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Elizabeth Bowron
Australian Energy Market Commission
PO Box A2449
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19 October 2018

Re: Coordination of Generation and Transmission Investment (ref: EPR0052)

Dear Ms Bowron,

Tesla Motors Australia, Pty Ltd (Tesla) welcomes the opportunity to provide the Australian Energy Market Commission (AEMC) with feedback on its Options Paper on the Coordination of Generation and Transmission Investment (ref: EPR0052) (the Options Paper).

From the perspective of facilitating battery energy storage provision, Tesla looks forward to working with the AEMC to achieve the following outcomes:

- The creation of a new market classification or market participation category, to recognise that energy storage is a unique asset class within the scope of the National Electricity Market; and
- A finalised regulatory position clarifying that energy storage assets should be exempt from paying transmission use of system (TOUS) charges.

Summary

Tesla considers that until energy storage assets have their own classification, they should be exempt from all TUOS charges. Settling the process for registering utility scale storage assets within the national framework is a necessary precursor to determining what charges these assets should be subject to.

This should not be perceived as being counter to principles of technology neutrality, as an energy storage asset is not a traditional end-use customer (it does not 'consume' electricity), nor is it a typical generator (it is not the source generation point). Storage assets also provide unique characteristics – being fully controllable, as well as providing tangible network benefits including system security, frequency and voltage support. Tellingly, this view is held by the transmission networks themselves, and appears to be the preference of most stakeholders engaging on the issue, with over 90 percent seeking a TUOS charge exemption until there is clarity on classification.

Any decisions that may inhibit the progress of storage projects should be avoided, and a requirement to pay both connection charges and TUOS charges is a clear example of an outcome that would perpetuate existing market distortions, provide a direct disincentive for storage assets, lead to further competitive disadvantage relative to other generators, and hinder the development of new storage required to meet the increasing demand for flexibility and provision of critical network services.

A detailed overview of our rationale for TUOS exemption for storage is included in the response following. For further information on any of the points raised in this submission please contact Emma Fagan at efagan@tesla.com or Dev Tayal at atayal@tesla.com.

Context

The Options Paper focuses on critical issues related to the current treatment of utility scale and transmission connected energy storage in Australia, specifically whether or not storage devices should pay for use of the transmission network through TUOS charges. As a related point, the AEMC touches on considerations for how hybrid facilities that combine storage with another generation source are treated for the purposes of registration under the national electricity rules (NER).

The current uncertainty in respect of these two interlinked issues has caused confusion and uncertainty for many energy market participants, and should this uncertainty continue, or decisions be made to further inhibit the integration of storage systems into the market, it will have significant repercussions on the development of further storage projects in Australia.

From a wider market perspective, the National Energy Objectives are "to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to: price, quality, safety and reliability and security of supply of electricity". By disincentivising one class of technology that can provide particular services in the most efficient and cost effective manner[1] and with demonstrable cost savings for customers[2] – just because the rules and regulatory frameworks are unsettled in this space, appears to be against these objectives of the national market.

The current NER framework contains several distortions for emerging technologies and does not yet fully recognise their unique capabilities and performance in providing a range of grid benefits. Battery storage in particular, is put at a competitive disadvantage relative to traditional generators. These distortions have been acknowledged and are being actively addressed through several concurrent AEMC, AER and AEMO reviews with varying implementation timeframes.

As an interim measure, and recognising their unique characteristics, battery storage assets register as both a generator and a market customer, being penalised with network and system operation costs associated under both classifications – payments to connect as a generator and to use the transmission networks as a load.

From a system planning perspective, there is an established consensus of the need to promote the uptake of storage in the NEM to ensure continued safe, secure and reliable operation over the coming decades, as well as promote efficient investment infrastructure in the interests of consumers. As AEMO state in its Integrated System Plan: "There is a growing need for energy storage over the next 20 years to increase the flexibility and reliability of supply"[3].

