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Chair
Energy Security Board
Lodged via: info@esb.org.au

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RE: Energy Security Board – Capacity Market – Project Initiation Paper

Dear Anna,

Tesla Motors Australia, Pty Ltd (Tesla) welcomes the opportunity to provide the Energy Security Board (ESB) with feedback on its Capacity Market – Project Initiation Paper. As a global leader in clean energy products and the largest provider of battery storage systems across Australia, we remain focused on creating a fit for purpose market design that can support our mission to accelerate the transition to sustainable energy. We are highly motivated to continue our engagement across all reforms being progressed by the ESB, including the detailed design seeking to explore potential capacity market mechanisms for the national electricity market (NEM).

As the ESB progresses towards its final recommendation to Ministers at the end of 2022, it should use the next twelve months as an opportunity to ensure the NEM is a future-focused market that facilitates investment in new technologies that collectively support a zero-emission energy future – at both grid and DER scale. Rather than look to extend the role of large thermal generators or expand the scope of government interventions, the ESB can strengthen incentives for the characteristics required to complement a renewables-based system, namely fast response, flexible capacity (and demand response) and provision of system services such as frequency, voltage, system strength and inertia. This will ensure the right investments are made today, ahead of coal plant closures, and ensure system security, reliability and affordable prices are maintained seamlessly going forward.

If[1], at the end of this process, the ESB ultimately concludes that current investment signals need to be strengthened and lengthened by unbundling and explicitly valuing capacity, then Tesla recommends:

1. **A flexibility market is the preferable mechanism** to incentivise the new build, flexible capacity and demand response required to support the energy transition reliably and at lowest cost
2. **All forms of capacity payments to existing thermal generators should be excluded** as this would be highly inefficient and antithetical to the overarching objectives of the transition, state targets, and the NEO more broadly
3. **Alternative mechanisms (e.g. a flexibility market) should be systematically assessed as potential substitutes to the RRO** before it becomes enduring or receives further enhancement
4. **De-rating considerations should reflect actual system needs** and avoid restrictions on plant operations

Further detail on each of these points is provided in the response that follows.

Sincerely,

Tesla Energy Policy Team

[1] We note this is a big 'IF' from a project financing perspective and will continue to change based on a range of influencing factors, however, there may always remain political appetite to address perceived risks through additional levers to ensure entry and exit of capacity is more streamlined and minimises high consumer prices

Context

As is well demonstrated by the AEMO's draft 2022 ISP, we are on track for a 'step-change' transition – away from centralised thermal assets towards a renewables-based electricity system. As we rapidly displace coal with renewables, the value of fast-response, flexible capacity increases in tandem. With storage complementing renewables (and recognising the true capability of grid-forming inverters and power electronics) - the full suite of reliability and system security services can be provided without falling back on any synchronous generation or traditional network assets such as synchronous condensers. As AEMO aptly summarises, "we need to build a system and market now, not in a few decades, that can operate at close to 100% instantaneous renewable energy".

Meanwhile, the investment case for storage is complicated, given the NEM does not fully value the suite of services that can be provided. Despite a growing pipeline of battery announcements, investment decisions for new projects are still largely made based on forecasts of frequency market returns, which provide the bulk of the revenue stack. However, these markets are intrinsically shallow, and are likely to be saturated well before 2025 due to the rapid influx of both utility-scale and distributed assets. This will require further evolution in the investment case for storage.

The introduction of fast frequency response markets, coupled with the recent move to five-minute settlement will help to address this concentrated investment signal, and will expand the value of fast-response storage and demand response capacity. Additional, longer term reforms may also act to diversify the commercial case for future battery storage projects (e.g. system strength provision contracts), but without structural change, projects will likely remain strongly reliant on out of market support mechanisms (e.g. state-based schemes, ARENA funding support, CEFC financing support, SIPS contracts etc) or seek nuanced case-by-case project investment drivers at the margin (e.g. short-duration systems to hedge existing gentailer portfolios). This remains out of step with the speed and scale of storage deployments AEMO highlights will be required to ensure an optimal, least cost pathway for the NEM – around 20GW of installed storage capacity by 2030, and up to 60GW by 2050, 50% as coordinated DER storage: *"The most pressing need in the next decade (beyond what is already committed) is for batteries, hydro or viable alternative storage of up to eight hours' depth to manage daily variations in the fast-growing solar and wind output"* [2].

