Australian Energy Market Operator (AEMO)

Via email to - mass.consultation@aemo.com.au

18 November 2021

Dear MASS review team

**MASS Review – Second Draft Determination**

Tesla Motors Australia, Pty Ltd (Tesla) welcomes the opportunity to respond to the Australian Energy Market Operator (AEMO) on the second Draft Determination on the Market Ancillary Services Specification (MASS). We appreciate the extended process that AEMO has taken to resolve the key issues of measurement resolution, and the due diligence that AEMO has taken in employing University of Melbourne (UoM) to undertake independent analysis ahead of releasing this second Draft Determination.

Tesla believes that the AEMO positioning in the second Draft Determination is evidence based and provides a reasonable compromise to address the concerns raised in respect of the one second data used for fast FCAS compliance purposes over the course of the AEMO VPP Demonstrations trial, and the existing 50ms requirement.

The 200ms measurement resolution proposal by AEMO recognises the unique characteristics of aggregated fleets of assets and virtual power plants (VPPs) and provides a reasonable middle ground to reduce costs for new market participants whilst maintaining the integrity of AEMO's operation.

Tesla supports the approach put forward by AEMO in the second Draft Determination:

- We support the 200ms resolution for aggregated facilities (more than 200 – with a 5% error if the number of aggregated sites is less than 200) and 50ms for all other facilities.
- We support AEMO's approach to measuring "at or close to" the connection points.

While we support the recommendations from AEMO, in the below we provide comments on:

- Positioning on updated measurement location and measurement resolution settings
- Baselining requirements and data resolution
- Transitional period, and
- Further support for the establishment of a DER Consultative Forum to continue to support the market integration of DER and VPPs over the coming years.

**Support for AEMO recommendations and general comments**

200ms measurement resolution for fast FCAS markets

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As noted above, Tesla supports the 200ms measurement resolution for aggregated assets with a 5% error applied where the number of sites is less than 200.

Tesla believes that the work done by AEMO to date supports the implementation of the 200ms requirement and we agree with the statement that this change is in the long-term interests of consumers and promotes the objectives of the National Electricity Objective (NEO). The "Fast FCAS Sampling Verification in support of MASS consultation – Part 2"[1] independent work undertaken by UoM was robust in supporting this position. Using 20ms frequency measurement supplied by AEMO converted to 50ms, 100ms, 200ms and 1sec *synthetic* power measurements with 0.7% droop setting and randomized polling for a 5kW battery by Tesla provided a replicable and verifiable analysis, separate from the FCAS assessment of a specific device or technology and focus the objective statistical analysis required to demonstrate that the verification error of 100ms and 200ms sampling rates reduces as the fleet grows.

As Tesla noted in our previous response to AEMO, we believe that a measurement resolution less granular than 50ms reduces costs for consumers, increases market competition and encourages more consumers to move from passive to active DER.

While we support 200ms and note that most responses to the previous consultation indicated an ability to provide data at the 100ms or 200ms resolution, there were also some responses that were limited to 1 second resolution.

We would encourage AEMO to continue the data-driven approach they have taken on the Draft Determination as a good approach for continuing the integration of new technology types into existing markets. We would support any future work done by AEMO to consider what would need to be demonstrated for 1 second resolution to be a viable alternative to further enhance competition. This may be a role for the DER Consultative Forum (more information included below).

**Tesla position: we are supportive of AEMO's position on 200ms resolution, notwithstanding our comments on the "inertial response" caveat and the points on data used for baselining, outlined below.**

Measurement location

While Tesla supported measurement at the device level in our response to AEMO on the previous Draft Determination, we are comfortable with the "connection level" approach proposed by AEMO in this second Draft Determination and support this decision.