Classification of energy storage in the national electricity market (NEM)

Battery energy storage does not fit well within any of the classifications for traditional types of participants in the energy market. While storage assets most closely resemble a generator in the services they provide to the market, they do not generate electrons – so are not, technically, a generator. The controllable nature of the load side of a storage asset, as well as the services that it can provide whilst charging, including both frequency and voltage support – also means that it's more than a traditional market load.

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[1] AEMO "Initial operation of HPR", available at: https://www.aemo.com.au/-/media/Files/Media_Centre/2018/Initial-operation-of-the-Hornsdale-Power-Reserve.pdf

[2] "Frequency control ancillary service (FCAS) market costs were 57% ($32.7 million) lower than in Q4 2017, with a key driver being the introduction of new technology (Hornsdale Power Reserve and demand-side response)." – AEMO "Quarterly Energy Dynamics – Q1 2018, Available at: https://www.aemo.com.au/-/media/Files/Media_Centre/2018/QED-Q1-2018.pdf

[3] "modelling shows that retiring coal plants can be most economically replaced with a portfolio of utility-scale renewable generation, storage, DER, flexible thermal capacity, and transmission." – AEMO "Integrated System Plan', available at: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/ISP/2018/Integrated-System-Plan-2018_final.pdf

The current interim requirements in the NEM, which require battery storage assets to register as two asset classes has also had a number of unintended administrative and cost implications for the asset operators:

- **FCAS raise and lower services -** The current model requires raise and lower FCAS services to be registered to the battery operating either as a load or a generator. As an example the Hornsdale Power Reserve is registered to provide 63MW as a Scheduled Generator for contingency FCAS (6 second raise) as well as 63MW as a Market Customer for contingency FCAS (6 second lower). If the Hornsdale Power Reserve was registered as a single asset then it would be able to register to potentially provide >180MW in both the contingency FCAS raise and lower markets. This accounts for the ability of a storage asset to swing from full charge to full discharge within a single dispatch period.
- **Dual clearing risks** – managing a single physical asset as two separate assets for the purpose of AEMO dispatch also presents dual clearing risks. The operator of a market battery energy storage asset will need to manage dispatch bids conservatively to ensure that it is not inadvertently cleared as both a generator and a load in a single dispatch period.

Tesla's preferred approach is to establish a new market classification for storage. This will manage the current inefficiencies in operation and dispatch outlined. There is a wealth of international experience that can be drawn upon to support this position, as outlined in our previous submission to the Discussion Paper.

Payment for use of the transmission networks

Ongoing payments for use of transmission systems by utility scale storage is a key operational consideration for project developers looking to build new hybrid facilities, retrofit storage onto an established wind or solar facility, or for transmission network connected storage assets to be viable in providing market and network support services.

The current treatment of storage assets in Australia, and the impact of the existing uncertainties, were well summarised in the Discussion Paper,[4] but the Options paper appears to take an initial position that will only increase the uncertainties and raise doubts for storage projects to go ahead. As a transitionary measure, under the current NER, utility scale storage (larger than 5MW)[5] is required to register as both a market customer and a scheduled generator. As noted by the AEMC, this has the following implications:

- Utility scale storage is required to pay network connection costs, as required by all generators looking to connect into the national electricity market (NEM); and
- Under Chapter 6A of the NER, the load side of a utility scale battery energy storage asset may also be required to pay TUOS charges for use of the network based on the relevant pricing principles developed by individual TNSPs.

