Australian Energy Market Operator (AEMO)

Submitted electronically: mass.consultation@aemo.com.au

9 March 2021

Subject: Response to Market Ancillary Service Specification Consultation Issues paper, January 2021

Dear Sir/Madam,

Social Energy is an energy retailer and operator of the UK's largest and fastest growing residential Virtual Power Plant comprising over 6,500 domestic solar and battery systems. Our VPP platform enables our customers to benefit by seamlessly participating in multiple flexibility markets while consuming more of their own renewable energy generation. In 2019 we became the first provider of primary frequency regulations services from residential assets in the UK, and November 2020 Social Energy Australia became an AER-authorised electricity retailer.

We believe passionately in the potential of intelligent, small-scale distributed energy resources to support the deployment of renewable and low carbon technologies, while simultaneously helping to promote secure, stable and low-cost electricity supply to customers.

We commend AEMO on its delivery of the VPP Demonstrations and welcome the opportunity to comment on the associated Market Ancillary Service Specification (MASS) Consultation Issues Paper (the paper).

The VPP Demonstrations Knowledge Sharing Reports and *the paper* have very clearly identified significant barriers for DERs to participate in Contingency FCAS markets. Similarly, we recognise the urgent need to amend the current MASS rules in order to enable DERs to compete fairly and fully in these markets to the benefit of consumers.

In general, Social Energy is supportive of the principle of amending the MASS based on the learnings from the VPP Demonstrations. Of the proposed options, we strongly favour Option 2 over Option 1. However, we also observe several failings of Option 2 to adequately address key issues relating to the current MASS rules. These are briefly outlined below and expanded in our response to the consultation questions:

a) The VPP trial and *the paper* propose the use of high-speed measurements of power flow and frequency at 1 site per 5MW of aggregated ancillary service capacity per region. *The paper* appears to have altered the requirements over the VPP Trial so that the "*high-speed meter installed… must capture the* ***power flow measurements from the controllable devices, generating units behind the connection point, grid flow*** *and local frequency.*"(emphasis added). By contrast the VPP Demonstrations FCAS Specification[1] required only "*One high speed meter (sampling of frequency on a time base less than or equal to 50 milliseconds) is required per region*". The additional power flow metering proposed under Option 2 in *the paper* does not appear to reflect any specific learnings reported from the VPP Demonstrations but places

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a prohibitive technical and cost burden on both providers and customers. We strongly urge AEMO to review this condition to ensure it does not undermine success of the trial.

b) The proposal for Option 2 states that "*the options to verify FCAS delivery using power flow measurements from the inverter or device level…, would be limited to Fast Contingency FCAS from ASLs rated at less than or equal to 1MW.*". This statement is not perfectly clear but seems to suggest that the proposed amendment relating to the FCAS measurement location would not apply to the Slow and Delayed Contingency services. Whilst the proposed change to the measurement resolution is only relevant to the Fast service, it is essential that the FCAS measurement locations in the VPP Demonstration be adopted for all FCAS Contingency services. This is because the impact of the baseline calculation (as described in *the paper* and the FCAS verification tool user guide) is even more severe in the case of longer duration services if the FCAS response is measured using the net flow from, or to, the grid. If the amendments to the MASS are applied exclusively to Fast Contingency FCAS, it will preclude DERs from participating in slower services, which would significantly weaken the economic case for participating in the Fast service, and be inconsistent with the objectives of both the VPP Trial, and the NEO.

Our responses to the consultation questions are provided below:

1.1 Which option for the ongoing measurement requirements for DER described in Section 2.3 do you want AEMO to implement and why? Should any other options be considered?

Option two because the current verification rules which use the grid flow are not suited to residential DER co-located with uncontrolled loads. A residential battery inverter sits in a location with uncontrolled load and generation as a rule rather than an exception. Uncontrolled assets should have no influence on the provision of a frequency service as, regardless of the presence of a DER asset, they would continue to supply/consume whatever power they like whenever they like. Only assets actively providing an FCAS services should be considered to be delivering that service. We acknowledge that it is possible for a load-following device to act to negate an FCAS response from a battery. In this case monitoring of the connection point and local generation is required to verify the response but because these devices typically operate at slow (relative to Contingency FCAS) timescales, the monitoring time resolution does not need to be great.

