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11 March 2021

Subject: Amendment of the Market Ancillary Service Specification (MASS) – DER and General Consultation

Thank you for the opportunity to comment on the consultation regarding the Market Ancillary Service Specification (MASS) Consultation - Issues Paper published in January 2021.

This response is a joint response on behalf of both Rheem Australia Pty Ltd (RAPL) and Combined Energy Technologies Pty Ltd (CET), as we have a complementary interest in the outcome of your investigations. Our views and recommendations outlined below relate specifically to the emergent control and orchestration of mixed DER sites, and importantly their participation in the Contingency FCAS market.

As the largest Australian manufacturer of water heaters, Rheem markets a wide range of solar, heat pump, high efficiency gas and electric water heater models to the domestic water heating market. Our brands include Rheem, Solahart, Vulcan and Aquamax. Additionally, we are now the number three supplier of photo voltaic (PV) systems in the country via our Solahart channel. Over the last three years we have also commenced the manufacturing and installation of smart electric water heaters, controlled remotely by our technology partner, CET.

Combined Energy Technologies (CET) is an Australian technology company specialising in energy management for residential, commercial and micro grid systems. CET systems utilise a local Energy Management Gateway to provide secure communications and local orchestration of a wide range of DER devices and DER manufacturers. Local orchestration of DER devices is achieved through a suite of CET Energy Management modules that provide cost effective power metering, communication and control. CET has extensive experience in the integration and orchestration of systems with multiple DER devices including the integration of solar PV, batteries, water heating, electric vehicle chargers, pool pumps and A/C for the benefit of the home owner, retailer and the grid.

Today Rheem has products in over 4 million Australian homes. Together, Rheem and CET are already actively participating in the emerging DER market with thousands of online, mixed, orchestrated DER sites (Solar PV, batteries, smart water heaters, HVAC, pool pumps, EV

chargers, other loads) across the NEM and the WEM. Over the past 8 years we have identified and resolved many issues (at live field sites) around how mixed, smart DER sites can be orchestrated to achieve the best financial outcomes for consumers, whilst providing a foundation for grid support services such as Contingency FCAS.

This position has given us a unique insight into the development and potential for the emerging new energy market. It is our belief that whilst batteries will be an essential component of the future grid, the cost of these devices will limit the speed of their uptake. We therefore would encourage the market operator to look beyond storage batteries and to support the uptake of affordable, equitable, smart DER solutions that will enable ubiquitous consumer participation in grid services. By doing so AEMO would increase the opportunity for consumer participation in the future energy market, not just by those that can afford batteries and solar PV, but also by those in non-solar homes and across a far greater socio-economic spectrum.

As an example, smart water heating could quickly become the dominant grid interactive DER resource given that water heating is ubiquitous in nature, and that storage water heaters represent a low-cost method for storing energy. Importantly, they represent an affordable entry point for consumers wishing to participate in the monetisation of demand management. Based on cost alone, we believe that the deployment of smart water heating could rapidly accelerate and far exceed that of storage batteries in coming years.

If the energy market is to be truly democratised, it is extremely important that any changes to market rules and associated technical specifications for participation in grid services (such as FCAS) are made with the consumer at the centre of the solution. This will ensure that current and future investment in smart DER by households continues to be made. Fundamental to this approach will be that new rules do not favour a particular technology, technology class, or technology manufacturer, and that technology neutrality is not impeded by barriers to entry in creating or modifying energy market rules.

Our specific responses attached are underpinned by this approach. Our recommendations are supported by empirical data from an existing fleet of thousands of NEM consumer sites of mixed DER. The data from these sites support our technical, architectural and commercial conclusions which are in alignment with the principles of the National Electricity Objective (NEO).

In summary we:

- Support Option 1 (2.3.1) to "Leave current measurement requirements unchanged”
- Believe that there is no significant cost impediment to installing power metering capable of measuring power flow and local frequency at intervals of 50ms or less at every site (NMI)
- Believe that Net metering (connection point metering per NMI) must be a requirement of the MASS for DER participation in the delivery of Contingency FCAS to support mixed DER sites
- Believe that Net metering does not obviate the need for smart consumer DER devices, (e.g. water heaters) with their own communications, to ensure that consumer amenity and safety is not put at risk

- Believe that regulatory changes are required to ensure that all embedded DER control specifications allow efficient orchestration and participation of mixed DER in grid services
- Believe that the findings arising from this consultation should inform the outcomes of the ERC0296 Fast Frequency Response (FFR) market ancillary services rule change consultation.

