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To whom it may concern,

Many thanks for the opportunity to provide feedback on AEMO's Market Ancillary Services Specification (MASS) issues paper.

Summary of key responses

1. Evergen supports Option 2: embed measurement requirements tested in the VPP Demonstrations into the MASS.
2. Almost all of Evergen's hardware partners are unable to achieve 50ms power and frequency sampling now or in the near future.
3. Measuring FCAS response at the connection point rather than at the battery inverter requires additional dedicated hardware and cost compared to current practice.
4. All existing Distributed Energy Resources (DER) in Evergen's fleets and almost all residential DER in the country lack this hardware and would be immediately excluded from participating in VPPs offering FCAS.
5. For new installs the inclusion of hardware to measure power and frequency at fast-FCAS-compatible sampling resolutions at the connection point is not a good value proposition for customers, since FCAS capability is not a key sales driver for residential DER and adding cost to the consumer by requiring additional hardware will negatively impact the speed of adoption of batteries more generally.
6. Limiting the delayed FCAS markets to switched control only will impact VPP value streams or drive VPPs to offer switched control across all markets to maximise participation.

Brief introduction to Evergen

Evergen is an Australian founded and owned software business and a market-leading aggregator of DER. Our company's purpose is to accelerate the decarbonisation of energy systems around the world through rapid adoption of renewable energy technologies.

Evergen has evolved from being "Single-Site Battery Optimisation" into an aggregator and fleet orchestrator of many DNSP and Retailer sponsored VPPs. Our software enables better outcomes (and experiences) for consumers, businesses, installers/battery vendors, DNSPs and both integrated generator/retailers and new electricity retailers.

We work closely with DNSPs to provide visibility and control of these assets to provide differentiation for the retailer, value for the asset owner and benefits to both the electricity system and the market.

Evergen's specialisation is at the heart of the overlapping innovation domains of renewable energy and distributed battery technology, communications, internet of things, artificial intelligence, data engineering and cloud-based software-as-a service.

We are successfully operating over 2MW (and growing) of residential batteries in the AEMO VPP trial, and this year we are working on commercial (C&I) and grid-scale batteries with leading innovators in this space. By the end of 2021 we expect to have more than 100MW (200MWh) of storage under Evergen control, including residential and industrial-scale green hydrogen batteries in homes, businesses, communities and on solar farms.

Our role of being the "invisible software layer" that creates better outcomes for all has enabled us to build good relationships with all the key hardware manufacturers, and we are now integrated with (or in the process of integrating with) the vast majority of devices being sold into the Australian residential and commercial battery markets. As a software company we are deliberately hardware agnostic. We carefully select batteries and inverters with which to integrate based on several factors (reliability/longevity, quality, market demand or partner/utility demand, capability of the API & battery responsiveness).

It's clear that with 80,000 to 100,000 residential batteries already installed in Australia, and with a major uptick in C&I and utility scale solar battery projects this year, that we will have a broad mix of battery & inverter manufacturers across the board. Evergen's role as an integrator and aggregator of these assets makes us accountable to AEMO (and equally to our DNSP & retailer partners) for meeting the operational and performance standards required in today's markets, and in the markets of the future.

Importantly, Evergen VPPs are orchestrated via the cloud, with no hardware/meter installed on site. Evergen is deliberately architected this way, as we believe the additional cost to install additional hardware, combined with the inherent operational risk, complexity, and installation effort, make this a significant cost and barrier to uptake for DER. It's also clear through our partnerships with key hardware manufacturers that the capability of their hardware will improve over time, enabling us to do things not currently possible, without the addition of an extra piece of hardware.

Evergen is primarily motivated to increase value to consumers, businesses, asset owners, and the electricity system as a whole (resilience) by enabling batteries to participate in broader electricity market processes and value streams - both now and into the future. Doing so will aid the uptake of renewable energy and support emerging technologies such as home and community energy generation and storage systems, enablement of EVs without disruption to the system, reduction of emissions and modernisation of Australia's electricity supply. Participating in FCAS markets and the value stream that comes with doing so contributes to this goal. If the barriers to entry are too high, then we lose a value stream to provide to customers, which would reduce incentives for the uptake of DER and reduce the speed of decarbonisation.