We note that option two as defined in *the paper* represents a deviation from the VPP trial metering setup as outlined in section 2.2.1 of the *DER FCAS Specification.* That paragraph in its entirety reads:

"One high speed meter (sampling of frequency on a time base less than or equal to 50 milliseconds) is required per region. The purpose of this meter to determine the expected fast FCAS response using the assigned droop setting of the variable/proportional controllers or the frequency deviation setting of the switching controllers."

The option two proposal states:

*"For every 5 megawatts (MW) of aggregated ancillary service capacity per region, a high-speed meter capturing measurements of **power flow** and frequency with a resolution of less than or equal to 50 ms on a common time scale must be installed. "* (emphasis added)

Option two includes 50ms metering of power flows in addition to frequency at one site per region. It is not clear why this additional power monitoring requirement has been added or what additional information it is supposed to convey. All assets forming a VPP will be type tested in their response at 50ms before being accepted so there is no doubt that they can meet the requirements.

By adding a single site that needs additional monitoring AEMO ends up with the worst of both worlds in terms of the benefits a VPP can bring over a standard large asset. VPPs are fault tolerant to local losses of supply and connectivity as well as other electrical faults in plant equipment. Requiring a single site to have 50ms metering of power means each VPP now has a single point of failure *and* the operators incur the cost of development, procurement, support & operation of 50ms class hardware which we understand it is the point of option two to avoid.

1.1.1 Should any other options be considered?

Option two should be extended to include the Slow and Delay services in its scope as this is how the VPP Demonstration rules were originally defined. Section 1.5 of the VPP Demonstrations FCAS Specification states:

"To determine if the VPP Demonstrations have been successful, AEMO will verify the performance of the VPP based on the aggregated response of the ancillary service loads to deliver contingency FCAS during a frequency disturbance."

Note this does not differentiate between fast, slow or delay contingency services. The final paragraph of option 2 on page 13 of *the paper* states:

"AEMO therefore proposes that, if included in the MASS, the options to verify FCAS delivery using power flow measurements from the inverter or device level, and the less stringent data resolution requirement of less than or equal to 1 second, would be limited to Fast Contingency FCAS from ASLs rated at less than or equal to 1 MW."

The requirement to verify response at the grid connection point limits the amount of inverter power that can be allocated to providing FCAS because a portion of it must always be reserved to maintaining a contracted baseline power (effectively negating the uncontrolled loads/generation in the house). For the Slow and Delay services this effect is magnified because the response times of the services (and hence the time the baseline is maintained) are long compared to Fast Contingency. Implementing Option 2 as currently defined will significantly reduce the business case for homeowners opting into FCAS services compared to the VPP demonstration rules.

The MASS should also be very explicit regarding the metering locations and the accuracy, resolution and sampling rate of each meter required.

If using the model that involves 1 reference site per 5MW, the MASS should be explicit to specify if this is 5MW of identical hardware (e.g. all units must be Brand A, Model B1 and 8kWh) or if the 5MW can be *any* combination of hardware (e.g. a combination of 250 batteries of varying age, model, manufacturer and capacity, each with varying response times). If the former, reaching any kind of scale will be difficult and the VPP market will be far less competitive as VPP Operators choose to focus on only one or two battery types. If the latter, there exists a very real risk that aggregators will set up specific systems for the reference data which bear little or no resemblance to the remainder of the 5MW fleet.