Relationship Between MASS and FFR Consultations

We are concerned that the FFR consultation appears to focus on Embedded Storage Batteries, whilst ignoring other forms of cost effective smart DER (e.g. loads such as smart, grid interactive water heaters) and their potential participation in the Contingency FCAS and other grid services markets. This approach would appear to be at odds with the National Electricity Objective (NEO) guidelines and principles[1] .

We would therefore propose further consultation to ensure technology neutrality in the formation of any proposed FFR rule changes. To that extent we would offer our expertise and insights, to join the relevant ERC0296 committee(s) to share our views and knowledge, and to ensure fair and equitable outcomes for consumers who choose to offer their DER assets for participation in the provision of grid services such as Contingency FCAS.

Whilst the above issue is resolved, we would ask AEMO to make no changes to the MASS and to consult again once requirements for FFR are finalised.

Support for the above positions is included in the attached responses to consultation questions.

As this submission has been prepared using the expertise of a number of Rheem and CET personnel, I would ask that any enquiries related to the submission are directed in the first instance to myself. I will then co-ordinate follow up responses to your enquiries or further meetings with the appropriate personnel within our organisations.

Yours Sincerely

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[1] "Promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity", and; "Promote competition - by minimising barriers to entry so that more FCAS providers can compete in the market".

Responses to MASS Consultation Section 2.5 questions:

Please find below our response to each of the MASS Consultation questions from Section 2.5. Please note our answers to these questions (per the above background information) are underpinned by empirical data and our experiences from thousands of mixed DER sites that we have under our control and monitoring across the NEM and WEM. We have also taken into consideration the need for technology neutrality and the need to consider other forms of DER (beyond just embedded battery systems) that will soon, and in the future, participate in the FCAS market.

Our responses, backed by extensive field experience with mixed DER sites, are driven by an imperative to ensure that sites are able to be readily orchestrated in situations where more than one type of DER at a site seeks to participate in grid services such as Contingency FCAS markets.

Q1 Section 2.5

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?

The market is in its early stages of utilising DER as a network asset. As we have outlined above, there are multiple DER types beyond embedded storage batteries that can participate, in many cases more cost effectively as grid assets, in the FCAS market. Many of these DER assets will exist on the same site. Our field experience suggests that this situation will only continue to grow exponentially.

We support Option 1 – "Leave current measurement requirements unchanged" for the following reasons:

- AEMO will remember that we consulted with your organisation some years ago during our product design and validation phase, to ensure that our interpretation of the FCAS metering specification was correctly implemented in our power metering solutions. Subsequently, over the past years we have invested significant resources in HEMs orchestration of behind the meter mixed DER and associated powering metering solutions. We have validated our metering solutions (across thousands of our mixed DER sites) in the NEM and WEM over the past years. Our power metering solutions meet the requirement to measure power flow and local frequency at intervals of 50ms or less at every site NMI
- Our FCAS compliant power metering solutions have a manufactured cost of sub $200 (AUD) and as a result we do not see that there are impediments to maintaining the current specifications to measure power flow and local frequency at intervals of 50ms or less at every site NMI - i.e. at the site connection point. We contend that the costs and issues in NOT doing NMI connection point metering are far greater – see further below
- We are aware that other Australian companies (as detailed and recorded by AEMO by multiple participants in the recent AEMO MASS Consultation Webinar) have similar cost-

effective power metering technologies available that comply with the current requirement to measure power flow and local frequency at intervals of 50ms or less at every site NMI

- Further, AEMO would be aware from the recent MASS Consultation Webinar of a development being undertaken by a current Tier 1 metering supplier who intends to add the capability required for FCAS power flow and local frequency measurement at intervals of 50ms or less to connection point metering. (i.e. per site NMI). They have stated that this additional cost is minimal.