Whilst we recognise the broad stakeholder support (and simplicity) of retaining an energy only NEM, it is clear from the ESBs scoping report that detailed design of a capacity mechanism will be progressed regardless, together with further analysis on its justifications and benefits relative to the base case of a stronger Retailer Reliability Obligation. However, before the RRO (or a similar decentralised, gentailer led model) is assumed to become the enduring framework, we recommend ESB explore alternative mechanisms that target the type of new capacity that is needed to ultimately deliver on end goal of a zero-emission NEM – i.e. incentivise fast response, flexible generation and demand response capacity in way that also includes DER assets. This could include models flagged previously in the ESB P2025 work, or be open to new options put forward by industry.

Energy market design is hard, and must solve for a range of competing objectives, with trade-offs between them: optimising economic efficiency to minimise long-term costs to consumers; ensuring security of supply; reliably integrating low-carbon generation; and providing policy certainty and market stability (beyond election cycles). Given the complexity in optimising across multiple interdependent variables, Tesla recommends policy makers take a principles-based approach to market design – prioritising 'no-regrets' decisions, for example recognising the opportunity and value that technologies such as battery storage provide in terms of market and grid services. Within this framing, the focus of all ESB reforms should be on supporting and streamlining the development of new renewable, storage and network capacity, rather than artificially extending the life of the existing coal fleet.

[2] AEMO 2022 Draft ISP: "significant investment in the NEM is needed to treble the firming capacity that can respond to a dispatch signal, including utility-scale batteries, hydro storage, gas generation, and smart behind-the-meter batteries or "virtual power plants" (VPPs)"

1. A Flexibility Market is a better, cleaner, less costly path forward

As general principles to apply to capacity mechanism design, Tesla encourages the ESB to maintain a focus on incentivising build-out of flexible capacity to enter the market – with the type of resource clearly defined such that it does not end up favouring incumbents and non-flexible assets. A capacity mechanism should ultimately reward the true reliability and performance of assets based on system requirements and to meet operational goals, not just preserve existing market powers based on legacy large-scale assets.

With these principles in mind, and as part of its detailed design work, Tesla recommends the ESB look at introducing a bespoke capacity mechanism, referred herein as a 'Flexibility Market', that has targeted design and participation parameters to best match the NEM's unique challenges and capacity deployment requirements over the coming decades. We acknowledge that unbundling and explicitly (and transparently) valuing capacity can provide an important safety net for governments concerned about potential reliability risks arising from retiring plant. This unbundling can also benefit all participants by avoiding further ad-hoc interventions or reactive reforms that undo or mute the effectiveness of long-term price signals that would otherwise incentivise new build capacity.

Specifically, Tesla recommends the introduction of a Flexibility Market to target additional revenue for new generation, storage and demand response capacity that is both fast-ramping and able to provide defined services to support the grid (as opposed to simply rewarding registered 'peak MW' capacity). This approach would provide transparent, efficient, and predictable price signals for new capacity at all scales. This would also address the risks of disorderly coal plant exits by ensuring new capacity is incentivised to enter the market before old plants are retired.

As a starting point, we suggest specific detailed design elements worth considering could include:

- Capacity (or demand response) must be new – the objective should be to accelerate additional investment, not reward incumbent plant
- Eligible assets must provide a combination of 'flexible services', such as fast response and fast ramp controllable dispatch – driving value for money outcomes and avoiding over-investment in single-use or out-dated assets
- Payments can be tied to actual technical capability (including energy and relevant ancillary and system services), as opposed to bluntly paying based on registered 'peak MW' capacity – i.e. the market needs fast-response, accurate, and targeted service provision, not more large, slow-start MWs ramping out of step with system needs
- Adaptable provisions for additional locational and temporal specific needs – i.e. temporary scalars tied to identified needs (e.g. as set out in AEMO's power system security reports, such as addressing low operational demand risks in one area, or provision of inertia in another)
- Technology neutral without being prescriptive on asset type, characteristics (e.g. duration[3]) or commercial models
- Scale neutral provided technical capability and service standards can be met – i.e. DER and VPPs should be eligible and encouraged, noting capacity mechanisms typically have a bias to centralised assets, with additional uncertainty or barriers for aggregated, distributed assets, when this will form the bulk of flexible storage by 2050
- Low/zero emission requirements could also be layered (or form part of an uplift multiple) to drive emissions reduction and align with existing state emission reduction targets and goals

The design could take either a central auction procurement approach (similar to standard capacity markets or NSW LTESA approach) that provides contracted revenue streams for set periods (e.g. 10 – 15 years), or be co-optimised with the existing NEM dispatch of energy and frequency markets to dynamically incentivise new entrants and be linked to real-time operational requirements (similar to the original intent of Infigen's proposed operating reserve

[3] We recommend avoidance of restrictive definitional parameters for plant characteristics (e.g. as currently proposed by the NSW Roadmap's requirement for storage to be "at least 8-hours duration") and instead let market and commercial drivers promote the most appropriate asset through genuinely technology neutral principles.

market). Either way, to deliver competitive efficiencies and support innovation, the procurement mechanism itself must be flexible and allow projects to capture the full value stack that their technologies are capable of providing even as it evolves over time.

