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Mr David Swift
Energy Security Board
COAG – Energy Council

30 September 2019

Re: Post 2025 Market Design – Issues Paper

Dear David,

Tesla Motors Australia, Pty Ltd (Tesla) welcomes the opportunity to provide the Energy Security Board (ESB) with feedback on its 'Post 2025 Market Design – Issues Paper' (Issues Paper). Tesla supports the ESB adopting a strategic 'principles-based' approach to evolve the development of the National Electricity Market (NEM) in order to avoid inefficiencies created by continued incrementalism. In turn, this will be critical to inform long-term policy design and provide clarity of direction to market bodies and market participants.

In summary, Tesla recommends the ESB:

- **Take a principles-based approach to market design** – recognising the opportunity and value that emerging technologies such as energy storage provide in terms of market and grid services. This should include providing a NEM DER roadmap and utility scale storage target for the integration of these technologies to account for the fast pace of technology improvement. The ESB's reform agenda should not be based on an iterative process (layering on existing rules) – the NEM needs streamlined and coordinated markets;
- **Focus on early trials** – to provide demonstrative evidence (ahead of 2025) of the new services required and the ability for new technologies to contribute to the system and deliver on market principles ahead of the ESB's market reforms being enacted;
- **Adopt the AEMO Integrated System Plan (ISP)** to underpin market design modelling – in addition to including a 100 percent renewables (or a 'zero-emissions') outcome that accelerates AEMO's 'step-change' scenario, aligning with commitments being made internationally and to drive the level of ambition required in the NEM. If the ISP is taken as a guide for future transmission, storage and generation infrastructure, then appropriate markets or alternative funding mechanisms can be designed to support these infrastructure requirements. This will provide industry ongoing consistency and alignment across multiple future scenarios, and will leverage the comprehensive consultative processes already undertaken; and robust analysis that continues to be refined as costs, assumptions and inputs are updated based on industry feedback;
- **Include a metric for emissions reduction** in its assessment framework – as well as provide transparency around how carbon costs and risks are being incorporated into future market designs to prevent ongoing market distortions (i.e. where causers are not being allocated costs to pay). This is already being incorporated into commercial analysis of projects, and will be increasingly critical in assessing future investment decisions in Australia's energy sector; and
- **Continue to consult widely** given the criticality and impact that wholesale changes to market design can have, and look to other jurisdictions that have demonstrated reform benefits, as well as insights from global energy participants that can provide input into investment and participation experience beyond the NEM.

More detailed comments and responses to the consultation questions are included below. For further information on any of the points raised, please contact Dev Tayal at atayal@tesla.com.

General Comments

Tesla supports the ESB undertaking a principles based approach to market design assessment. The preferred outcome is a 2025 system that is governed by principles and is able to account for the fast pace of technology improvement - using early trials to demonstrate new technologies' contribution to the system and ability to deliver on the principles.

From Tesla's perspective, enabling the integration of energy storage into the NEM will be critical to achieving an efficient, secure and low-emission future grid, as outlined by the Finkel Review blueprint and now consistently recognised by the AEMC and AEMO. As a global leader in both stationary energy storage and electric vehicles (and the interaction and integration between the two and with the grid), Tesla looks forward to continued engagement through the ESB's 2020 work program in facilitating a fit for purpose NEM for the decades to come.

The following provides additional considerations across the 5 key market design challenges identified in the ESB's Issues Paper.

1. Driving innovation to benefit the consumer

The ESB rightly promotes the National Electricity Objective as the threshold test and overarching principle for market design. As the Issues Paper notes, consumer empowerment should also be central to an efficient and equitable future market. This will be increasingly critical as the sector transitions towards more decentralised and distributed assets (often owned and paid for by end-consumers). As part of its ongoing consultation, the ESB can assess what existing barriers and challenges are inherent in the NEM's retail structures, and how new models may instead serve to create additional benefits for these end-consumers who may require additional incentives, options or new market design elements to share their assets to benefit the wider market. Irrespective of the wider design framework, owners of DER assets should be fairly compensated for the services they provide to both the energy market and the networks.

A critical component of consumer empowerment will be ensuring sufficient consumer education and awareness. The importance of this has been clearly demonstrated by the various residential battery storage and virtual power plant programs being rolled-out in the NEM, particularly in South Australia – where there has been significant opportunity to address concerns and create increased awareness for the wider storage industry, yet there remains high levels of confusion and complexity for consumers. Collaboration between government, industry and market bodies can assist in the education of customers.

