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Australian Energy Market Operator  
GPO Box 2008  
Melbourne VIC 3001  
Submission by email to:  
[mass.consultation@aemo.com.au](mailto:mass.consultation@aemo.com.au)

Dear AEMO

**RE: Market Ancillary Service Specification Consultation**

SwitchDin is an Australian energy software company that bridges the gap between energy companies, equipment manufacturers and energy end users to better integrate and manage energy resources on the grid. SwitchDin's technology enables our clients to build and operate vendor-neutral virtual power plants and microgrids, and to optimise performance across fleets of diverse assets. Founded in Newcastle NSW in 2015, SwitchDin now operates in all states of Australia with early successes in Europe and emerging opportunities in the Americas and Asia.

SwitchDin welcomes the opportunity to comment on the proposed amendments to the Market Ancillary Service Specification. These amendments will provide visibility and long term certainty on the requirements to enable VPPs to participate in the FCAS market. We have provided our responses to relevant questions posed in the consultation paper for the DER MASS Review and General MASS Review below.

**DER MASS Review**

**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?**

At a high level, the two options presented in the MASS Consultation Issues Paper are:

- Option 1: To leave the measurement requirements in the current MASS unchanged or
- Option 2: To embed the measurement requirements that were tested in the VPP Demonstrations into the ongoing MASS

SwitchDin's enabling technology is technically capable of providing a solution that would be able to meet the requirements of either Option 1 or Option 2. Specific feedback on the measurement resolution for fast contingency services and measurement location is provided below. Feedback on the thresholds at which to apply alternative measurement requirements is provided under Question 8.

### **Measurement Resolution for Fast Contingency Services - Frequency Measurement Accuracy**

The limiting factor in delivering a solution that meets the requirement will likely be driven by integrating with hardware that is able to meet the frequency measurement accuracy of less than or equal to 0.01Hz error and less than or equal to 0.0025Hz resolution. This frequency measurement requirement is the same for Option 1 and Option 2. If AEMO chooses to proceed with Option 2 then SwitchDin recommends that consideration is given to whether this level of frequency measurement accuracy is required, or whether this can be relaxed in order to lower the cost of delivering a solution.

### **Measurement Resolution for Fast Contingency Services - Other Options**

Consideration should be given to what measurement resolution and accuracy is required as a minimum to verify the delivery of FCAS from DER VPPs without the need for an additional high speed meter. This would ensure that more stringent requirements are only imposed where there is a clear need for verification at that level of resolution/accuracy. Measurement at 100 millisecond resolution without additional high speed metering was included as an option within the VPP demonstrations indicating that lower resolution measurement may be sufficient without the need for an additional high speed meter.

In particular, alignment of FCAS measurement requirements with the future mandatory requirements of inverters (AS/NZS 4777.2:2020 Grid connection of energy systems via inverters, Part 2: Inverter Requirements) should be considered as this may result in lower cost implementation in the longer term.

**Table 2.5 — Specification for measurement and calculation accuracy**

Quantity	Measurement accuracy	Measurement time	Measurement range
Voltage	$\pm 1\% V_{\text{nominal}}$	100 ms	0 to 280 V
Frequency	$\pm 10$ mHz	100 ms	45 to 55 Hz
Active power	$\pm 4\% S_{\text{rated}}$	200 ms	0 to 120 % $S_{\text{rated}}$
Reactive power	$\pm 4\% S_{\text{rated}}$	200 ms	0 to $\pm 120\% S_{\text{rated}}$
Apparent power	$\pm 4\% S_{\text{rated}}$	200 ms	0 to $\pm 120\% S_{\text{rated}}$

NOTE For the purposes of measurement accuracy,  $V_{\text{nominal}}$  refers to 230 V of AS 60038.

Source: AS/NZS 4777.2:2020 Grid connection of energy systems via inverters, Part 2: Inverter Requirements

### **Measurement Location**

AEMO requires that all providers of FCAS must demonstrate that FCAS services have been delivered in the case of a contingency frequency event. In the context of VPPs, measurement at the controlled device level rather than the connection point for the verification of FCAS delivery is a trade off between the VPP operator having the highest level of confidence of being able to demonstrate that the required response was delivered and the VPP operator incurring additional cost for extra metering where there is more than one controllable DER resource at a single site.

As VPPs mature and integrate more controllable DER device types such as hot water, electric vehicles and air conditioners the cost of measurement at the controlled device level may become prohibitive. However, for some sites - for example commercial sites - where the DER capacity is low compared to the overall site load, measurement at the controllable device may be required to give the VPP operator sufficient confidence of being able to verify that the required response was delivered.

With this in mind, SwitchDin's position is that the default measurement location for verification of FCAS delivery should be at the connection point, but that VPP operators should be able to opt for

measurement at the point of control (incurring additional cost to themselves) in cases where measurement at the connection point would give the VPP operator insufficient confidence of being able to verify that the required response was delivered.

### **Additional Issues/Clarification**

#### **- Number of High Speed Meters**

Section 2.3.2 of the MASS Consultation Issues Paper states that *“At AEMO’s discretion, the minimum number of high-speed meters may be reviewed depending on the number of controllable systems and the types of systems used to deliver ancillary services under the same aggregated ancillary service facility.”*

SwitchDin’s technology allows for vendor-neutral power plants to be built and as a result VPPs using our technology are likely to be made up of a wide range of DER devices from different manufacturers and different types. We would welcome clarity on what factors are likely to influence AEMO’s decision on the number of high speed meters required, and in particular to what extent that may be influenced by the number of discrete models/manufacturers of DER within a single VPP.