We appreciate the comments made by AEMO in section 4.2.3 of the MASS Draft Determination:

> *On the other hand, if a potential FCAS non-compliance is identified using the grid/net response, AEMO may request the measurements from the asset/s to confirm whether the change in active power was in line with each Ancillary Service Facility's droop setting, frequency deadband or frequency deviation trigger settings"*

[1] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2021/mass/third-stage/fast-fcas-sampling-verification-in-support-of-mass-consultation-phase-2.pdf?la=en

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We believe that this largely resolves the potential under-delivery concerns that were raised by Tesla in our previous submission regarding fringe situations where uncontrollable load or generation may interfere with AEMO's assessment of FCAS compliance.

**Tesla position: we are supportive of the recommendations made by AEMO to measure performance from data "at or close to" the connection point.**

Inertial response

Tesla notes that the current wording of the 200ms requirement for "*aggregated facilities with no inertial response".* Our understanding of the description of inertial response (per the UoM analysis) is that this refers to the physical properties of "synchronous machines". As such in this context it is used as a physics term, rather than as a reference to "inertia" as a future market service.

We think that this is an important distinction for AEMO to make considering the AEMO "Application of Grid Based Inverters in the NEM" White Paper that was released in August this year[2]. That paper highlights the ability of inverter-based technologies to contribute to system inertia (when operating in grid forming mode). The White Paper also notes:

> *This does not exclude the potential of smaller distributed energy resources (DER) to provide capabilities in line with the applications discussed in this paper.*

As with the development of all new market or grid services, Tesla deems it prudent to ensure that DER are not inadvertently excluded from accessing these future markets or contracted services, provided they are technically able to meet all requirements.

**Tesla position: AEMO should clarify that "inertial response" in this respect refers to the physical properties of synchronous machines and is not intended to exclude VPPs from being able to provide future inertia market services if the market deems that necessary. We recognise that further work will need to be done to ensure that VPPs set up to support system inertia will also need to demonstrate that this does not interfere with MASS compliance and the ability to fully deliver on FCAS bids.**

**Baselining data requirements used by AEMO**

The one concern that Tesla has with a transition to 200ms resolution for aggregated assets, is whether that same data resolution is required over the 5 seconds preceding a Frequency Disturbance Time. AEMO has noted that conditional logging is appropriate for providing compliance data, which Tesla is fully supportive of as it significantly reduces the overall data storage requirements associated with logging and storing millions or billions of datapoints for a fleet of assets. Where logging at 200ms is triggered by a change in frequency, capturing the 5 seconds preceding

[2] https://aemo.com.au/-/media/files/initiatives/engineering-framework/2021/application-of-advanced-grid-scale-inverters-in-the-nem.pdf

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an event at the same data resolution is challenging. Where data needs to be logged at 200ms at all times to provide the same resolution for the 5 seconds prior to an FCAS event, it may undermine the allowance of conditional logging.

Tesla's understanding is that the average value of these measurements is only used to calculate a baseline for the purpose of Fast FCAS assessment, noting the potential challenges associated with capturing the 5 seconds prior to a frequency event using the same measurement resolution (under a conditional logging approach), Tesla has undertaken further analysis to determine whether 200ms (or 100ms data) provides any additional benefits when compared to 1 second data. Note that this analysis has been undertaken purely for the assessment of measurement resolution needed to establish a baseline. Tesla accepts AEMO's position on 200ms data resolution for the duration of the event and the 60 seconds following an event.

Tesla ran an analysis using the 100ms battery power measurements of 10 sites registered under VSSEL1V1 during five contingency raise events. We concluded that using 1sec measurements instead of 100ms measurements would have led to an over-estimation of the FCAS services delivered no greater than 11 Watts per Powerwall, that is 0.22% of the 5kW expected response at 49.5Hz. The average value of the fifty 100ms measurements over the 5 seconds preceding the Frequency Disturbance time is the benchmark against which the average value of the five 1sec measurements is compared.