Limiting market access for small-scale DER will deprive AEMO of:

- interaction with customers who are moving towards more interactive "prosumer" roles in the electricity market;
- participants and competition in the FCAS contingency markets;
- the opportunity to develop networks of small DER at scale;
- experience in DER operations for AEMO staff; and,

- the opportunity to showcase Australia's progressive approach to decarbonisation and enablement of mass adoption of batteries, to support the mass adoption of rooftop PV in which we lead the world.

Evergen would be able to meet Option 1 requirements at little cost if our hardware partners offered Option 1 monitoring requirements as part of their battery and inverter capabilities, and if they could deliver measurement from the connection point rather than the device. However, feedback from our hardware partners - who include some of the world's leading battery and inverter manufacturers and DER suppliers as well as a prominent utility meter supplier - is that they cannot meet Option 1 requirements at this stage. As technology evolves this may eventually be possible, but does not seem likely in the near future.

For this reason, **we support Option 2**, whereby AEMO would formalise the lessons and approach derived from the VPP demonstration program, and offer practical and viable measurement and participation requirements for VPPs comprising small-scale DER in contingency FCAS markets.

In the remainder of this response, we will address AEMO's specific questions raised in the Issues paper.

Question 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?

Evergen supports Option 2, based on two key considerations:

1. The infeasible cost and logistics of upgrading vast numbers of existing systems to deliver Option 1 requirements.
2. The additional cost and complexity in purchasing solar & battery systems should specific hardware devices need to be added to meet Option 1 sample rate and measurement point requirements.

Existing systems

Inverter and battery vendors have existing cloud infrastructure, software and servers in place to monitor and control DER and store data as part of their standard non-VPP offering to consumers. DER firmware updates and cloud infrastructure modifications are frequently all that is needed to facilitate one-second telemetry and automatic response to frequency excursions. This standard offering is not able to deliver 50ms telemetry measured at the connection point.

To allow existing systems to participate under Option 1 would require one of the following two options:

1. New monitoring hardware installed on site
2. Access to data from an existing revenue meter already installed on site, where the meter provider can offer access to telemetry sufficient for FCAS reporting requirements.

Installation of monitoring hardware: Sending a technician to a site to install new hardware would cost approximately $300 plus the cost of the hardware itself, much more for more remote locations. Total costs may exceed $1000 per DER. The consumer would wear this cost, on the promise of additional revenue from participation in FCAS markets. Evergen regards this as non-viable for the following reasons:

- The uncertainty attached to quantifying FCAS revenue.
- Lack of clarity for consumers about how FCAS works - it's difficult to convince customers to invest additional money if they don't fully understand what they are investing in and the conditions on achieving a return on investment.
- Other uses of VPPs (e.g., for spot price arbitrage or network benefits) do not require installation of new hardware, so consumers can still benefit from VPP participation without the cost, complexity and questionable value attached to FCAS participation under the Option 1 specification.

Accessing data from an existing revenue meter: On the assumption that revenue meter manufacturers or electricity retailers are willing and able to facilitate cost-effective and compliant Option 1 data access to an aggregator such as Evergen, using revenue meter data still presents logistical barriers. To enable an existing residential site to participate, Evergen or a client VPP partner would need to determine the make and model of meter installed at the customer's site. For many existing customers, this may require a site visit, or else an arrangement with the customer's retailer to report the meter make and model to Evergen, after the appropriate data sharing permissions have been secured.

Evergen would also need to maintain two separate API integrations per site (one for battery control, and one for meter data collection) and integrate data across both sources to deliver a solution. Lastly, this solution would introduce commercial complexity, with FCAS participation for a customer requiring some level of involvement from the customer, Evergen, the meter provider, the retailer, the battery/inverter hardware partner, and the system supplier.

Given the logistic barriers to this approach, it is likely that FCAS participation of customers with existing DER would be unviable. Evergen would guide such customers towards the other value streams that come with VPP participation but do not require 50ms resolution data from the connection point.

New installations

The offerings of DER manufacturers are not built to deliver Option 1 FCAS capability, because customers do not presently require this. Residential battery uptake is still in the early adopter phase, and FCAS participation does not yet impact custom decisions compared to the value a battery-based DER provides to customers for reducing grid imports and environmental impact.

Unless the value to the customer is sufficiently visible and high, such that customers will opt to demand a DER that is Option 1 FCAS capable, then DER manufacturers will have no reason to deliver this capability.