Innovation will flourish when design principles focus on achieving outcomes, rather than mandating specific short-term requirements. This is particularly true for the energy sector, where technical requirements are critical to maintain the safe, secure and reliable operation of the system, however emerging technologies can often meet equivalent outcomes through non-traditional means. To provide two specific examples:

- **System security services -** Tesla battery systems have a virtual machine model that can mimic the response of a traditional rotating machine to provide an inertial response. Tesla is working to demonstrate this inertial response capability and will continue to engage with market bodies to explore how inertial services may be procured and compensated in the market. By recognising such innovations in service provision that can achieve equivalent desired outcomes, and not restricting the supply of services to be based on traditional technologies or restrictive technical requirements, end-consumers will benefit from more efficient investment and system operation as new technologies continue to evolve and integrate into the NEM.
- **Metering and monitoring -** DER assets are increasingly able to meet the Chapter 7 requirements of national electricity rules, however the additional requirements of the *National Measurement Act 1960* will prevent these assets from being used as an appropriate sub-meter - a requirement for residential solar power purchase agreements (PPAs) and some virtual power plants (VPPs). A performance based approach for metering would reduce the need for customers to install a second revenue grade meter for PPAs, VPPs and other emerging residential energy services.

2. Investment signals to ensure reliability

The Issues Paper recognises the challenges for industry in navigating an unstable policy environment and uncertain investment landscape over the long term. From an energy storage perspective, whilst still a growing sector, the NEM currently provides mixed signals for investors looking to develop private storage projects, highlighting a significant gap in meeting AEMO's forecast levels of storage deployment by 2030 (i.e. over 10GW by 2030 as projected in the 2018 ISP 'fast change' scenario). These projects are crucial to contribute to both reliability and system security outcomes in the short term, and to drive affordability and efficiency outcomes for consumers over the longer term. From a wider market design perspective, AEMO highlights the increasing role of storage to provide an attractive alternative to investment in network infrastructure, provide key grid services, and enhance market competition for wholesale energy and ancillary services as stand-alone or aggregated assets in the form of additional dispatchable generation capacity.

It is within this context that the ESB should explore what potential market design features will be necessary to stimulate the requisite levels of private investment, for example:

- Capacity mechanisms and/or contracted payments – the efficacy of centrally planned deployment levels may warrant further consideration, as well as consideration of how direct contracting may complement market based revenues as has been used in California to optimise the system for both reliability and the contributions of new technology such as storage
- Pay for performance – to ensure all services, and the quality and performance of those service being provided, can be fully recognised and can generate returns
- Equitable access and technology neutrality – structuring markets to value service provision (rather than asset type) becomes increasingly relevant for evolving market designs that will need to integrate a suite of technologies providing comparable services across the grid. As a principle, all technologies should be able to access all revenue streams for which they can provide services.

3. Integration of distributed energy resources

DER assets are growing in their scale and proportional impact on the grid. A long-term market design must continue to enable growth in DER across the NEM, whilst also ensuring deployment unlocks the potential benefits that DER can provide in terms of critical network support and reducing costs. This has already been demonstrated by several trials (e.g. South Australia Power Networks Salisbury Trial and Energex) which highlights how the smart management and deployment of battery energy storage assets on the network can reduce peak demand, reduce peak export, and minimised overvoltage issues.

Tesla's SA VPP program, which recently expanded from public housing trust customers to private customers in South Australia, is leading the way in highlighting opportunities that can be realised across multiple stakeholders, with SAPN, AEMO and residential customers enjoying some of the benefits of aggregated storage and solar systems providing energy and ancillary services. Whilst not a full representation of the total market value stack, by leveraging AEMO's VPP trial to access additional market streams, value generated from this market participation will be returned to customers in the form of reduced electricity bills, which in turn will reducing the payback period for investment in the solar and/or storage assets.

VPPs can also have a demonstrable impact on reducing wholesale price exposure of the utilities themselves, where they have invested in appropriate active DER infrastructure. For example, Green Mountain Power in Vermont, has invested in a VPP consisting of 2,000 Tesla Powerwalls. Over July-18, Green Mountain Power estimates that the VPP saved the utility $500,000 over the course of a week.

