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

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RE: TRANCHE 8: EXPOSURE DRAFT PROPOSED ELECTRICITY SYSTEM AND MARKET AMENDING RULES – CONSULTATION

Dear Jai,

Tesla Motors Australia, Pty. Ltd. (Tesla) welcomes the opportunity to provide a response to the Exposure Draft of Tranche 8 Wholesale Electricity Market (WEM) Amending Rules consultation (the Draft Rules).

We commend EPWA's commitment to adapt and evolve the WEM Rules to ensure a future proofed regulatory framework, particularly in relation to integrating Energy Storage Resources (ESR) and navigating barriers to the technology's continued adoption at pace. ESR has quickly demonstrated clear benefits to grid reliability, reducing consumer price impacts, and lowering WA's emission profile. The focus on refining market mechanisms to support ongoing integration of renewable energy and energy storage systems aligns with the state's ambitions for a decarbonised and resilient energy future.

ESR, such as battery storage, are well-suited to provide a flexible suite of services, including essential services such as load shifting, charging off excess solar, frequency regulation, and contingency reserves. Battery technologies are highly flexible and dynamic to price signals, responding in real time to AEMO to contribute to reliability and system stress events, including low operational demand risk, not just insurance capacity for 1 in 10-year peak demand days. The Tranche 8 amendments, in principle, seek to continue to encourage ESR deployment to smooth out fluctuations from renewable generation, particularly during evening peak demand when solar output declines. We understand from preliminary calculations and EPWA commentary that the ESR duration requirement is likely to increase from the current 4 hours to 6-8 hours or longer. It may also result in a further change in the benchmark technology type used to set the BRCP from energy storage back to an open cycle gas turbine (OCGT). This is concerning.

Tesla's analysis into the WEM's future duration requirements finds the most cost-effective approach is for ESR reserve capacity to continue to incentivise four hours of energy storage capacity, with a separate, more tailored scheme to address the 1 in 10 year or extreme tail risk in the 2040s and beyond. This approach also aligns with future grid studies seen elsewhere in the NEM and globally that shows until renewable penetration reaches 80% and above, 4-hours of storage is more than sufficient:

- AEMO Services review and analysis of the Long Duration Storage requirements for NSW's Electricity Roadmap – clearly showed lowest cost to consumers from building 4-hours of storage, not 8 hours[1]

[1] www.energy.nsw.gov.au/sites/default/files/2024-05/NSW-202405-AEMO-Services-Long-Duration-Storage-Advice.pdf

- AEMC Reliability Panel's 'Review of the form of the reliability standard and administered price cap' final report determined a 4-hour requirement for firming capacity, and identified that 96% of unserved energy (USE) events have a duration of less than 6 hours[2]
- NSW EnergyCo Advisory Board member Alex Wonhas' modelling in the article: 'How much storage? What's the cost?' showed 4-hours of storage as optimal[3]
- Numerous NREL and CAISO studies in the US, show 4-to 5-hours of storage in a network is sufficient to maintain reliability with up to 80% penetration of variable renewable generation. NREL's 2021 study shows US storage requirements "dominated by 4-hour battery technology" past 2040 in all scenarios[4]
- CAISO's expanded and refreshed 2024 study reinforces the comparative roles between storage durations, highlighting the need for ~50GW of 4-hour battery storage vs 5GW of other clean firming/LDES and 4GW of pumped hydro storage out to 2045[5]
- NREL has conducted several in-depth investigations into optimum storage duration requirements in the evolution and operation of the U.S. power sector. Multiple reports reiterate most benefits are met by four-hour storage, with additional duration coming at significant additional costs to the market
- In its 2022 Report 'Moving Beyond 4-Hour Li-Ion Batteries: Challenges and Opportunities for Long(er)-Duration Energy Storage', NREL identified that 'in locations with a 4-hour capacity rule, a 4-hour storage device captures well over 80% of the total capacity plus energy time-shifting value that could be captured by a much longer device. The incremental value of adding additional duration beyond 4-hours is less than the annualized cost of current Li-ion battery capacity'[6].