In practice, battery energy storage assets are considered on a case by case basis in respect of whether energy storage resources will be required to pay TUOS charges or not. This lack of consistency makes it difficult for developers to accurately plan project expenditure and assess project feasibility. Should the AEMC pursue a change that goes further, such as considering storage equivalent to a load, or specifically mandating storage assets to pay TUOS, this could undermine battery storage projects from going ahead. This would also ignore storage assets unique characteristics beyond a standard end-customer load - such as being controllable, or providing grid and frequency stabilisation services. Ultimately, the AEMC has to decide

[4] AEMC "Coordination of generation and transmission investment – discussion paper", available at: https://www.aemc.gov.au/sites/default/files/2018-04/EPR0052%20-%20Discussion%20Paper%20for%20publication%20180413.pdf

[5] AEMO, "Interim Arrangements – utility scale battery technology", available at https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Participant-information/New-participants/Interim-arrangements-Utility-Scale-Battery-Technology

whether it:

a) Exempts storage assets from TUOS charges under the existing rule framework;

b) Further considers how storage assets should be classified based on their unique characteristics and services; and once a decision is made on classification, then consider how TUOS charges may apply; or

c) Treats storage assets the same as all other market customers and allocates TUOS charges on an equivalent basis.

As the AEMC notes: "ideally, consistent decisions on this would be undertaken across the NEM". Tesla's view is that this consistent decision should be to exempt all large-scale storage projects from TUOS charges until a more permanent decision is reached on what the classification of storage assets should be.

Stakeholder consensus on exemption

Tesla disagrees with the AEMC's assessment that "stakeholders were largely divided in their views" on whether or not it is appropriate for energy storage systems to pay TUOS charges. Assessing the responses to the initial Discussion Paper, it actually appears that 90 percent of stakeholder views submitted to the AEMC on the subject consistently argued for storage to be exempt from TUOS charges, or at least called for improved clarity on the classification of storage assets before a decision was made. This includes the view of the transmission network owners themselves (see table 1 below):

Table 1: Stakeholder Summary and views on TUOS charges for storage assets

Stakeholder	Views on TUOS charges
AEMO	Intending participants wishing to connect large scale batteries should discuss the process for the negotiation of use of system charges with the relevant TNSP or DNSP consistent with principles set out in the NER, since each NSP determines use of system charges according to its own pricing methodology. A new registration classification or category may help resolve the issues related to TUOS payments. The transmission pricing regime and payments for services should provide incentives for batteries to locate in "advantageous locations".
AER	The AER accepted ElectraNet's position on ESCRI and agreed that TUOS charges would not be payable at the connection point under the NER.
AGL	Create new or sub-category of registration for hybrid facilities to allow participants to utilise entire facility as a scheduled generator. This would enable generators to provide the benefits of storage to address network issues, whilst offsetting any applicable TUOS charge when absorbing excess load. (i.e. any TUOS charges applicable to a storage device when used as a load should reflect the value that the device provides to the network).
Australian Energy Council	Support establishing a separate registration category for storage, and specific consideration of the TUOS charging arrangements for such participants, which reflect the purpose of the storage: to increase the reliable supply to the grid.
AusNet Services	Storage can provide frequency regulation, reserve capacity, load levelling and peak shaving, and that these services will become increasingly important as the percentage of intermittent generation in the power system grows. Storage should not be liable for TUOS charges when performing these functions on the power system. Storage connections can be distinguished from other loads, including scheduled loads, because: • they are negotiated transmission services, and the pricing arrangements under Part J of Chapter 6A of the NER would not apply • their services are primarily energy supply chain services provided for the benefit of energy consumers, and are subject to AEMO dispatch control.
Clean Energy Council	The behaviour of utility-scale batteries as time-varying generators and loads means the current method of calculating and applying TUOS charges is not appropriate for these storage assets. Utility-scale storage assets are also unique in their potential to provide network support, congestion management services and an alternative to network augmentation works.