#### **- VPP Testing Regime for Registration - Testing on Every Type of Controllable Device**

Under the proposed amendments *“a frequency injection test would be required on every different type of controllable device that responds to a frequency excursion”*.

The MASS Consultation Forum #1 Q&A Summary published on 24 February provides further clarity on the definition of a type of controllable device, specifically from Q14, *“the type of controllable device refers to the different technology types and model of inverter. A hybrid inverter is considered a different type of controllable device than a non-hybrid one. A single-phase inverter would also be considered a different type of controllable device than a 3-phase inverter.”*

Device testing at this level will significantly impact the cost and practicality of implementing frequency injection testing for vendor neutral VPP providers. To further understand the impact of this, SwitchDin would welcome additional clarity on the definition of a type of controllable device, for example: do models with different power ratings but the same internal hardware and firmware count as different types of controllable devices.

### **2. Which option do you think is more consistent with the NEO, and why?**

Aligning FCAS measurement requirements for DER with the future mandatory requirements of inverters (AS/NZS 4777.2:2020) would result in the lowest cost implementation in future and therefore is more consistent with the NEO.

### **3. Should AEMO consider any principles other than those described in Section 2.4 to guide its assessment?**

SwitchDin recommends that technology neutrality is explicitly included as a principle to be considered by AEMO to guide its assessment.

**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.**

A current solution capable of 50mS measurement is likely to add around \$400-500 to each site/measurement point in hardware alone compared to 1 second measurement, increasing to over \$600 when installation is taken into account. We expect that these costs would decrease significantly due to economy of scale if this level of resolution was required at every measurement point for FCAS participation.

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

Requiring VPPs to be registered as either a proportional service or a switched service will limit some devices to only one VPP type. This means that achieving scale (multiple MW) within a single region will become more difficult. As an example, Tesla's API currently only includes provision for proportional response for FCAS. Other devices, including controllable loads, may only be able to implement a switching response. This may lead to increased competition for switched services but a lack of competition in the proportional market.

**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?**

We consider that 5MW would be a more appropriate threshold for application of the revised measurements rather than 1MW. This is particularly in view of large commercial and industrial customers that may wish to operate their own VPP, integrating a range of different DER assets across multiple sites, which may have a significant range of capacity from tens of kW to the low MW range.

A 5MW threshold would be consistent with other capacity-based limits already in place within the National Electricity Rules, such as generators with a nameplate rating of less than 5MW being exempt from generator registration and having significantly less complex requirements for grid impact modelling.

## General MASS

### 11. Frequency responsiveness of FCAS:

#### a. What would be involved in ensuring that non-frequency responsive facilities:

##### i. Respond only when enabled in the relevant FCAS market(s)?

Ensuring that assets only respond to frequency deviations when enabled for FCAS would require each individual device to be aware of the market enablement status in real-time and to react accordingly (for example toggling FCAS delivery mode on and off). This does not present any significant technical difficulty.

##### ii. Do not deliver significantly more than market enablement (for example, >50%)?

The following would be required in order to ensure that VPPs do not deliver significantly over-deliver on their market enablement:

- Accurate forecasting of fleet power and energy availability, to determine an appropriate FCAS bidding profile;
- Real-time measurement of fleet availability and real-time, asset level control of FCAS enablement allowing a portion of the total fleet to be enabled to match market enablement.

Forecasting the aggregated available power and energy within a VPP in order to determine an appropriate FCAS bid is a complex task that requires an accurate forecast of the constraints that may apply to individual assets depending on the time of day, weather conditions, level of solar production, configuration/type of the inverter etc. In the absence of accurate forecasting VPPs may deliberately under-bid in order to ensure that they do not under deliver on their FCAS commitment.

Real-time control of the VPP fleet at an asset level, via orchestration, rather than fleet-wide enablement is not currently widely available.

##### iii. Do any alternative options exist to manage over delivery?

In the absence of real-time, asset level control, over-delivery could be partly reduced by allowing VPPs to bid in sub-1MW increments. Increased granularity would allow FCAS bidding to more closely follow the actual available capacity within the VPP, particularly for smaller VPPs with registered capacity of 1-2MW, rather than adopting an on/off response.

#### b. Please provide feedback on the proposed revised trigger ranges for switching controllers set out in Table 1 and Table 2 of section 3.3, and; c. Please provide feedback on the proposal in section 3.3 to require proportional controllers to set deadbands no wider than $\pm 0.1$ Hz.

The proposed revised trigger ranges and deadbands do not present any additional technical challenges as the droop curve maintains the same gradient. However any significant increase in the number of expected frequency events per month may require increased orchestration by VPP operators to ensure that individual sites do not exceed agreed acceptable limits of use.

### 13. Regulation FCAS requirements:

d. Clarification of requirements for Delayed FCAS – please consider the implications from your perspective of clarifying that Delayed FCAS controls may be of a switched type only (rather than also proportional), and, whether other factors in addition to those outlined in section 3.6 need to be considered.

We would appreciate clarity on whether a single VPP fleet could be registered as both a proportional service and a switched service if able to demonstrate the required response for each service. This could allow VPPs to choose to bid in as either a switched or proportional service and, in particular, not specifically exclude VPPs normally providing a proportional service from accessing the Delayed FCAS market if also registered as a switched service.

### **Request for Meeting with AEMO**

In addition to providing this submission, SwitchDin would appreciate a meeting with AEMO to discuss the implications of testing and operational requirements on mixed fleet VPPs, particularly in view of ensuring that vendor neutral VPP operators are not unnecessarily disadvantaged in the registration process.

We thank AEMO for the opportunity to provide feedback to this process.

Best regards,

DocuSigned by:  
  
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**Andrew Mears**  
Chief Executive Officer