The ESB is well placed to review all existing market participation barriers that are preventing DER assets and VPPs from extracting the full market value from the services they can provide in the NEM. Tesla also recommends the ESB consider the parameters for market design that will allow DER assets and VPPs to provide all services currently provided by utility scale assets. As noted in the Issues Paper, this would increase the value of DER to owners, drive additional investment, and lower overall system costs. This could take the form of a NEM-wide DER roadmap (as instituted in Western Australia) to set out the barriers and outline both short term priorities (through immediate trials and market changes) and long-term priorities (for post 2025).

4. System security and resilience

Tesla supports the ESB exploring how the NEM's current energy-only market may be expanded to ensure ongoing system security and resilience. As a general principle, Tesla supports incentive-led approaches that seek to support innovation through markets rather than mandating services or regulating through network-led requirements (as the latter approaches typically introduce greater inefficiencies).

We encourage the ESB to consider how additional 'ancillary' markets may be integrated – such as fast frequency control, inertia, flexible day-ahead dispatch – and welcome further consultation on the option design. A key consideration will be the interaction across all market types, noting that technologies are increasingly reliant on multiple sources of revenue ('value stacking') to meet required rates of return and drive new investment – so new markets may not be mutually exclusive to other design features such as capacity availability payments. As with all energy market design features, the detail will greatly influence the potential (and viability) of each option and as such, the ESB must continue to refine any initial specifications in consultation with the market.

An important lesson from the design of capacity mechanisms in other jurisdictions, is for the ESB to ensure that whatever mechanisms are progressed – they encourage all technology types to participate, so long as they can meet the system security outcomes needed. For example, a study in the UK found that so-called 'stress events' on the UK's energy networks are typically around two hours, yet short duration batteries were initially dominating the capacity payments in the market. To address this, the UK applied a de-rate factor to ensure that storage with shorter duration (e.g. 15min to 30min) could still participate in the market, but were recognised as being less valuable than 2 hour to 4 hour storage systems. Similarly, the participation criteria should acknowledge that there is no need to over-capitalise and require 6 or 8 hour storage capacities if the system only needs system security services for 2 hours. This approach is also in line with technical requirements introduced in the Ireland and Californian markets.

5. Integration of variable renewable energy

The current reform processes seeking to integrate and coordinate renewable generation and transmission infrastructure is reliant on the ESB to provide clarity of direction and vision. In particular, by setting a strategic framework for post 2025, the ESB can ensure the AEMC's Coordination of generation and transmission investment (COGATI) review meets its stated objectives and drives additional investment into the NEM.

The COGATI review does not need to be over engineered – and given the timeframes involved, cannot afford to introduce layers of additional complexity into existing market frameworks that are already multi-faceted. The ESB should consider a middle path approach, whereby:

- The ESB ensures that AEMO's integrated system plan is 'investment grade' to show where key transmission investment is needed and highlight where/how much new generation is needed within each Renewable Energy Zone
- This can then be used to incentivise generation to locate in these zones and unlock the investment required and will address the risk of building out key transmission links ahead of generation and can combine with other policy incentives to offer to first-mover projects (such as marginal loss factor uplifts)
- In combination, variable renewable generation should be complemented by energy storage targets so that flexible dispatchability can maintain reliable supply
- Network service providers themselves should also be incentivised to consider grid scale storage as a credible alternative to network investment – such as through the capabilities provided by 'virtual transmission'.

Additional detail and specific feedback on the ESB's consultation questions are included in the table below.