Evergen has spoken to several battery/inverter manufacturers and their advice has been that the cost and complexity of modifying their hardware to do this is prohibitive - DER sales are not currently driven by FCAS capability even under Option 2, let alone the Option 1. To the extent that customers are interested in VPP participation on potential benefits, Evergen and DER manufacturers can offer this without participating in contingency FCAS markets, and Evergen already works with clients interested in securing VPP services that are not related to FCAS. One manufacturer indicated that while their hardware is capable of monitoring at 50ms resolution, they would be faced with the additional cost of delivering monitoring at the connection point and modifying the data transport, cloud servers and storage capabilities to handle the much higher volumes of data.

It is unlikely going forward that many DER manufacturers will modify their own offerings to deliver Option 1 FCAS compliance in the short term. For new installations, Option 1 compliance going forward would therefore require either the installation of dedicated Option 1 FCAS monitoring equipment at additional cost to consumers, or else for the DER installer to note the revenue meter make and model, and for an aggregator such as Evergen to develop cost-effective data access via the revenue meter manufacturer.

In addition to the cost burden of consumers, implementing numerous devices is simply poor value for money. There are currently 2.6 million households in Australia with rooftop solar. Many of these will acquire batteries. Implementing additional costly devices represents a multi-million dollar investment across households for dubious benefit to either the energy market or DER owners. If we regard DER as a significant pillar in our future energy network, we should avoid unnecessary costs.

Question 2: Which option do you think is more consistent with the NEO, and why?

Evergen relies on AEMO's expert advice regarding the suitability of Option 2 VPP monitoring requirements, given that AEMO has recently tested and continues to test the performance of VPPs with similar requirements as part of the VPP Demonstration project.

To date, AEMO has facilitated significant learning and knowledge sharing through these demonstrations. On quality, safety reliability and security, AEMO advises that participating VPPs have been able to deliver compliant FCAS capability with measurable benefits.

Based on this advice, Evergen believes that Option 2 is more consistent with the NEO. As well as satisfying the NEOs intent in terms of the above factors, Option 2 presents a lower barrier to entry for DER providers and an increase in the number and nature of FCAS providers. This increase will lead to more competition and resulting beneficial efficiency and price impacts. Option 2 also solves for greater system security by enabling more distributed FCAS resources.

Question 3: Should AEMO consider any principles other than those described in Section 2.4 to guide its assessment?

In satisfying the principles in Section 2.4, AEMO should do so with consideration to the wider context for DER and the realities of participation. At present, the contribution of VPPs comprising small-scale DER is a tiny but promising proportion of the whole FCAS market.

Similarly, the FCAS value stream is a potential opportunity for DER suppliers, but not their core offering. AEMO's approach to date allows a low-cost way for aggregators to explore the benefits of enrolling VPPs for FCAS, meeting compliance requirements, and learning-by-doing. Option 2 continues this progression, and given the small slice of the FCAS market presently occupied by small-scale DER VPPs, the short-term impacts to the electricity system - even under the highly unlikely event of widespread VPP non-compliance - are negligible. In contrast, the potential longer-term benefits of fostering new entrants to the FCAS contingency markets and increased competition is invaluable.

Question 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.

Being hardware agnostic, Evergen itself is well-positioned to form VPPs and meet requirements whether Option 1 or Option 2. We are working with hardware vendors who can meet the 1-second telemetry requirement for fast FCAS under Option 2, but there are certainly still many companies who do not yet offer even 1-second telemetry. Developing 1-second telemetry capability was an investment for the companies that are now capable of this.

The limiting factor for Evergen to deliver a VPP that is Option 1 compatible is the measurement and monitoring capabilities of existing installations, and of our hardware partners into the future. As discussed previously, information we have received from battery and inverter vendors, and advice from a utility meter vendor is that they cannot deliver Option 1 capability now or in the near future.

Considering 3rd party, non-utility-meter providers of monitoring/control hardware that would be capable of Option 1, to our knowledge there is only one consumer device able to meet Option 1 requirements. We are aware that hardware and installation costs for these devices can be between $800 - $1,700. Of the 100,000+ residential PV-battery systems currently operating in Australia, only a small fraction include these devices, so the cost to pursue a hardware solution for enabling these existing systems is likely prohibitive and likely not possible without significant disruption to consumers, cost, and risk. Option 1 would prevent most existing DER from participating.