ElectraNet	Transmission-connected batteries that are centrally dispatched and cannot drive transmission augmentation should not be liable for TUOS charges. ElectraNet sought an exemption from the AER from TUOS charges being payable for the ESCRI-SA battery on the basis that the transmission services being provided under the terms of the connection agreement between AGL and ElectraNet will comprise negotiated transmission services, not prescribed transmission services
Energy Australia	When determining whether TUoS or DUoS charges should be applicable to storage assets, it is important to recognise that the primary use of storage is to provide generation services and facilitate the efficient use of the network. There is a risk that the application of TUoS tariffs to storage may undermine or inhibit investment in these assets.
Energy Networks Australia	Under the current transmission pricing arrangements, if transmission connected scale batteries are centrally dispatched and cannot drive transmission network augmentation, transmission use of system charges should not be levied when the batteries are charging. As the transmission service would fall within the definition of a negotiated transmission service, this outcome could be accommodated by the current Rules.
ENGIE	As storage has the property of demand when charging, should pay cost reflective transmission charges for any electricity imports, but be treated the same as generators on the exports. But network charges need to be more granular (either dynamic or conditional on system conditions) to ensure efficient and optimized response.
Genex Power	Within a separate/sub-class of registration for large-scale storage, generators should be exempt from TUOS by demonstrating their technical capability and economic business case to use load primarily to support the future dispatch of this energy into the NEM. A requirement to pay TUOS charges would provide a direct disincentive to invest in storage and potentially render projects commercially unviable
LO3 Energy	Transmission connected batteries should therefore be treated as generation, which means that consistent with the treatment of generators generally, they should not pay for use of the transmission network.
Origin Energy	While noting that storage generating units are both generation and load, our view is that their treatment under the transmission framework should be consistent with that of generators. On this basis, we consider it appropriate that storage units are not subject to TUOS charges.
Public Interest Advocacy Centre	PIAC recommends a separate registration category for storage and hybrid facilities. The creation of a storage-specific registration category would allow a decision to be made about the network charging arrangements for storage facilities independent of any decision for generators.
Reach Solar	Storage facility should pay TUOS charges if it "intends to behave as demand" and imports electricity from the grid for arbitrage purposes, but not where its main focus is generation and the provision of ancillary services.
S&C Electric Company	If TUOS is applied to all imports, regardless, then TUOS will be charged twice. Once when the electricity storage imports to charge and then the final end consumer will again be charged TUOS on their import. Noted work undertaken by Ofgem in the UK regarding charging, and rule changes submitted by Scottish Power to exempt electricity storage from balancing use of system charges.
Snowy Hydro	Large-scale storage, specifically pumped hydro technologies, should not be liable for TUOS charges on the basis that they provide essential system services such as energy, inertia, system strength and voltage support – services that are not provided by loads but rather by synchronous generation.
Tesla	Battery energy storage should not pay TUOS charges. They are controllable loads, have positive impacts on balance of system costs, are capable of providing critical system services, and therefore applying TUOS charges needs to be re-considered within the context of a unique classification.
TransGrid	Storage has the potential to provide a number of benefits and services throughout the electricity supply chain, including to wholesale and retail markets, ancillary services, network support and system security. These benefits can provide greater reliability and lower costs for consumers. Any concerns from allowing TNSPs to efficiently provide the range of services offered by batteries can be addressed through the application of the AER's Cost Allocation Guideline and Shared Asset Guideline. The Cost Allocation Guideline defines the allocation of

As noted in the broader context of this review, utility scale storage assets are currently required to register using imperfect market settings. Some of the arguments put forward by stakeholders for a storage asset to pay TUOS charges if it "intends to behave as demand" and import electricity from the grid for arbitrage purposes, show a lack of understanding both of the role of storage and the interim conditions for which they can register. Battery storage assets currently have no choice but to import from the grid under the current registration approach – as they have to be registered as a separate asset under a separate connection. AEMO is working hard to update settings but until a hybrid approach is developed there is no other ability to charge directly from a co-located wind or solar asset. As such, requiring utility scale storage to pay TUOS charges will disproportionately punish first movers.

