investment in new grid services, ensuring that inertia is procured efficiently and cost-effectively as system needs evolve. Unlike long-term procurement, which locks in suppliers, a dynamic market approach fosters competition, innovation, and investment in new cost-effective sources of inertia as technologies rapidly evolve at a faster rate than procurement rounds through the regulatory processes.

Tesla does not support the AEMC's assessment that the expected inertia supply in the NEM mainland exceeds minimum needs to 2045 for multiple reasons, including cost and time delays for TNSP procurement of synchronous condensers, as well as challenges with their operations and maintenance. This is due to synchronous condensers relying on mechanical components and can experience a total

[1] https://arena.gov.au/assets/2024/02/Neoen-Hornsdale-Power-Reserve-Upgrade-Project-Summary-Report.pdf

loss if taken offline for maintenance due to even minor faults. AEMO outlines in a report: "Inadvertent trips of synchronous condensers could present an increasing risk as progressively more SCs are installed across the NEM to manage system strength requirements."[2] More broadly, synchronous condenser asset life is likely shorter than expected due to equipment obsolescence and limited vendor maintenance support, and requiring periodic major refurbishments to maintain functionality and impacting ability to meet annual availability targets closer to end of life.[3]

Similarly, the AEMC has not considered the emerging concerns outlined by AEMO in the 2025 General Power System Risk Review[4], that inertia impacts following non-credible contingencies are not currently planned for but may become necessary to do so if ESS become concentrated in small areas of the network, for instance, with the proposed procurement of eight synchronous condensers in the New England REZ[5]. These challenges demonstrate the benefits of a dispersed and diverse procurement of inertia, not just geographically, but across technology types, to ensure system resiliency and support the NEO.

As an alternate solution, Tesla has extensively demonstrated the capabilities on the role of grid-forming inverters in providing inertia, outlined in previous submissions[6][7][8]. This capability has been validated by others, including AEMO's white paper on the Voluntary Specification for Grid-forming Inverters[9] and the Application of Advanced Grid-scale Inverters in the NEM[10], and ARENA's 2025 Grid-Forming Battery Portfolio Series Report.[11] The modular architecture of batteries allow them to continue operating even when individual units are offline, maintaining inertia provision without disruption.

Furthermore, when considering the costs of meeting inertia requirements—as mandated under the National Electricity Objective (NEO) to promote efficient investment in and operation of electricity services—a heavy reliance on synchronous condensers undermines the long-term interests of electricity consumers. Transgrid's recent PACR admitted a 90% rise in synchronous condenser costs since the PADR one year earlier[12]. This is only expected to rise further, given the major global supply chain constraints leading to cost increases and time delays. If alternative sources of inertia, such as synthetic inertia from grid-forming BESS, are not seriously considered by the AEMC, and synchronous condenser deployments face delays, the only viable fallback will be extending the operational life of existing thermal generation assets.

In contrast, the cost of BESS are continuing to decline considerably as advancements in energy storage technology and economies of scale reduce prices. This makes BESS an increasingly attractive option for providing grid services, including inertia. The AEMC's draft determination noted that AEMC and

[2] https://aemo.com.au/-/media/files/electricity/nem/market_notices_and_events/power_system_incident_reports/2022/multiple-separate-incidents-involving-buronga-synchronous-condensers.pdf
[3] https://www.aer.gov.au/system/files/GHD%20Advisory%20-%20MGSS%20Contingent%20Project%20-%20Economic%20Life%20Advice%20-%2028%20June%202019.pdf
[4] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-general-power-system-risk-review/2025-gpsrr.pdf
[5] https://www.transgrid.com.au/media/kzqd14sn/2507-transgrid-pacr-meeting-system-strength-requirements-in-nsw.pdf
[6] https://www.aemc.gov.au/sites/default/files/2025-02/Tesla_0.pdf
[7] https://www.transgrid.com.au/media/y54k5rp4/2408-tesla-padr-submission.pdf
[8] https://www.aemc.gov.au/sites/default/files/2023-04/AEMC%20Efficient%20Provision%20of%20Inertia%20-%20Tesla%20response__FINAL.pdf
[9] https://aemo.com.au/-/media/files/initiatives/primary-frequency-response/2023/gfm-voluntary-spec.pdf
[10] https://aemo.com.au/-/media/files/initiatives/engineering-framework/2021/application-of-advanced-grid-scale-inverters-in-the-nem.pdf
[11] https://arena.gov.au/knowledge-bank/ekistica-arena-grid-forming-battery-portfolio-series-summary-report/
[12] https://www.transgrid.com.au/media/kzqd14sn/2507-transgrid-pacr-meeting-system-strength-requirements-in-nsw.pdf

HoustonKemp's analysis identified a net benefit from the operational procurement of additional inertia over a 10 year horizon when the estimated inertia costs were $0.04/MWs, which could comfortably be accommodated by grid-forming batteries.

Beyond commercial considerations, there are technical risks from the AEMC's proposed approach to meeting inertia requirements through existing methods of procurement, with network procurement of synchronous condensers with a flywheel attached. Synchronous condensers, like traditional synchronous generators, are susceptible to angle stability issues. These occur when a disturbance (such as a fault or sudden change in demand) causes the rotating elements of the condenser to fall out of sync with the rest of the grid. Maintaining synchronisation across a large network is critical for system stability. Historically, angle stability issues were less of a concern because the grid relied on dispersed, centralised synchronous generators with high inertia and coordinated control. Now, with reduced inertia, clustered synchronous condensers, and a more decentralised grid, these challenges are becoming more pronounced.

Similarly, high penetration of synchronous condensers could introduce small signal stability issues in the NEM. These could be subtle, persistent oscillations in the system that can weaken overall grid stability over time. AEMO's 2025 General Power System Risk Review noted that synchronous condensers introduce negative damping of inter-area modes. AEMO recommends that 'research into synchronous condenser damping devices should be a high priority to ensure the addition of synchronous condensers for system strength and inertia does not have unacceptable small signal stability outcomes'[13], which has not been done. Such risks should be considered by the AEMC when considering the future inertia supply mix.

Finally, Tesla is concerned that the Draft Determination's recommendations are non-binding, lacking accountability for AEMO, TNSPs, or other stakeholders to ensure transparent, cost-effective inertia procurement. Consequently, Tesla encourages greater consideration for the creation of ESS governance frameworks.

Tesla encourages the AEMC to reconsider the decision to not progress the operational procurement of inertia, to support the NEO. Tesla welcomes any questions or comments from the AEMC and looks forward to continue engaging on the best approach to supporting system security needs.

Kind regards,

Tesla Energy Policy Team

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[13] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2024/2025-general-power-system-risk-review/2025-gpsrr.pd