A NEM Flexibility Market would help avoid the ongoing challenges being experienced in the UK's capacity market, first introduced in 2014. The UK started with the typical assessment of assets and award of contracts based on peak nameplate capacity, which created overly generous payments to existing large coal and gas facilities – at the expense of other flexible new technologies such as battery storage and demand response. This issue ultimately led to a demand response provider suing the UK Government for a bias to incumbent fossil fuel technologies. Following ongoing tweaks and evolution of the scheme, the UK has seen an increase in capacity payments to battery storage from around 140MW of capacity in 2018, to 770MW for the 2024 delivery year[4]. We suggest the ESB build on these lessons and leapfrog the NEM's mechanism to be fit for purpose at commencement.

Moreover, by expanding beyond the standard (but blunt) 'peak MW' criteria often used in historical capacity markets, it is envisaged a Flexibility Market could ultimately complement the ongoing work of the AEMC that is seeking to introduce new markets for essential system services (e.g. system strength and inertia). It also becomes more aligned with state REZ plans, where incentives for new projects would ensure MW capacity targets are achieved as well as firming, storage and system service provision, facilitating connection of renewables with increased network utilisation. And it aligns with the congestion model proposed by Edify to create new congestion relief payments through dispatch. But perhaps the greatest benefit of all is being able to avoid introducing mechanisms that reward old technologies to address future grid issues.

2. Capacity payments should specifically exclude existing, emission intensive thermal plant

Tesla agrees that "*explicitly valuing capacity can complement existing spot and contract market revenue streams, and in doing so, should provide an investable and enduring long-term signal.*" But this should be relevant to only new projects seeking financing to bring additional capacity online.

From first principles, it would be unnecessarily inefficient for a capacity mechanism to supplement the energy market revenues of ageing thermal plant when we need that same plant to rapidly retire to achieve our "net zero emission market" of the future. In other words, it seems completely backwards to provide capacity payments to prolong the life of a coal plant that is already a sunk asset, when those funds could otherwise be used to incentivise and accelerate the entry of the additional capacity actually required (see figures below), ahead of said coal plant retiring.

To include old high-emission plant in scope would also seem counter to the overarching emission reduction criteria set by Ministers and is clearly incompatible with emissions reduction targets set by all state governments. It also does little to address the market power risk that the ESB has identified, with the NEM's thermal plant concentrated amongst a limited set of participants. Accordingly, Tesla does not support the introduction of any mechanism that would artificially extend the life of existing thermal generators. We urge the ESB to limit the scope of any potential capacity mechanism design to allow payments only to new capacity. This mechanism could then be complemented by the host of additional reforms being considered for orderly exit management – such as improved information provisions, compliance regimes, or jurisdictional processes to ensure thermal plant closures occur as expected.

[4] https://www.emrdeliverybody.com/CM/Capacity%20Auction%20Information.aspx

Figure 1: Resource adequacy designs should be targeted to incentivise the new capacity required