Overview of Tesla position

The basis for charging TUOS for market customers is to ensure that TNSPs are adequately compensated for maintaining existing transmission infrastructure to ensure ongoing reliable and efficient supply of energy at all times – both peak and off-peak; as well as for investing in new infrastructure investments to meet projected increases in peak demand.

From first principles, these charges should naturally fall to end-customers that are passively using the network to receive a service or benefit– i.e. traditional load customers and other transmission and distribution network service providers that have a connection point with the network. Generators, who don't receive an equivalent or specific benefit at the connection point itself, do not pay TUOS charges, and AEMC's own analysis "assumes that this will continue to be the case". This makes sense for storage assets as well, as a connecting storage asset is ultimately negotiating with the TNSP for a power transfer capability at the connection point and should therefore only pay the connection charge that relates to the cost of their connection to the transmission network.

From a technical perspective, storage assets neither consume not produce electrons. All electrons are stored in the asset for export back into the grid at a later point in time by an alternative end-use customer.

The current framework is set up around historical definitions of services and customers – as the AEMC itself notes: "Given that the current framework is set up around transmission businesses planning to provide transmission services that are for the benefit of consumers, it follows that end-use consumers pay for the costs (investment and operational) incurred by the TNSPs in providing these shared transmission services. Consumers therefore pay TUOS charges." Storage assets should not be considered consumers in this traditional sense.

Battery energy storage systems in particular differ from traditional market customers and scheduled loads and provide network support benefits to the NEM in several characteristic ways that should negate any requirements for TUOS charges:

- Battery energy storage provides network support by managing the impacts of transmission congestion. This is particularly so during periods of high wind output and low network load where battery storage systems can reduce the need for wind curtailment by storing excess generation.
- Battery energy storage assets are capable of absorbing and supplying reacting power to support network voltage which can offset the need for infrastructure augmentation. These services are provided at cost to the battery energy storage asset operator who bears the costs of the losses associated with providing voltage support.
- Storage assets are also often dispatched to charge and provide critical system security services. No generator is ever required to pay TUOS charges, let alone when it is dispatched to provide a system service. The ability to quickly and accurately switch from discharge to charge to follow AEMO signals

was well demonstrated in the recent report by AEMO on the preliminary operation of the Hornsdale Power Reserve[6]. Charging TUOS for an AEMO instructed dispatch to charge may result in a counter incentive to providing critical frequency services.

It is also unfair to allocate use of system costs to storage systems in the same way as other market customers:

- The controllable nature of storage assets, and market optimisation principles, means that charging most often occurs during low price periods, which equates with periods of high generation. This controllability means that storage assets will not contribute to peak network congestion, and do not result in the same requirement for future network expenditure. For instance, the connection of a 100MW battery energy storage system does not mean that the TNSP is required to account for an additional 100MW of peak demand on their network. In practice, this may actually work to offset future network investment.
- The pricing principles set out in clause 6A.23.3 of the NER require that "prices for recovering the adjusted locational component of prescribed TUOS services must be based on demand at times of greatest utilisation of the transmission network by Transmission Customers and for which network investment is most likely to be contemplated". This highlights the inappropriateness of using the pricing methodology as is for storage assets – assets that are rarely, if ever, utilised as a load during peak demand periods. This is counter to the cost-reflective and technology-neutral principles of the NER.

Note that all points made above apply equally to DUOS charges for utility scale battery energy storage systems connected directly to distribution networks.

Precedents from International Contexts

There is a growing body of international experience that can be drawn upon to support the position of storage exemption from TUOS charges as well as instituting a separate market classification:

- Across the United States – the Federal Energy Regulatory Commission (FERC) has recently defined energy storage as "a resource capable of receiving electric energy from the grid and storing it for later injection of electricity back to the grid." This recognises that the services provided go beyond traditional generation or load services.
- As early as 2016, the UK Government recognised traditional network charging allocations as a barrier to storage technologies: "storage can be charged as an end user of electricity (even when this electricity is exported and used a second time). We are looking to address this double counting" and in particular highlighting it as "an issue which we believe could have an impact on the competitiveness of storage".[7]
- The UK's Ofgem and National Grid continue to assess how to "remove liability from storage facilities for Balancing Services Use of System charges on imports" through a formal working group[8] and rule