Whilst direct comparisons to other grids are not sufficient evidence on their own to dictate what the WEM should do, they are nonetheless instructive on the approach other grid operators and system planners are undertaking to incentivise the right type of capacity today, to ensure stability and reliability in the decades to come.

To date, the average duration of storage provided by Tesla globally is in the range of 2.5- to 3-hours, skewed upwards by a 4-hour requirement in several US jurisdictions including California (4-hours is driven by the peak load duration requirement to allow vertically integrated utilities to capture the full capital cost of the generator in their rate base; as well as the fact batteries are now out-competing gas peakers as the optimum technology for fast-ramp reserve capacity).

These results are somewhat intuitive, as storage under 4-hours is significantly cheaper than eight-hour storage as a whole of system cost, until we reach a grid in which there is high penetration of VRE, which is likely to occur in the 2040s or beyond. Subsequently, Tesla advocates for a data-driven approach to the WEM's ESR duration requirements and recommends the methodology seeks to minimize consumer costs and total system costs, not just focus on satisfying 1-in-10 year peak capacity needs.

If there are concerns for reliability risk or low probability tail-risk events occurring in the future, Tesla advocates for policy decisions to be made based on the underlying research and data that outlines the

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[2] www.aemc.gov.au/sites/default/files/2024-04/Draft%20Report%20-%20Review%20of%20the%20Form%20of%20the%20Reliability%20Standard%20and%20APC.pdf
[3] https://reneweconomy.com.au/how-much-storage-whats-the-cost-now-you-can-build-your-own-integrated-system-plan/
[4] www2.nrel.gov/analysis/storage-futures
[5] www.caiso.com/Documents/RevisedDraft-2023-2024-TransmissionPlan.pdf
[6] www.nrel.gov/docs/fy23osti/85878.pdf

scope of these potential considerations, given: a) the significant additional cost to build out a portfolio with longer storage durations that assume the worst; and b) the flexibility and modularity that short and medium duration storage assets have to expand their energy capacities over time if and when needed. Further, this approach can also integrate within the context of complementary changes – e.g. transmission upgrades, accelerated renewable energy connections and overbuild, demand-side participation, load flexibility, along with aggregated assets like Virtual Power Plants (VPPs), Vehicle to Grid (V2G), and community batteries, which can all alleviate perceived risks and ensure the system needs for reliability will be achieved – at a cheaper cost – than assuming blunt on-off operation of stacking grid-scale storage in the WEM. Without a more nuanced approach to duration calculations, a single error in a peak demand forecast scenario or an error in the ESOO could either drive underinvestment in requisite storage capacity or result in significant excess costs to consumers who will be bearing the cost of excess MWhs of 'insurance capacity' that does not deliver the incremental reliability benefits forecast.

Instead, an adaptable approach over time will allow the WEM to benefit from the technology cost improvements over coming decades – which means consumers won't have to wear the risk of over built infrastructure and can drive an optimum, and dynamic economic solution that evolves based on market requirements and price signals.

Advantages of a more nuanced methodology:

EPWA's current proposal to extend the ESROI in a 1-in10 year event using ADG is a blunt approach to a complex problem. For example, it negates the following two potential aspects of real-world battery operations:

1) **Concatenating operation with other storage assets**: Coordinating multiple storage systems to work together efficiently (e.g. 2x 4-hour storage assets dispatching as 1x8 hour asset) – i.e. a 500MW / 4000MWh battery storage system, has half the power capacity to offer as 2x 500MW/2000MWh systems- despite both offering 4GWh of energy storage capacity. This is particularly important for a smaller, isolated grid like the SWIS, where every incremental MW can participate in energy, frequency, and system services and lower the marginal cost to all WEM consumers.

2) **Leveraging modularity to expand energy capacity**: Scaling up storage assets behind the same connection point and power inverter infrastructure, as needed over time is often a much more efficient and commercially viable alternative to building dedicated longer duration green field sites (e.g. Neoen's Collie BESS being built in multiple stages).

In the NEM, the flexibility benefits of storage have been recognised by AEMO Services themselves, as demonstrated by the selection of the eight-hour Limondale BESS for the first round of the NSW LTESA Long Duration Storage tender. This project demonstrated the advantages of flexible battery storage solutions, whereby discharging was de-rated to eight hours, but the charging activity of the battery was maintained to have a duration of four hours to maximise solar-soaking benefits and address low operational demand risk during the middle of the day.

