



18 November 2021

Attention: Amendment of the Market Ancillary Service Specification (MASS) – DER and General consultation
Australian Energy Market Operator (AEMO)
Via e-mail: mass.consultation@aemo.com.au

sonnen Australia Pty Ltd - Amendment of the Market Ancillary Service Specification (MASS) – response to second draft determination

sonnen is at the forefront of innovative, well-engineered home energy storage systems and services empowering energy choice and contributing towards a healthier planet for local communities in markets including Australia, Germany, Great Britain, Italy and the USA. sonnen Australia is a registered Demand Response Service Provider (DRSP), and our Virtual Power Plant (VPP) technology provides Frequency Control Ancillary Services (FCAS) in NSW under the AEMO/ARENA VPP Demonstration Program, and South Australia under the Market Ancillary Services Specification framework (MASS).

sonnen’s VPP technology is unique. Our VPP technology provides ‘closed-loop controlled’ and predictable responses to fluctuations in power system frequency to meet the needs of contemporary power systems tasked with incorporating growing amounts of variable renewable generation resources and achieves this at an efficient low incremental cost by utilising Distributed Energy Resources (DER).

[Creating a privileged class of participants](#)

sonnen is the only Market Participant that operates under both the VPP Demonstration Program and the MASS frameworks which provides sonnen an unique and informed perspective on AEMO’s proposals.

Both sonnen VPP clusters utilise identical hardware and VPP coordination capabilities but deliver vastly differing market opportunities (Table 1).

| VPP cluster Regulatory Framework and jurisdiction | Market registration |
|---|-----------------------------------|
| VPP Demonstration Program, NSW | 6 contingency FCAS services |
| MASS framework, SA | 2 lower contingency FCAS services |

Table 1. Comparison of VPP Demonstration Program and MASS opportunities for identical resources

Comparing an equivalent number of aggregated batteries under each framework, and the technical and jurisdictional regulatory benefits afforded to VPP Demonstration Program participants the value of market revenue streams is vastly different.

For each day the VPP Demonstration Program framework is permitted to exist, value is transferred to a privileged class of Market Participants at the expense of those who compete on the level playing field provided by the MASS.

AEMO has not made a substantive justification for continued support of the VPP Demonstration Program framework. The current and future value transferred away from other Market Participants has been glossed over, and over time the consequential lessening of competition has not been quantitatively addressed. The VPP Demonstration Program has failed to substantially inform the development of the MASS, as such it serves no continued purpose.

sonnen strongly reject any proposal to implement a VPP Demonstration Program Transitional Arrangement.

[The renewable energy transition is occurring too quickly and the regulatory update cycle too slow for good policy to be developed by iteration.](#)

The MASS update consultation has been vastly more successful than the Demonstration Program in engaging with current and future DER FCAS service providers. sonnen acknowledge the detail and breadth of input from stakeholders and the significant effort of AEMO staff and consultants in engaging with submissions.

Despite the significant effort of all those involved, many conclusions informing the draft determine are based on substantially incomplete and/or qualitative assessments.

sonnen is strongly of the view that further analysis is required to deliver a robust determination that will drive efficient investment in the provision of FCAS from DER. The determination of the DER elements of the MASS update should be delayed until the gaps in quantitative analysis can be addressed. The renewable energy transition is occurring too quickly, and regulatory update cycle too slow, for good policy to be developed by iteration.

sonnen are not satisfied that AEMO has achieved justifiable and workable conclusions with respect to:

- Optimising the available DER from residential consumers
- Establishing a level playing field to encourage new entrants and support innovation

These failures risk increasing FCAS costs to consumers and reducing the benefits that resource diversity brings to improving power system resilience.

Moving from theory to practice

The studies by University of Melbourne have been scoped to yield insights necessary for establishing an appropriate delivery validation framework. However, scope limitations have resulted in findings that do not adequately address all factors effecting the implementation of a practical validation framework.

Furthermore, sonnen and other stakeholders have queried how to apply the draft MASS frequency measurement accuracy specifications in practice.