[6] AEMO, "Initial Operation of the Hornsdale Power Reserve" available at https://www.aemo.com.au/-/media/Files/Media_Centre/2018/Initial-operation-of-the-Hornsdale-Power-Reserve.pdf

[7] UK Department for Business, Energy & Industrial Strategy's "Call for Evidence", available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/576367/Smart_Flexibility_Energy_-_Call_for_Evidence1.pdf

[8] National Grid "Workgroup Terms of Reference" available at: https://www.nationalgrideso.com/sites/eso/files/documents/CMP281%20%27%20Removal%20of%20BSUoS%20Charges%20From%20%20Energy%20Taken%20From%20the%20National%20Grid%20System%20by%20Storage%20Facilities%27%20Terms%20of%20Reference%20v4.pdf

change process (CMP281).[9] This follows an initial discussion paper where the majority of respondents agreed that network charges for storage are unfair and should be reviewed. In the initial rule change proposal, it was recognised that the reduced recovery of these charges from storage operators would need to be recovered from the remaining customers, however estimates showed impacts to be very small – approx. 0.75% of the total use of system bill.

- Ofgem is also in the process of reviewing their current generator licencing requirements to create a modified generation licence for storage assets. Further the UK Government is looking to explicitly define electricity storage as a distinct subset of generation in the UK *Electricity Act 1989*.

Feedback on the AEMC's preliminary view

Preliminary Questions

In its Option Paper, the AEMC puts forward three definitional questions to clarify the TUOS issue. This preliminary definition appears to presume that the market is already fully competitive and has no distortions for storage assets. In practice, and as highlighted by the barriers to development, registration and participation of the Hornsdale Power Reserve, this is far from the case under the NEM's existing frameworks, which still require interim arrangements to allow large scale energy storage projects to proceed.

Given these existing arrangements, the only category that the AEMC should be currently considering is whether energy storage systems that draw electricity from the grid and then export at a later time should pay TUOS charges. As outlined above, Tesla's view is that it would be unfair to require any payment of TUOS charges by energy storage systems. This position is subject to change over time, but the approach for hybrid connection arrangement for utility scale energy storage is part of a broader work program that extends beyond this particular review.

Implementation Considerations

The AEMC's Options Paper also highlights several considerations that need to be taken into account should a TUOS exemption be implemented for storage assets. Additional feedback on these considerations has been included below:

- **Technology neutrality:** Tesla agrees with the principle and need for technological neutrality. Any asset capable of receiving electrical energy from the grid or another asset, and storing it to be provided later for energy or frequency purposes, should be considered within its own classification. In the interim, the double allocation of both network connection and TUOS charges would put storage assets at a competitive disadvantage against other generation assets (amongst other existing barriers in the current NER framework), despite having access to the same revenue streams when providing the same or similar services. Excluding storage from paying TUOS charges is not 'picking winners', it is recognising an imperfect market and minimising existing distortions.

  Government policy incentives may continue to promote particular technologies as required, however, these potential incentives should not be conflated with decisions regarding cost allocations.

- **Re-definition of TUOS charging allocation:** Tesla views this technological bias should be corrected by a specific classification for storage assets – as opposed to their interim treatment as both generators and market customers. The UK market regulator has recently acknowledged this issue:[10]

  "we remain of the view that storage may be at a disadvantage in comparison with generation in

[9] National Grid "Rule Change proposal (CMP281)" available at: https://www.nationalgrideso.com/sites/eso/files/documents/CMP281%20-%20Removal%20of%20Storage%20Import%20BSUoS%20Charges.pdf

[10] Ofgem, "Targeted Charging Review" available at: https://www.ofgem.gov.uk/system/files/docs/2017/08/tcr_scr_launch_letter.pdf

providing the same or similar services to other parties. We think that, in order to deliver changes as quickly as possible, changes to network charges for storage should proceed through the usual code modification process"

A storage asset's business model is built around serving customers, as is the case for other generators. Should storage providers in Australia continue to be placed at a competitive disadvantage, this is likely to distort market outcomes more significantly than any TUOS exemption, and lead to worse outcomes for consumers.