Given that there are ten 100ms measurements in a 1sec interval, there are ten possible distinct average values of the 1sec measurements, each of which produces a different error compared to the 100ms benchmark. The figure below shows the results of this analysis, with the 0.22% baseline error mentioned previously observed for the 25$^{th}$ of August event (most negative value). It is worth noting that for contingency raise events, a positive error would lead to an underestimation of the FCAS services delivered. Indeed, the maximum error observed was 35 Watts per Powerwall (or 0.70% of 5kW) on 25$^{th}$ August, from an average 1-sec baseline of 1.275kW vs the average 100-ms baseline of 1.240kW. This is due to the same phenomenon as the one observed by UoM in their study of the FCAS window assessment methods, where the 1-sec measurements may capture the very beginning of an FCAS response at certain devices depending on which millisecond the frequency excursion happens vs which millisecond the 1-sec measurement happens.

For context for this analysis, Powerwalls have demonstrated in the Frequency Injection Tests that they respond to Frequency Disturbances within about 250ms, as mentioned in our previous submission. It is also important to note that this open loop inverter-based response does not rely on a meter's power measurements and that the baseline used by the control loop which provides FCAS services is the amount of real power injected/absorbed milliseconds before the Frequency Disturbance Time.

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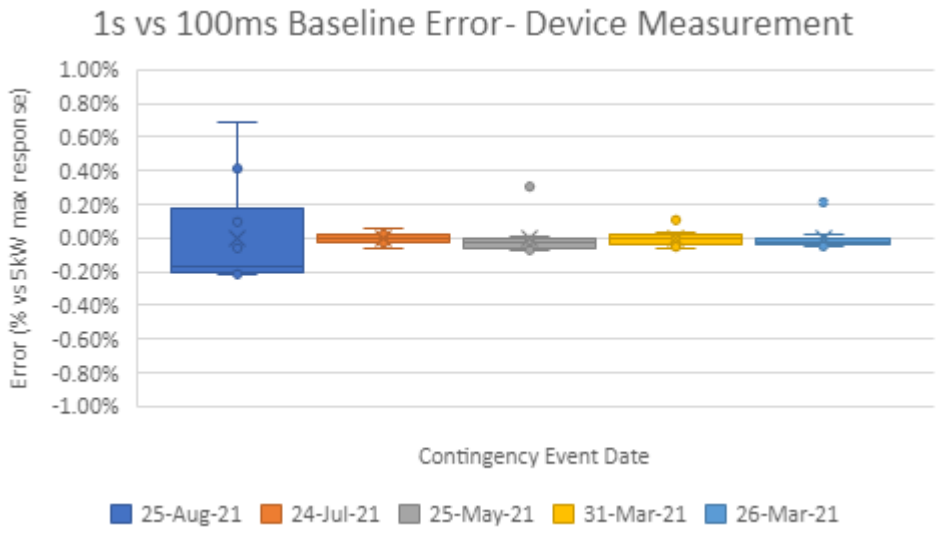


In addition to the analysis above, Tesla notes that a ≤200ms measurement speed over 5 seconds will provide 25 measurements for Fast FCAS, while AEMO is satisfied with 5 measurements for Slow and Delayed FCAS which require ≤4sec measurement speed over 20 seconds. Tesla would suggest that AEMO considers a 1sec measurement speed requirement over the 5 seconds preceding the Frequency Disturbance Time, which will provide 5 measurements for baselining purposes.

**Tesla position: Tesla recommends that AEMO consider using 1 second resolution for the 5 seconds prior to an FCAS event (for baselining purposes) and 200ms during and after the event. We suggest that AEMO consider data from Tesla and other VPP participants to verify our modelling above.**

### Transitional period

Tesla appreciates AEMO releasing the VPP Demonstrations Guide to Transition (Draft) document (Transition Guide). This is a helpful document for industry in transitioning from the VPP Demonstrations trial. There are still areas of the transitional arrangements that we believe would be supported by further clarification from AEMO, these include:

- Transitional arrangement boundaries - AEMO should clarify the boundaries and any limitations (other than time) to the “transitional period”. For instance, can AEMO confirm that if a market participant “separates load” as per the Transition Guide, then this separated load will no longer be considered as transitional. We understand that the separated load would need to be fully compliant with the MASS, however the definition of “transitional” also has relevance to the ESCOSA VPP licencing requirements in South Australia.
- New DUID – if all NMIs are moved across from the existing VPP Demonstrations DUID to a new DUID, does AEMO require a separate “plant” list, or can this be done through a back-end AEMO transfer of systems.
- Droop curve – AEMO has indicated that the droop curve applied to VPPs may be subject to review. How will this change be managed? Will it be subject to consultation and how will any change to droop curve affect existing participants?

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- Ongoing compliance data requirements – will AEMO continue to require data to be provided on an aggregated basis for compliance purposes or is a move to NMI level data (to address oscillation risks) anticipated. How is AEMO thinking about collecting compliance data? Is there the possibility of reinstating the API?
- Measurement location – for VPP operators who continue to use the transitional arrangements, does compliance data need to be provided "at or close to the connection point" (as per the MASS Draft Determination) or should it be provided from device level data (as per the VPP Demonstrations trial).
- NMIs – is there a limit on the number of NMIs that can be registered under the transitional arrangement. AEMO notes that it is possible to replace NMIs to address customer churn. Tesla asks AEMO to clarify whether there is a cap on the total number of NMIs that can be added to a transitional DUID, provided that the total MW capacity does not change (e.g., can a market participant theoretically add an extra 1000 NMIs to a 2MW registration provided the total MW does not change).
- Definition of "plant" – AEMO uses the term "plant" throughout the Transition Guide. Can AEMO clarify that in this respect "plant" refers to the devices that will be providing the FCAS response?

**Tesla position: Tesla believes that the Transition Guide should be updated to provide further information to industry which addresses the points above.**

**DER consultative forum**

As per our comments in the response to the previous MASS Draft Determination, Tesla is very supportive of AEMO's proposal to establish a DER Consultative Forum. We would reiterate our support for establishing this forum and believe that it should be set up as a matter of priority, particularly as AEMO looks to finalise the approach taken for collecting compliance data on an ongoing basis.

We largely agree with AEMO's approach to keep the Consultative Forum technical in nature, though we do think it is important for AEMO to clearly link the different work-streams with the various DER policy priorities as well. This will reduce duplication of effort and ensure that the insights garnered in the Consultative Forum are used to their best effect.

Tesla supports the Roadmap set out by AEMO. We also believe that the following points should be considered:

- The DER Consultative Forum could also be used to formalize AEMO's and DER provider/ VPP data-sharing arrangements and continue to address any residual concerns regarding oscillatory behaviour from particular DER assets.
- It would be helpful for AEMO to provide more detail on what goes into each line item of the Workstream.
- For each workstream clear terms of reference should be set, and it would be helpful for AEMO to set out at the start the technical inputs and data sharing requirements from each participant.
- The UoM independent analysis has been helpful in the MASS Review. We recommend that AEMO considers which workstreams require independent analysis and
- engage the appropriate parties early.

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**Other**

- Tesla supports the ongoing clarification from AEMO in respect of the incorporation of the Interim Arrangements for DER[3], which clarifies that both imports and export flows from ancillary services generating unit and ancillary services load can be used for FCAS purposes.
- In respect of the introduction of the Control Response Delay (CRD) requirements and the requirement in 10.4(e) that this is "no greater that 150ms", Tesla believes that AEMO could feasibly request a far quicker response from Regulation FCAS providers. AEMO may wish to consider whether 15 seconds is a more reasonable response time.

For more information on any of the content included in this submission please contact Emma Fagan at efagan@tesla.com.

Kind regards

**Emma Fagan - Head of Energy Policy and Regulation , Tesla Energy**

[3] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Participant_Information/New-Participants/Interim-Arrangements-for-FCAS-from-DER.pdf