To ensure the proposed validation framework is robust sonnen recommend that:

1. the Rate of Change of Frequency (RoCoF) method is subjected to a sensitivity analysis addressing the impact of dynamic errors in practical frequency estimation, as utilising the derivative of frequency (df/dt) can accentuate errors that arising from poor performance in frequency tracking by certain frequency estimation algorithms. The UoM report does not provide insights into the impact on estimation of Frequency Disturbance Time (FDT) and delivery quantity estimation errors arising from:
 - Frequency measurement errors due to dynamic response and power system noise impacts
 - Timing jitter in update rates
2. the MASS frequency accuracy specification be amended to codify the maintenance of accuracy under predefined power system noise and RoCoF criteria.

Yours faithfully,



Alister Alford
Director, Wholesale and Flexibility Markets
sonnen Australia Pty Ltd

Establishing a level playing field to encourage new entrants and support innovation

sonnen encourages AEMO to take away the 'training wheels' and let DER compete on a level playing field with other MASS service providers.

sonnen is strongly of the view that given the significant pace of the renewable energy transition occurring at a distribution and transmission network level any transitional arrangements for VPP Demonstration Program participants will hinder the recognition of DER as a genuine solution to the challenges facing the broader market.

Under the VPP Demonstration Program framework AEMO has no obligation to place the investment of incumbents ahead of new entrants. sonnen committed resources to the VPP Demonstration program without commitments to future market access. The Demonstration Program existed to support informing the evolution of the MASS but has failed to be an effective tool for doing so.

While sonnen disagrees with AEMO's decision to abandon the distinguishing features of the VPP Demonstration Program specification (for example measurement point location), we strongly believe the transitional mechanism will distort the market in favour of the incumbent VPP Demonstration Program participants at a critical time for the development of the industry.

If the proposed Transitional Arrangement is implemented sonnen expect it will be sound commercial behaviour for participants to replenish their portfolios to the point that there are sufficient assets to ensure the registered capacity in the fast services is constantly available to the market.

Given that value derived from fast (R6, L6) services is typically higher than the slow and delayed services, those VPP Demonstration Program participants with underutilised registered capacity will gain a greater marginal net benefit from placing a new asset into a VPP Demonstration program cluster than a MASS participant would receive for an identically performing asset.

Broader availability of low-cost, proven, and robust MASS compliant high speed event recorders and supporting IT infrastructure solutions will address this gap over time, however market share lost to privileged VPP Demonstration Program participants in the interim reduces the prospects of competitors reaching commercial scale.

The greater marginal benefit will assist VPP Demonstration Program participants to maintain marketing and sales momentum while others are developing MASS compliant solutions. MASS compliant participants will be at a competitive disadvantage until the Transitional Arrangements terminate, or the VPP Demonstration Program clusters completely utilise their registered capabilities.

Optimising the available DER from residential consumers

sonnen's remains strongly committed to our position that measurement of FCAS delivery by DER at the device level is the most efficient approach in the long-term interests of consumers.

AEMO's preference of measurement at the 'connection point' may improve the validation certainty of delivered quantities in limited circumstances, but this comes at the expense of failing to minimise the value of resources required to deliver a given level of output.

AEMO has not provided quantitative analysis demonstrating the 'expected'¹ cost of uncertainty in delivery (for example, the amount of additional FCAS enablement, if any, required to address uncertainty) exceeds the benefit of reduced hardware and installation costs from measurements at the device.

In addition to the absence of quantitative evidence to support AEMO's conclusions, sonnen has listed in Table 2 further responses to AEMO's evaluation.

| AEMO's evaluation | sonnen's comments |
|--|--|
| <p>FCAS is necessary for the power system to manage disparities in supply and demand <u>on a continuous basis</u>. AEMO needs to know how much energy is being produced and <u>consumed at all times</u>, and these measurements are taken at the connection points.</p> | <p>AEMO do not have access to real-time connection point data for most distribution network connected loads/generations. AEMO rely on aggregate data (such as bulk supply point data) to manage disparities in supply and demand. AEMO have not demonstrated the relevance of this statement to distribution network connected DER.</p> |
| <p>In certain circumstances, they could counter each other's contribution to FCAS, negating any benefit to the power system which, as DER penetration grows, could have a significant impact.</p> | <p>No quantitative based assessment has been provided by AEMO to demonstrate that potential counter-productive behaviour of other behind the meter devices might increase to the point of 'significant impact'.</p> <p>No 'efficient frontier' has been described balancing lower cost of FCAS provision with the level of risk posed by other devices that are detrimental to the value of FCAS provided.</p> |

Table 2. Location of measurement point for FCAS provided by DER

¹ Expected or probability weighted outcome rather than low probability maximum risk limit.