The AEMC notes the need to re-define the allocation of TUOS charges to clarify customers who 'end-consume'. Whether achieved through this wholesale NER re-definition, or a specific exemption for a classification that includes storage assets providing system services, Tesla supports further consideration of this issue.

- **System support services:** Given the nature of storage facilities and the system support role that they play, storage assets are very unlikely to impose balancing costs on the system when compared to other users. This would be the case even when storage operators provide these system services based on their own commercial drivers, as the AEMC notes. Currently, system services provided by storage assets often go uncompensated, particularly with respect to their speed, flexibility and accuracy. The AEMC argues that the provision of these services should be rewarded separately to the allocation of TUOS charges. Whilst this principle may hold in a truly fair and efficient market, in practice, storage assets are competing to provide these services against other generator assets that do not have to pay TUOS charges.

  If storage assets are the only assets to get charged for providing critical network services, while also providing these services in the most accurate, rapid and flexible manner, it would not create efficient market outcomes – counter to the national energy market objectives.

  Exempting storage assets from TUOS charges should result in fairer allocation of all charges and hence in stronger competition amongst ancillary service providers, which should in turn continue to drive lower cost outcomes and new forms of flexibility. Any decision made on the allocation of TUOS charges should therefore consider these wider impacts of ensuring effective competition in the generation and supply of electricity.

- **Impacts on Network Investment:** As noted above, storage assets (being classified as generators) are required to pay connection costs. Any additional impact on network investment caused by the charging behaviour of storage systems would be mitigated by the controllable nature of storage. As the AEMC recognises, "conceptually it would seem possible that an energy storage system that is required to register as both a generator and a customer might pay twice for the same assets". This is clearly a sub-optimal outcome that unbalances the principles of a fair and equitable framework.

- **Perverse Incentives and Unintended Consequences**: Exempting transmission network utility scale battery storage from TUOS charges does not need to result in an incentive structure where all scheduled loads add a battery storage system. Any battery will need to be metered separately, and this load can be netted off from the scheduled load at a site to determine the appropriate TUOS charge.

  Fear of flow on impacts to remaining customers liable for TUOS charges should also not be a barrier to implementation. Existing customers would be expected to pay the same (if not less) TUOS charges going forward, even with a storage exemption. This is because storage projects do not currently contribute to TUOS charges (e.g. with both Hornsdale and ESCRI negotiating exemptions), and increasing storage assets across the grid should assist in reducing overall network costs that need to be recovered from all customers (e.g. by providing network support or deferring capital investment). The proposal for the UK also highlights the insignificant impact expected for customers – with estimates of less than 1% impact on balance of system charges.

- **Avoidance of double counting**: The AEMC should also be taking care to avoid double counting, or double charging of network services. As noted above, energy storage assets neither produce nor consume electrons. They are built to store electricity generated from alternative sources, for use by and end use customer at a later time. In effect charging TUOS for all electricity imported from the grid into utility scale energy storage assets would result in a double count, as end-use customers who are eventually consuming this electricity are also charged TUOS for the same MWh.

  The only electrons technically consumed by utility scale energy storage assets, is the net variance in total MWh charged from the grid, and subsequently discharged into the grid, based on round-trip efficiency losses. This is the view that has been taken by the Clean Energy Regulator (CER) in allocating renewable energy target (RET) liability to utility scale storage assets.