Other providers of similar equipment may provide less expensive hardware, but likely lack 50ms measurement resolution. Using providers such as these would theoretically allow participation in the slow and delayed markets, but not the fast market, significantly reducing the benefit to VPPs and their constituent end-users from undertaking to provide contingency FCAS services.

Question 5: Do you think that either of the options presented will result in more or less competition in the Contingency FCAS markets?

Option 2 will result in more competition in the contingency FCAS markets because it will most readily allow VPPs comprising small-scale DER to participate. Option 1 represents a

significant barrier to entry, and means that the majority of existing DER would be ineligible to participate without upgrades.

Question 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?

At the current scale of DER participation in the FCAS market, the potential negative impact of lower resolution frequency support on the network is extremely small. There will be a tipping point, at some time in the future, where reliance on DER is higher and the impact of possible DER inadequacies is greater.

There is an expectation that the market will change in tandem with the rise of renewables and DER. The current single operator paradigm is likely to shift into decentralised energy systems (and possibly markets) and DNSPs are likely to take on increasing operational responsibility for managing DER, the so-called DSO (Distribution System Operator) role.

There is a risk that some FCAS providers will be unable to supply suitable frequency control at reasonable prices in this DSO-driven future. This risk can be mitigated by the introduction of new ancillary services as the network evolves, providing investment certainty to hardware manufacturers and customers. The definition of new ancillary services designed to support a DSO-managed decentralised network is not currently within the remit of AEMO but relies on the work of the ESB defining the post-2025 market and the AEMC managing current and future rule change requests.

We believe that successful qualification and participation in the AEMO VPP trial using relatively small and relatively inexpensive household batteries demonstrates that fleets of DER can meet the technical requirements and standards required to be a reliable component of the energy system. As rule changes such as 5MS and others are adopted, we believe this will become more valuable for AEMO and the energy system as a whole.

Question 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?

Given the current scope of VPP participation, any market distortion is negligible. FCAS providers who satisfy existing MASS requirements have the significant advantage of incumbency and will retain a large market share of the FCAS market for a long time to come. VPPs require sites with battery installations and customers willing to participate. Even under Option 2, it will be some time yet before VPPs can deliver FCAS service in large enough volume for the possibility of market distortion to be credible.

What Option 2 will do is facilitate new entrants to the FCAS market. In the longer term, this can only have a positive impact on the markets by driving competition and lower prices.

Question 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 economics of large scale assets differs from aggregated fleets: larger assets are required to register with AEMO as Market Generators (and Market Customer for import-related services), and have access to lucrative Regulation FCAS markets. Individual large assets avoid the need for complex fleet orchestration systems and associated customer operations, and the relative cost of registration and compliance are lower per unit of power. Given the complexity of managing fleets, and the competition energy markets will have with local self-consumption priorities, it's reasonable that advantages are conferred to residential (or commercial) behind-the-meter assets that are not shared with larger scale assets.

The demarcation lines have been drawn at 5MW as maximum size for an individual device in a VPP, with the suggestion that devices > 1MW could not use Option 2 varied measurement requirements. Evergen is happy to defer to AEMO on the technical need for high-speed monitoring for devices in this range. However, we note that devices at this scale for C&I or community battery purposes are still in the early-adopter stage of market penetration, and are more sensitive to cost impacts from the additional measurement requirements than very large batteries. 1-5MW batteries in VPP fleets will not have access to regulation FCAS participation, and don't have the same economies of scale as 100+MW batteries.

Question 9: Additional comment on General MASS Review, Q 13d. Clarification of Delayed FCAS Requirements

Evergen notes that although VPPs may typically be configured to provide either switched or proportional FCAS response, AEMO does not allow a single DUID to include devices from both types of response simultaneously. For this reason, limiting Delayed FCAS to only switch-based control would mean either:

1. VPPs would be incentivised towards offering switch-based control across all markets to participate in all contingency markets, or
2. reduced profitability (and therefore a higher barrier to entry) for VPPs that offer proportional control, and are thereby excluded from the Delayed markets.

We thank you for the opportunity to participate in this important matter, and look forward to collaborating with AEMO and with the industry as a whole further in the future.

Sincerely,

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