In respect to Grid flow / Connection Point (NMI) vs Appliance level metering:

- We support NET (Connection point) metering, and the requirement for FCAS providers to control the grid power flow at the NMI, and hence verification of the delivery of contingency FCAS via net power measurements at the site connection point.
- We believe that the technological challenges associated with multiple agents controlling various DER at a single site are currently too significant to be overcome in the short term. The most cost effective and robust contingency FCAS solution currently is orchestration of DER at a site with connection point metering.
- This position is based on our extensive experience at thousands of orchestrated DER sites where we use connection point (NMI) metering for the validation of HEMS orchestration of site generation, storage and loads under control. Our orchestration of smart, mixed DER is via a site edge HEMS gateway, local smart DER control interfaces, and net flow power metering to MASS - FCAS specification.
- From this experience we note a number of issues that need to be addressed:
    - We are increasingly experiencing a range of issues on sites with embedded DER that DO NOT support local orchestration (control) via a local standards compliant interface. For example, a closed battery system operating outside the control of the site Energy Management System (EMS) (or HEMS gateway as it may be known) can cause other DER to respond to changes in the battery charge, discharge or FCAS response, affecting the rest of the site. *Such automated actions / reactions can negate the intended FCAS response.*
    - As a result of the above, we believe strongly that site level coordination of all smart DER devices is required. Where this is not the case, reliability of grid services such as the delivery of FCAS will quickly decrease.
    - If site level co-ordination is to be achieved, some level of standardised open control interface across all DER will be required. These communications interface standards should be mandated on all embedded DER to enable the orchestration of mixed DER sites where multiple DER types are participating in FCAS and/or other grid services under local control.
- Rheem and CET believe that the above approach will not only ensure reliability in the supply of FCAS and other grid services, but will also provide the best financial outcome for the site owner, as well as facilitating their ability to churn their DER assets across different energy market/DER VPP services providers. This in turn ensures competitive commercial access by Energy Market Service providers to control the site DER assets in accordance with the principles of the NEO.

- The VPP demonstrations gave no assurances to participants that MASS clauses superseded for the VPP demonstrations would be rolled into any future rule changes. As such, it is our view that the continued commercial operation of the deployed VPP demonstrations beyond the end date should not be seen as an imperative for a relaxing of the power and frequency measurement requirements of the FCAS specification. Rather, we believe AEMO should, as a separate exercise, seek consultation on how and if the existing VPP participants in the trial should participate in the FCAS market in the future (e.g. grandfather sites, period of time to bring into compliance etc) and that this should be carried out in conjunction with both this MASS Consultation and any changes that may come from the FFR rule change consultation process.

Q2 Section 2.5

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

As per the issues raised in response to Question 1, we believe that Option 1 is more consistent with the NEO. Further viewpoints in respect to consistency with the NEO can be found in our answers to AEMO's other MASS consultation questions.

Q3 Section 2.5

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

We believe that the guiding principles as detailed in Section 2.4 cannot be realised without further addressing a number of impediments to the successful growth of orchestrated mixed DER. The embedded DER issues we have identified (as highlighted in our response to Question 1) are a real and present threat to the successful growth, operation, competitiveness and delivery of FCAS services in mixed DER sites.

To ensure an open, successful and competitive market for participation of mixed DER (at a site/NMI) in Contingency FCAS, it is our view that the following issues need to be addressed as part of the MASS Consultation:

- Participation of one form of DER in FCAS services must not be to the detriment of other DER resources / assets at a site seeking to participate in FCAS or other grid services
- Open, local, standards-based control interfaces are required on all embedded DER to ensure their ability to be orchestrated with other site DER resources (e.g. smart water heaters, pool pumps, HVAC, batteries, EV charging, solar PV etc) for the provision of HEMs services inclusive of mixed DER FCAS
- Local access to the monitoring and control of DER is necessary to ensure a consumer's DER assets can be migrated by the asset owner (consumer / site owner) to any other energy

market service provider (aggregator, retailer etc) they may choose, without any loss of functionality, or continued reliance on the day to day involvement of the DER manufacturer

- Having a DER device operating outside the orchestrated site control is to the financial detriment of the site/consumer AND decreases the reliability of the site orchestration in providing grid services such as FCAS
- The principles of technology neutrality should be observed in the consideration and making of any changes to current NEM rules / specifications relating to DER participation in grid services such as Contingency FCAS.

In support of this position we note the following:

In the recent "Project EDGE" kick off meeting hosted by AEMO, the "Testing a DER Marketplace" introductory slide stated:

- "Consumer interests (must be) met by identifying efficient DER integration pathways that align to the National Electricity Objective".