Feedback on Consultation Questions

Consultation Questions	Tesla Comments
What scenarios and shocks should be used? How should these be used to test market design?	ESB should adopt the AEMO Integrated System Plan to underpin its own market design modelling – this will provide industry ongoing consistency and alignment across multiple future scenarios, and can leverage the comprehensive consultative processes already undertaken; and robust analysis that continues to be refined as costs, assumptions and inputs are updated
How can market and economic modelling best be used to evaluate individual components of market design or the end-to-end market design?	Future grid planning studies have often focused on facilitating higher renewable energy penetration levels (leveraging existing government subsidies for large-scale wind and solar); and/or on how to best manage the upcoming retirement of coal plants via replacement generation capacity and stronger transmission links. However, as yet there are no overarching plans or direct mechanisms to support the integration of storage that will need to be deployed in parallel to contribute to both reliability and system security outcomes in the short term, and drive affordability and efficiency outcomes over the longer term (e.g. by providing an alternative to investment in network infrastructure, improving loss factors and reducing congestion, or enhancing market competition for energy and ancillary services). The ESB's market design program can fill a key gap in this area and leverage the AEMO's ISP modelling to provide clarity of direction to market bodies and participants regarding the scale and speed of the future investment for the NEMs energy storage requirements going forward (at both a utility and distributed scale).
Is the assessment framework appropriate to evaluate the effectiveness of future market designs? What else should be considered for inclusion in the assessment framework?	A strong and direct measure for low emission outcomes should be central to any future market design, and we recommend a clear metric or criteria be created to provide the support and investment certainty required for low-emission energy technologies.
Have we identified all of the potential challenges and risks to the current market? If not, what would you add?	Similar to the commendable work the COAG Energy Council and ESB have initiated with the AER on expediting RIT-T processes, it will be useful to consider how the full value streams can be unlocked for 'non-traditional' sources of generation and network services in the immediate term, where there are clear market barriers currently preventing uptake. This will ensure true efficiency across the NEM's infrastructure requirements (more broadly than just network investments), whilst also improving loss factors, power quality and system security. A key aspect of this will be reviewing the appropriateness of existing network investment frameworks (i.e. the RIT-T/D). If it continues to be the case that non-network solutions are all un-successful through these existing processes, then a review on market benefit/cost definitions may be warranted (e.g. to recognise the additional value streams being provided by storage to the benefit of the wider market). A broader review on the assessment frameworks may also be required to address existing biases towards traditional capital investments in the network, noting that alternative models have already proven successful in other markets, such as California's Transmission Economic Assessment Methodology.

Which of these challenges and risks will be most material when considering future market designs and why?	Investment risk – as identified by the ESB issues paper – that is created by ad-hoc government interventions targeting significant infrastructure or generation investments not based on clear or transparent selection criteria, and led by Government owned assets – as is currently the case with the large pumped-hydro projects being explored. Whilst government interventions are external influences to the NEM, the ESB must recognise that any market design will need to provide additional investment certainty for private projects seeking to compete in the same energy, ancillary or capacity markets. Coordination risk – significant reforms are being undertaken in parallel and whilst longer term policy direction is valuable, the ESB must also recognise the speed of market integration required to extract full value from new technologies, many of which are already transforming market processes and network requirements (e.g. AEMO's Virtual Power Plant demonstrations and call for more storage, smart inverters and management systems). Flexible market design will be critical to allow industry to flag market gaps or flaws and allow fast resolution of issues as they are identified. For example, the existing rules only allow load-side participation for DER and demand response services. To provide appropriate direction for future DER and demand-side participation (noting the concurrent rule changes and trials being progressed), the ESB must assume a market design that allows for both load and generation side participation, and also ensures DER assets can be optimised across both energy and ancillary service markets to maximise market efficiency. This will align with the AEMO and Energy Networks Australia (ENA) ongoing work program through its Open Energy Networks.
Which (if any) overseas electricity markets offer useful examples of how to, or how not to, respond to the challenges outlined in this paper?	Tesla supports the ESBs initial consideration of the UK, PJM, and Californian markets, which are all undertaking distinct approaches to enhance the provision of ancillary services (e.g. pay for performance) – in particular focusing on the integration of new technologies such as battery storage through a combination of centrally planned targets, direct contracting and capacity availability payments. California is a great example of a market that is creating appropriate investment signals for new assets – whereby capacity contracts have been allocated to both storage and gas plant - demonstrating technology neutrality but also showing that storage can compete successfully when it is allowed to.

Conclusion

Tesla supports all ongoing work undertaken by market bodies alongside the ESB to provide clear direction as Australia's electricity system undergoes a significant transformation.

With substantial levels of investment still to come to drive the integration of new generation, transmission and energy storage (as highlighted in AEMO's Integrated System Plan), Tesla welcomes the ESB's efforts to coordinate a market design review that will concentrate industry focus and enable fulsome consideration of future requirements and participation of emerging technologies such as utility-scale and distributed storage systems.

Tesla welcomes the opportunity to continue to engage with the ESB as this work progresses, to ensure the immediate reforms and market rule changes being developed at a working level are aligned and tracked against the longer-term vision for the grid and market in the decades to come.

Kind regards

Emma Fagan

Head of Energy Policy and Regulation