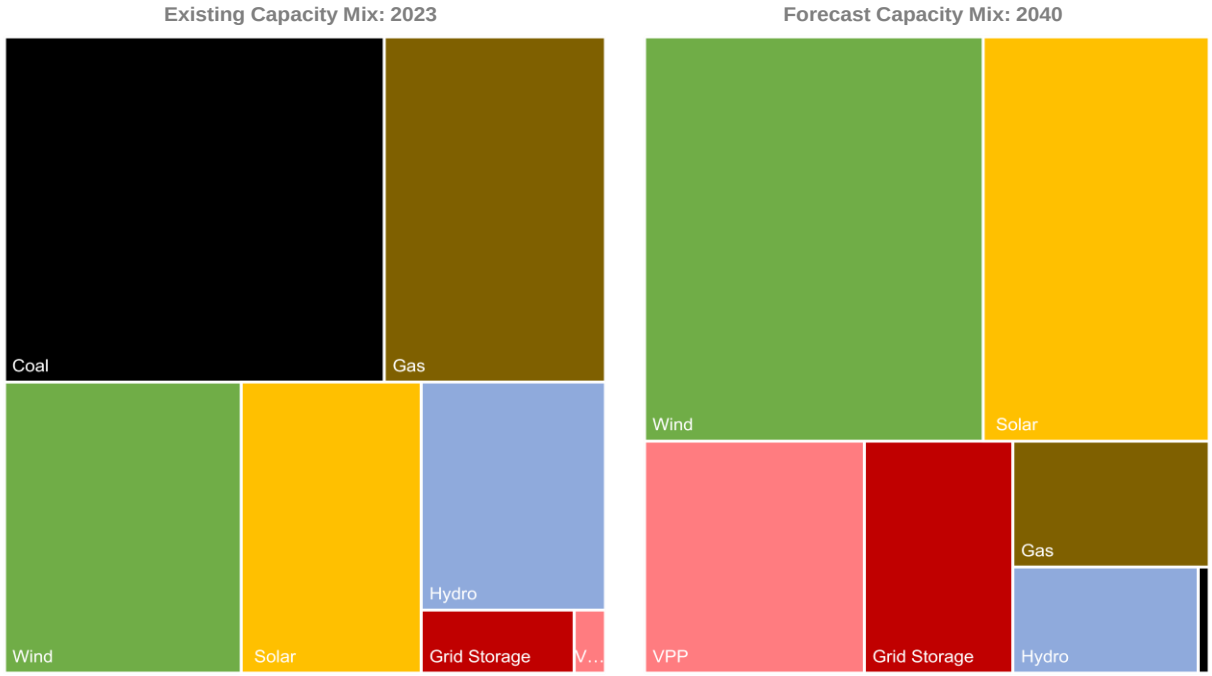
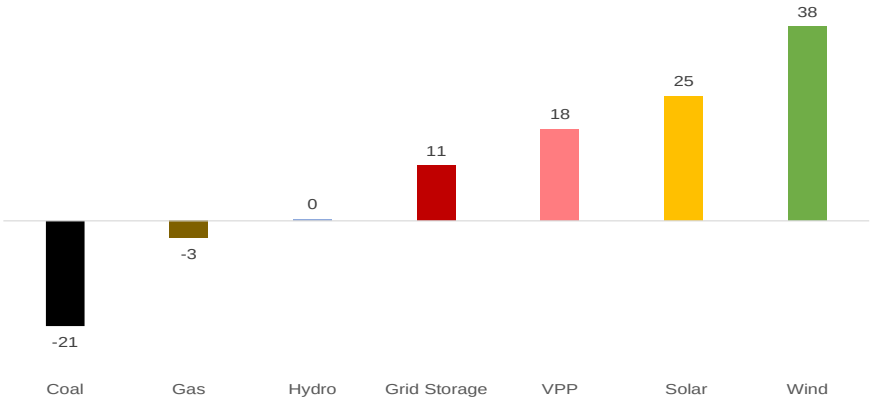


Figure 2: Forecast change in capacity mix 2023 - 2040 (GW)



Source: AEMO 2022 Draft ISP

Technologies such as battery storage provide critical reliability and system security across the NEM, addressing unexpected outages or strategic bidding behaviour of the existing thermal coal and gas fleet. It seems counter-productive to reward these increasingly un-reliable thermal assets whilst simultaneously muting investment signals for new flexible capacity. As noted above, we have already seen these risks play out in other markets, with capacity mechanisms in the UK and some parts of the US used to prop up legacy thermal plant and/or incentivise additional gas generation at the expense of targeted deployment of new battery storage projects. This results in dampened energy prices, halting the case for future projects and creating a feedback loop for higher capacity payments – leading to much greater market inefficiency and unnecessary costs to consumers.

By designing a new Flexibility Market that strengthens investment signals for new, flexible capacity only - resource adequacy and provision of system services can be met in a way that is both technology neutral (allowing inverter-based resources to compete with synchronous machines) and scale neutral (allowing provision from DER and virtual power plants) to ensure lowest cost, highest benefit outcomes for consumers over the long-term.

3. Decentralised retailer led solutions (i.e. RRO / PRRO) should be properly assessed against alternatives before becoming entrenched (or enhanced)

The existing RRO is a complex mechanism that is still being understood by the market. Direct impacts are unquantified and influences on both existing and new storage projects remains unknown. However, it is widely accepted (and acknowledged previously by the ESB) that the RRO (and any enhancements) will have an inherent bias to incumbent, ageing, slow-ramp thermal plant that will be rewarded for nameplate 'peak MW' capacity in order for large retailers to satisfy their obligations and would result in overcompensation of existing thermal generation assets.

