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Therese Grace
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

18 May 2018

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

Dear Therese,

Tesla Motors Australia, Pty Ltd (Tesla) welcomes the opportunity to provide the Australian Energy Market Commission (AEMC) with feedback on the Stage 2 Discussion Paper on the Coordination of Generation and Transmission Infrastructure (ref: EPR0052) (the Discussion Paper).

The Discussion Paper includes consideration of two critical issues related 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, and
- 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 points, particularly in respect of payment of transmission use of system charges (TUOS) and distribution use of system charges (DUOS), has caused confusion and uncertainty for many energy market participants. This includes project developers looking to connect energy storage systems on existing wind and solar sites, or develop new hybrid systems.

Tesla believes the following core principles should form the basis of all ongoing considerations by the AEMC on the two key issues outlined above:

- 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 treated as a generation only for network purposes, 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.

A detailed overview of our consideration and rationale for both of these points is considered in the response following. For further information on any of the points raised in this submission please contact Emma Fagan at efagan@tesla.com with any questions.

Kind regards

Mark Twidell

APAC Director – Energy Products

Payment for use of the transmission networks

As noted above, 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, and financially responsible market participants (FRMPs) looking to retrofit storage onto an established wind or solar facility.

The current treatment in Australia, and existing uncertainties, are well summarised in the Discussion Paper. As a transitionary measure, under the current National Electricity Rules, utility scale storage (larger than 5MW)[1] is required to register as both a market customer and a scheduled generator. As noted in the Discussion Paper 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).
- 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, as noted in the Discussion Paper, 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.

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.

Battery energy storage systems differ from traditional market customers and scheduled loads in a number of ways that should negate the standard requirement to charge TUOS.

- Battery energy storage provides network support, can manage 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 also 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 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[2]. Charging TUOS for an AEMO instructed dispatch to charge may result in a counter incentive to providing critical frequency services.
- The controllable nature of storage assets, and market optimisation principles, also means that charging most often occurs during low price periods, which equates with periods of high generation.

[1] 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

[2] 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

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. As noted above, it may actually work to offset future network investment.

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

The AEMC also highlighted a number of areas for consideration that need to be taken into account when considering the ongoing arrangements for whether battery storage assets should be charged TUOS. Preliminary feedback on these considerations has been included below:

- We agree 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 this classification. This includes battery storage as well as other asset classes.
- In respect of incentives - 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.

Hybrid facilities and classification of batteries

As noted above under the interim AEMO guidance battery storage facilities over 5MW are required to register as both a scheduled generator and as a market customer. Wind and solar assets are registered separately as semi-scheduled generators.

There are two issues related to this current requirement, both of which the AEMC have raised in their Discussion Paper, and which we discuss further below. The first arises from having to register a single physical asset (the battery energy storage system) as two separate assets [results in a separate dispatch for the purposes of NEM dispatch (a scheduled generator and a market load). The second issue is that this configuration does not allow the entity to use the battery to smooth out the wind or solar generation of the co-located asset.

Tesla's preferred approach in respect of these issues is to:

- Establish a new market classification for storage. This will manage the current inefficiencies in operation and dispatch outlined below. There is a wealth of international experience that can be drawn upon to support this position.
- Ensure that all hybrid facilities are able to deliver firmed output from the wind or solar generator. Note that this option can be progressed a matter of priority through the AEMO review process noted. Improving the conditions for firming can be done prior to introducing a new market classification for battery storage.

<u>Rationale for new market classification for storage assets</u>

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.

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 FRMP and/ or operators of the storage systems:

- **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.

The combination of these factors has led to a reduction in revenue when considered against how the system would operate as a single asset. There is also plenty of international precedence to support the move to a single asset class.

- The California Independent System Operator (CAISO) represents batteries as non-generating resources and the market operator manages state of charge limits through its market co-optimisation. This allows the resource to be properly optimised in the market and simplifies operations for battery operators and aggregators.
- Across the United States – the Federal Energy Regulatory Commission (FERC) has just 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.
- In the UK, Ofgem is 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*.

Tesla recognises that any new market classification that is introduced will need be also be considered with regard to the points highlighted in the Discussion Paper in respect of TUOS – the need for definitions to be technology agnostic, and management of any unintended consequences. However, we do think that introducing a new market classification type will lead to improved operational efficiency of storage assets and that any risks can be managed through appropriate consultation on asset definitions.

Approach for renewable firming

As noted above, a separate and more immediate consideration relates to how energy storage assets can firm the wind or solar output under a hybrid site configuration. Under the existing rules the entire site can effectively be registered to provide scheduled output from the entire site. AEMO is exploring detailed options of configurations that support this approach[3]. As such the point noted by the AEMC in the Discussion Paper that hybrid facilities cannot deliver firmed output is not strictly true.

While this approach would also benefit from a new market classification for storage assets (based on the benefits outlined above) it is not wholly linked to it. There are a number of options that could be considered

[3] AEMO, "Emerging generation and energy storage", available at https://www.aemo.com.au/-/media/Files/Electricity/NEM/Participant_Information/Emerging-Generation/Emerging-Generation-and-Energy-Storage.pdf

within the scope of the existing rules that could better allow for the firming of renewable energy output from hybrid facilities.

Tesla supports an approach that allows for the co-location of multiple assets behind a single point of connection. If operated by a single FRMP or system operator, there should be no reason that the co-located renewable asset could not combine with the energy storage system to effectively provide scheduled output. However installing a BESS device downstream of an existing generating asset connection point should not require the existing asset to register as a scheduled generator. The fear of adding onerous requirements to existing generators if a BESS is installed and shares their connection point is presently driving layouts that are economically inefficient and which may be sub-optimal from a power system security perspective.

Hybrid plants should be able to allow for renewable firming under the current electricity rules under a number of potential configurations, if the following principles are followed:

- Both/ all assets (wind or solar and storage) are installed behind a single connection point.
- Each asset can respond to separate signals from AEMO, with the appropriate control metering for each asset. This accounts for the different services that can be provided by each asset.
- A single generator performance standard (GPS) could apply to the entire hybrid site, to meet all AEMO requirements with some sections of the GPS having different performance standards for the BESS portion than for the renewable generator portion.

Tesla supports all ongoing work undertaken by both the AEMC and AEMO to address these issues. Managing these points will reduce operational uncertainties and inefficiencies related to the current market operation of battery storage assets, and encourage greater uptake of storage to provide critical system security support.