Another demonstration of the flexibility of four-hour storage is recognising that multiple four-hour batteries offer superior reliability and versatility in value stack over a single eight-hour battery, and at reduced costs per kilowatt ($/kW). To take another high level example, in the table below, both battery storage assets can provide 1 GW for eight hours, and while the total capital cost for the 2GW four-hour BESS is 20% higher (using AEMO's 2024 ISP cost assumptions), this is more than compensated by it being able to provide double the power capacity (and associated benefits of charge/discharge flexibility, capacity reserve, ancillary service provision, network services etc). Therefore comparing the 2GW/8GWh option with a 1GW/8GWh BESS shows the 4-hour BESS is ultimately better value – and indeed 40% lower cost when using a $/kW basis for comparison:

Comparison of AEMO Cost for BESS (from 2023 IASR)

	GW	GWh	AEMO 2030 $/kW	Total Capital Cost $M
BESS 4hr	2	8	1,253	2,506
BESS 8hr	1	8	2,087	2,087
			- 40%	+ 20%

In practice, this could see the 2GW/8GWh portfolio of (4-hour) battery storage flexibly satisfy 9 out of 10 years of peak demand requirements – whilst also providing significant value across other system and network services. Then, if a 1-in-10 year extreme peak demand event were to occur, resulting in a 1GW supply gap for 8-hours, this same portfolio of 2GW/8GWh could still meet requirements by operating at a de-rated power capacity and provide 1GW for 8 hours (i.e. still 8GWh) – and avoid additional costs to consumers that would otherwise come from building a dedicated 1GW/8GWh 8 hour battery that is not necessary for 90% of peak demand events; and/or forcing all future ESR to be >8-hours through the updated ESR duration incentives; whilst also risk stranding the existing pipeline of shorter duration ESR re-seeking capacity accreditation.

An alternative approach to ADG:

A better methodology than the Availability Duration Gap (ADG) approach for evaluating ESR duration requirements - one that could lower costs to consumers - could focus on value-based or system-level optimisation rather than rigid duration-based rules. This would assess proposed ESR ability to meet critical grid needs—such as evening peak demand, contingency reserves, and renewable integration—through a more holistic assessment that considers flexibility, availability, and alignment with system reliability requirements. This would be akin to how AEMO models for the Integrated System Plan – using a detailed grid simulation and dispatch model (e.g. PLEXOS, HOMER etc.) to simulate actual grid operations. AEMO also stress tested outcomes by extending scenarios beyond likely demand, supply and weather conditions – see ISP Appendix 4.[7]

Applying this method in the WEM would then assign capacity credit based on actual system contribution during critical periods, rather than a fixed duration threshold. For example:

a) Dynamic Dispatch Simulation: Model each storage asset's dispatch during peak demand periods and contingency events to determine how much firm capacity and essential system services are delivered when needed.

[7] AEMO performed exploratory modelling to test the resilience of a power system dominated by VRE to prolonged VRE drought events. In the absence of reliable predictions of future weather conditions, algorithms have been applied to historical data to extend the duration of observed extreme weather conditions to simulate a more volatile future climate. This 'what-if' analysis simulated an extended period of low VRE conditions, extending a three-day event to eight days in duration. This approach retains the inherent internal consistency between supply, demand, and transmission models by using historical weather rather than future synthetic weather patterns.

b) Contribution-to-Reliability Metric: Use probabilistic reliability metrics like Effective Load Carrying Capability (ELCC) to evaluate each battery's contribution to reducing unserved energy – to highlight actual demand/supply gaps forecast.

c) Flexible Duration Weighting: Instead of requiring a hard 4+ or 6+ hour threshold, assign partial credit based on how a battery's profile matches system needs (e.g., a 2-hour battery that reliably covers net peak ramps could still get credit), i.e. maintaining EPWAs approach to de-rating.

d) Incentivise Optimal Siting and Operation: Reward ESR placed where and when they improve grid stability most—such as in constrained nodes or during low reserve margin periods, or low demand events, or at the load —regardless of raw duration.