Given the RRO's structural design, the removal of triggers and/or evolution to physical certificates will only increase this bias to large thermal plants. Battery storage can participate in theory, but its speed and flexibility is devalued relative to its duration limitations (the inverse of how gas and coal plants are proposed to be valued and rewarded). This also ignores plant level availability and resiliency – which is higher for new, low emission technologies with less moving parts.

We also support the view that the RRO (in whatever form) will impose increased barriers to retail competition and product innovation (i.e. gentailers with large portfolios of thermal assets will see relative advantages, and drive reduced liquidity in financial markets).

Finally, there remain ambiguities and disconnects between the stated intent of the RRO and the treatment of storage specifically. It would be helpful to clarify that storage (when charging) is exempt from any obligations, at all scales - utility, industrial scale and for VPPs participating in wholesale markets. This approach is consistent with the objectives of the RRO and recognises that storage is not equivalent to end-customer load, and has a unique ability to provide energy, system and network services that support the grid and increase reliability, rather than hamper it. Particularly where assets are located behind the meter, storage will already be responding to price signals to relieve peak demand and provide grid services when required (and when rewarded appropriately).

4. De-rating parameters should reflect actual system needs and avoid restrictions on operation

We note the ESB's high level discussion on the need to de-rate capacity across different technologies types. Whilst the influence of these parameters will be inherently linked to the overarching capacity mechanism progressed, we agree that accreditation is an incredibly sensitive issue for all technology types and can 'make or break' the entire efficiency of a capacity scheme. Getting it wrong can either completely restrict the participation of particular technologies or create overly generous incentives for its participation.

Ultimately, the de-rate element should be designed in a way that fully recognises the unique capability of each technology class. For example, for battery storage capacity, rewards must value the fast and accurate response, flexibility to stack services, full swing from generator to load, and ability to address all peak reliability events. Conversely, new obligations placed on storage participating in capacity markets should not simply mirror existing thermal plant that may have lower performance capabilities, and should reward participants based on the actual service provided when it is needed, recognising new technologies can act differently (to the benefit of consumers and system operators).

We support the ESB progressing the design for a future NEM that will be very dynamic and have rapid fluctuations on demand and supply side as renewable energy penetration (both sides of the meter) increases.

Noting the precedence of battery storage participating in capacity markets globally, we observe the following:

- In California, for storage to be eligible for 100 per cent capacity credit, it must have "the ability to operate for at least four consecutive hours at maximum power output" (the 4-hour rule).
- In UK, there are already hundreds of MWs of battery storage projects currently participating in the capacity market, with varying contract lengths and de-rating factors, but with the market now offering over 98% for 4-hour systems. We note the availability of all plant seeking capacity payments is confirmed by looking at plant generation correlation with peak demand periods – and recognising that as long as plant have been available to generate during these peak periods – they should receive capacity payments.
- In France, batteries are de-rated at 100% (i.e. awarded for their entire capacity). This reflects the lack of grid-scale batteries operating in France as yet, providing education on how battery storage performs at a system level – ahead of an expected influx of deployments in later years (when de-rates may be revised downwards).

Other high-level considerations for capacity accreditation are included below, based on our experience supporting the assessment, detailed design and development of similar market reforms globally:

- Depending on the final procurement approach, additional flexibility in capacity accreditation will be required to future proof against known and unknown reforms (e.g. new spot markets or other network service markets).
- Capacity accreditation should be based on expected output. We support a de-rate approach so long as de-rate factors do not artificially penalise storage relative to incumbent thermal plant and/or introduce extra barriers (e.g requiring unnecessarily long run times greater than 5 or 6 hours delivers minimal market benefit but imposes huge penalty and can exclude entire asset classes, noting most system stress events are less than 4 hours).
- It is worth ESB considering the value provided when storage acts as a load (i.e. charging from the grid), as it may actually be providing a system benefit at times of high generation and low demand. This could include additional payments to storage when it is charging at the 'right' time, and aligns with the workstream exploring congestion management that is seeking to incentivise additional dynamic loads on the system.
- On compliance and obligations – the design should recognise and reflect that the primary purpose of a capacity mechanism is for meeting reliability criterion and addressing resource adequacy over the long term. It should not be designed to address unplanned contingency events (e.g. trips of generation/network) on an interval basis – as that is what contingency markets are for. There is no need to overlap on objectives or tie obligations or penalties to try and restrict operations for these other purposes.