Clear and unambiguous technical requirements for stakeholders to develop hardware

DER hardware developers typically have product development cycles of 3 years or longer. Changes to technical requirements and/or interpretation of technical requirements create risks for DER hardware developers such as sonnen. sonnen is concerned that the MASS frequency measurement accuracy specification is open to various interpretations.

Frequency Measurement Accuracy for FCAS delivered by DER

As AEMO have disregarded sonnen's concerns regarding the cost impact of frequency measurement accuracy expressed in our prior submission² we are restating and elaborating on our earlier feedback.

During the 2nd stage consultation AEMO sought feedback from stakeholders on the cost of high-speed event recorder solutions suitable for DER installations. Cost estimates varied greatly, and sonnen's previous submission attributed the likely cause of widely varying engineering cost estimates to stakeholders forming different views on the required robustness of frequency estimates under noisy and high RoCoF conditions.

sonnen has observed behaviour within our VPP clusters consistent with local power system noise impacting frequency measurements. To ensure delivery of a dependable distributed FCAS resource sonnen's VPP controller continuously examines quality indicators in the 1 second data stream from batteries to remove devices from the resource pool that may not provide a predictable FCAS response. sonnen has observed in its fleet, battery installations with sporadic poor quality frequency measurements that persist after hardware exchanges. In these instances, sonnen have concluded that real world network conditions are having a significant impact the performance of frequency measurement algorithms.

Frequency measurement does not escape the classical engineering optimisation paradigm:

- **Low cost, robust, and accurate. Choose any two.**

Many low-cost frequency measurement implementations, such as those suggested by other stakeholders in earlier consultation stages, risk failing to maintain adequate accuracy (error $\leq 0.01\text{Hz}$) under high Rate of Change of Frequency (RoCoF), in the presence of noise or voltage waveform distortions

Delivering a high update rate (i.e., 50ms), high RoCoF tolerant, fast settling, and robust frequency estimate that maintains adequate accuracy under dynamic and noisy conditions requires both a suitably responsive estimation algorithm utilising high sample rates in conjunction with digital filtering and conditioning logic to remove implausible estimation artifacts (particularly those introduced by impulse noise sources).

² MASS Consultation – Third stage consultation forum – summary of discussions 4.2 – ‘AEMO noted that it had not considered revisiting the accuracy requirements for frequency, noting that VPP trial participants had not raised this as a barrier to entry in FCAS markets and it had not been raised in submissions.’

Sophisticated frequency measurement algorithms, digital filtering and state estimation algorithms typically rely on more costly Digital Signal Processing hardware.

Sophisticated instrumentation, such as the high-speed recorders utilised by VPP Demonstration Program participants to provide a reference 50ms frequency record achieve adequate settling of frequency estimates within 50ms, but at a high cost that cannot be replicated on distributed installations.

The proposed revised MASS does not provide adequate guidance on the need to maintain accuracy of frequency measurements under dynamic conditions typically experienced during contingency events. The 'standard ramp' described in the MASS does not reflect actual contingency events.

AS/NZS 4777.2:2020 inverter frequency response time and accuracy requirements are not a reasonable proxy for MASS requirements and address separate needs

Standards such as IEEE C37.118.1-2011 targeting grid synchrophasor measurement have attempted to address frequency measurement performance under dynamic power system conditions and may provide guidance on how AEMO can specify dynamic performance expectations.

Recommendation

1. Amend revised MASS to specify the power system conditions that the frequency estimate error must be maintained at less or equal to 0.01Hz. sonnen require a response to this matter to avoid wasting development costs.
2. Establish a public record of measurement devices that have demonstrated compliance with MASS measurement accuracy specifications to reduce the incidence of duplicate testing of performance.