Tesla does not agree with the AEMC's preliminary view that to exempt energy storage from TUOS charges would represent a non-technologically neutral approach, by not treating all transmission customers the same.

Related Considerations

A separate but no less immediate consideration relates to how energy storage assets can be integrated with wind and solar under a hybrid site configuration, particularly under retro-fit arrangements. Whilst Tesla recognises that AEMO is currently exploring configuration options that may assist in clarifying part of this process, a series of regulatory provisions are already adding unnecessary complexity that is hindering battery storage assets from being integrated with renewable energy projects.

Tesla supports an approach that allows for the co-location of multiple assets behind a single point of connection in order to realise greater utilisation of existing network infrastructure. However, due to the current interim classification of battery storage assets, project developers looking to combine their renewable assets with storage need to find ways to preserve the renewable generator's classification as semi-scheduled, whilst the battery is separately registered as both a scheduled generator and market customer.

If operated by a single market participant, there should be no reason that the co-located renewable asset could not combine with the energy storage system to effectively provide 'firmed' output – unlocking the flexibility attributes of batteries to the benefit of market and technical outcomes. However installing a storage asset downstream of an existing generating asset connection point should not require the existing asset to register as a scheduled generator.

In addition, onerous network and metering requirements specify separate and re-defined connection points (e.g. under parent – child arrangements via embedded networks) and are forcing project proponents to register as network service providers (NSPs) in some instances, if they seek to retrofit battery energy storage onto an existing wind or solar site. This forces individual exemptions from NER connection access obligations as well as needlessly invokes AER consideration of whether the distribution network services are to be classified for economic regulation. Clearly, this is not a fit-for-purpose arrangement.

Alternatively, where existing wind or solar sites look to retrofit battery energy storage, and adjust the site NMI to the medium voltage side to accommodate the addition of a battery energy storage asset, they risk generator performance standard compliance issues

The uncertainty and fear of onerous requirements being added to existing generators if a storage asset is installed is presently driving layouts that are economically inefficient and sub-optimal from a power system security perspective. Consideration of where connection and metering points are required for renewable projects should take into account these storage integration issues, and ensure an ability to integrate new storage assets with existing generators seamlessly.

A simple solution in this instance would be to allow the renewable project developers to locate the site NMI on the medium voltage side of the site transformer, without requiring renegotiation of the existing generator

performance standards. This would enable renewable energy sites to be truly “energy storage ready” should they later look to retrofit a battery energy storage asset.

Conclusion

Tesla supports all ongoing work undertaken by both the AEMC and AEMO to address and coordinate the broad range of interconnected topics related to generation and network planning, particularly at such a critical period as the energy system confronts significant transformation.

The NER objectives explicitly promote the efficient investment in, and use of, electricity services in the long term interest of consumers. Recognising the transition that is currently underway, and with significant investment still to come to drive the integration of new generation and network infrastructure (as highlighted in the ISP), any decision or perverse incentive that will restrict battery storage projects from being developed or fully participating in the market should be avoided.

As such, Tesla believes the following core principles should form the basis of all future considerations by the AEMC on the critical issues outlined above as part of the Options Paper:

- Transmission connected storage assets should not continue to be treated as both a generator and a load for the purposes of network connection and ongoing operation. Energy storage asset should be afforded an exemption to TUOS charges, as the load side of an energy storage asset is fully controllable and provides tangible network benefits.
- A new market participant classification should be developed to account for the unique characteristics of battery energy storage systems when compared to the existing classes of generation assets and market loads.

Managing these points will reduce uncertainties and inefficiencies related to the current market development and operation of battery storage assets, and ensure that the uptake of storage projects is commensurate with the need for critical system security and grid support identified as part of AEMO’s future grid planning. Tesla welcomes further opportunity to progress these related work streams with the AEMC, AEMO and all relevant stakeholders, to ensure a fit for purpose regulatory framework enables efficient investment in the decades to come.

Kind regards

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