Summary of Comparison:

Metric	ADG-Based Method	System Value Contribution
Basis for Credit	Minimum hours	Actual contribution to grid
Incentive for Innovation	Low	High
Likely Cost to Consumers	Higher (overbuild risk)	Lower (targeted value)
Market Efficiency	Rigid	Adaptive

Summary of Concerns with Tranche 8 Amending rules:

1. Technology bias: while the Tranche 8 amendments aim to be technology-neutral, there is a risk that market mechanisms may inadvertently favor longer-duration storage solutions (e.g., 8-hour+ ESR) due to their ability to provide sustained output. If capacity payments or reserve service contracts prioritise duration over flexibility, fast and flexible ESR under 8 hours could face reduced competitiveness, discouraging investment in this proven and scalable technology.

2. Increased cost to consumers: if ESR duration methodology is based on the blunt assessment of 1-in-10 year events but do not account for modularity, concatenation, demand flexibility etc then this could lead to an overbuild of capacity at the expense of consumers.

3. Regulatory uncertainty: The transition to new market rules introduces uncertainty for asset operators. For existing 4-hour storage, changes to capacity accreditation methodologies or reserve service eligibility criteria could impact revenue projections. For future projects, unclear or delayed implementation of the Tranche 8 rules may deter investors, particularly if payback periods are extended due to lower-than-expected market returns.

4. Operational Constraints: requirements for participating in new reserve services, such as the Contingency Reserve Service, may impose technical or financial burdens on existing ESR. For instance, frequent cycling to meet reserve obligations could accelerate battery degradation, increasing maintenance costs and reducing asset lifespan. Without clear compensation for such wear-and-tear, operators may be disincentivised from offering these services.

Recommendation:

Tesla recognises that short-duration storage is not the sole element required for a decarbonised electricity system. A diverse portfolio of storage types and technologies—varying in scale, duration, and grid levels (behind the meter, distribution, and transmission)—will be essential. However, for the near and medium-term targets outlined by the WEM's objectives, a focused data-backed approach on cost-effective, ESR duration is recommended. This strategic focus will ensure that the primary goal of transitioning to a high-renewable generation mix is met efficiently and effectively. The policy intent of the ESR Duration Requirement is focused on reliability, and thus consideration should be given to the billions in uplift in costs for optimal four-hour versus longer duration storage solutions and exploring alternative methods to address adjacent objectives for tail risks.

Given the continual changes to ESRDR to date, and challenges in reaching consensus on how best to forecast required ESR duration going forward (not just a WEM specific problem- see other studies referred above), Tesla recommends deferring any decision until further analysis and consultation is undertaken. This will ensure a data driven approach that is future proofed to the inevitable changes of the WEM's generation fleet and demand composition. Therefore, Tesla recommends EPWA set the value at 4 hours for inclusion in the 2025 ESOO and undertake a more fulsome review of the methodology together with industry in the months to come.

If this approach is not viable, we then recommend considering the following alternatives:

a) Recognising the benefits of flexibility alongside duration for system reliability, in parallel, adopt a capacity accreditation methodology that recognises these unique values of shorter duration ESR. This could involve assigning higher capacity credits to ESR that demonstrate high availability and rapid response capabilities, even if their duration is shorter than other storage technologies.

b) For existing 4-hour BESS, the transition to the new market rules must be carefully managed to avoid stranding assets. EPWA should provide clear guidance on how existing facilities will be accredited and compensated under the Tranche 8 framework. For future projects, a roadmap outlining the timeline for rule implementation and expected market outcomes would reduce investment risks and build confidence.

c) EPWA establish an industry working group focused on ESR to ensure that the specific needs of the WEM, and all duration, operation, and flexibility benefits are taken into account.

d) If Tranche 8 progresses unchanged, we recommend grandfathering previous ESR duration certifications for a minimum of 10 years to ensure investment certainty.

e) Finally, we recommend maintain the benchmark technology as battery storage to avoid volatility in the BRCP, and align with ESR cost trends and emissions objectives going forward.

We look forward to ongoing engagement as battery storage assets continue to deploy at scale in WA, as well as continuing to support WA's energy transition going forward.

Yours sincerely,

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