For this reason, a 50ms, multi-meter reference site is a bad idea. Much better results would be provided with 100ms-1s metering at every site and this would seem to be the only feasible method of providing a true reflection of the performance of a fleet. AEMO should also openly assess the need for any specific sampling rate for data. Why is 50ms, or 100ms necessary, and what benefit does this provide to the process over another arbitrarily selected sample rate, such as 500ms or even 1s? Rather than accepting the existing technical constraints, a sampling rate should be selected which meets the needs of the program with as little technical and developmental burden as possible, including reducing data storage.

1.2 Which option do you think is more consistent with the NEO, and why?

Option 2 will promote the uptake of DER/VPP services as its technical requirements represent a lower barrier to entry comparted to the current MASS rules. Our experiences from operating in the UK market show that VPPs hold several advantages over traditional large static assets. Their distributed nature means they are more resilient to local losses of electrical supply, data connectivity, and other faults. Their

higher granularity can increase the efficiency of auction processes that they participate in realising better value for money for TSOs.

Procuring frequency balancing services from VPPs will improve all metrics outlined in the NEO.

1.3 Should AEMO consider any principles other than those described in Section 2.4 to guide its assessment?

1.4 What is the difference in implementation costs, such as updating the communication links or installing additional equipment, for capturing data at a resolution of either 50 ms or 1 second for every NMI for different VPP facility types? Do you consider the cost difference to be prohibitive for participating in the Contingency FCAS markets? Please provide examples or analysis if possible.

Consider a VPP of 1MW consisting of 250 battery inverter systems. Each site will require a replacement SCADA capable of 50ms data gathering. The equipment costs and man-hours will amount to hundreds of dollars each per-site. There is also additional administrative overhead in contacting customers to arrange the updates as well as training costs for the engineers for installing the new equipment. In total it is reasonable to assume costs of > $120k per MW.

Whatever server-side infrastructure must be scaled up to handle 20 times the data throughput compared to 1 second resolution data. Usually, this kind of cost scales linearly on public cloud providers and data storage represents a large proportion of cost for VPP operators.

1.5 Do you think that either of the options presented will result in more or less competition in the Contingency FCAS markets?

Option two will reduce barriers to entry for VPP participation in the Contingency FCAS markets which will increase competition for providing those services.

1.6 Are there any technical risks that you envisage if the Option 2 measurement requirements are allowed? How material do you consider those risks and how could they be efficiently mitigated?

By adding a single site that needs 50ms monitoring of power AEMO ends up with the worst of both worlds in terms of the benefits a VPP can bring over a standard large asset. VPPs are fault tolerant to local losses of supply and connectivity as well as other electrical faults in plant equipment. Requiring a single site to have 50ms metering of power means each VPP now has a single point of failure *and* the operators incur the cost of development, procurement, support & operation of 50ms class hardware which it is the point of option two to avoid.

Simply not including the power flows in this requirement allows an operator to reduce this risk by seeking out more reliable sites to position their frequency meter which may not otherwise be participating in the VPP. There is no reason for the frequency measurement to be co-located with an inverter and residential broadband can be a limiting factor for single assets in a domestic VPP. It then becomes simpler and cheaper to add additional sites which increases fault tolerance further.

1.7 Does the sampling rate of one second rather than 50 ms for Fast Contingency FCAS under Option 2 and the determination of the FCAS delivery at the inverter/controllable device level create market distortion or negatively impact the FCAS markets?

Option two will reduce barriers to entry for VPP participation in the Contingency FCAS markets which will increase competition for providing those services. An increase in competition will reduce market distortion.

1.8 If Option 2 was adopted, should the changes to the measurement requirements of the MASS be limited to small-scale DER (under 1 MW per NMI), or should a different threshold apply, such as 5 MW? For example, what do you see as the risks and benefits of expanding these measurement requirements to other FCAS providers and in what circumstances might that be appropriate?

The timescales of Contingency FCAS delivery are long relative to the 50ms data rates currently required in the MASS. It is hard to imagine what additional information is conveyed by this higher data rate from generators of any size for these services. If the pre-qualification tests can satisfy AEMO that plant can provide its response in a suitable fashion then that ought to be sufficient.

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