In the DER Wholesale Integration WIP Spreadsheet presented to the Forum by AEMO, it is stated that the DER solution must:

- "Ensure all smart hardware can act on a local control signal from an EMS (i.e. local energy management system);
- "Enable any aggregator to control any device, so that a new aggregator does not have to roll a truck to implement their proprietary control devices", and;
- "Maximise retailer/aggregator competition for my business (and home) and incentivise them to use my controllable devices";

The above AEMO statements seem to be consistent with our response, and our identification of other important principles that must be addressed to ensure the successful participation of mixed DER in FCAS and other grid services. In that respect we believe we are correct in raising (for resolution) the issues with embedded DER and that resolution of this issue as part of the MASS consultation is required if the intent of the National Electricity Rules are to be adhered to, i.e:

- "Promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity", and;
- "Promote competition – by minimising barriers to entry so that more FCAS providers can compete in the market".

Q4 Section 2.5

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 50ms 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.

As per previous comments in this response paper, we see no requirement for additional power metering equipment (beyond FCAS compliant connection point metering), nor the need to change to 1 second data capture.

Regarding the difference in implementation costs of metering at the device or NMI level:

- Capturing data at the 50ms resolution at the NMI does not incur any significant costs. The meter can either cache the data for the duration of the event or can transmit the data to a coordinating device in the local network. In either case the costs are low. There may be a case to decrease the sampling rate to 100ms to align with data transmission speeds found in Modbus/RTU implementations.
- A typical DER installation will include a solar PV system. On installations with solar PV system, nett metering is already required to maximise self-consumption of the solar power. As stated previously, CET and other organisation have stated on record that low cost metering can satisfy existing FCAS requirements at a price comparable to existing meters being installed with solar PV and storage systems.
- We are not aware of an existing technological solution that could overcome the unintended outcomes likely to arise from competing DER energy management systems at a single site.
- We therefore believe that a “whole of home approach” to FCAS / site connection point (NMI) power metering verification and orchestration of all DER on site is the only cost effective and sensible solution for consumers and the grid at the present time
- Water heating, due to its positioning as an essential appliance, represents a low cost opportunity to build a fleet of DER assets capable of responding to the Contingency FCAS and other grid services markets.

We do not believe that there is anything prohibitive in either the cost of implementation or the technical specification requirements of the existing MASS Contingency FCAS specification.

In summary, the growth in numbers of mixed DER sites, and in particular their participation in grid services including FCAS, is heavily reliant on the ability to successfully orchestrate all generation and load DER on a single site. This requires NET, connection point metering (NMI), and open, local standards based control, especially on embedded storage batteries.

Q5 Section 2.5

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

We believe that 2.3.1 Option 1 with connection point metering will result in far more competition in the DER FCAS market for the reasons that we have detailed in our responses to previous questions above.

The one major caveat to this position is that installations of "closed loop" DER assets cannot continue to be allowed. DER assets that do not allow local, on site, standards based control access effectively excludes their participation in mixed DER sites under orchestration of a local HEMS site gateway (e.g. IEEE2030.5 complaint). If installation of such products continues, asset owners will be limited in their ability to participate in the future energy market, and the reliability of a grid response such as Contingency FCAS will be put further at risk.

Q6 Section 2.5

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?

As outlined in our previous responses, we believe that the adoption of Option 2 (in conjunction with device level metering) would present a threat to the growth of, and effective orchestration of, mixed DER sites, and hence the effective provision of FCAS services on sites with more than one form of active DER.

We believe the risks and commercial implications of adopting Option 2 measurement requirements (interval and location) to be significant, adding cost to the consumer, technical complication and FCAS service delivery risk. It will create a major impediment to the ubiquitous growth of mixed DER sites (whereas current 50ms interval metering will enhance mixed DER service delivery verification) and the participation of those sites in grid services such as FCAS.

We have shown there is no significant cost impediment to maintaining the current MASS specification for monitoring Power and Frequency at the site NMI.

Further, we have detailed why it is an imperative that NET connection point metering be a requirement of MASS DER site participation in FCAS services and why local, open standards based interfaces for control of all DER assets are required for the successful orchestration of sites with mixed DER assets.

Q7 Section 2.5.

Does the sampling rate of one second rather than 50ms 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?

As outlined elsewhere in this response (e.g. in our response to Q5), we believe that the MASS should support NET metering and site wide orchestration of all DER seeking to participate in grid services for each DER FCAS implementation (per connection point NMI). The use of the current 50ms metering for Fast Contingency FCAS services ensures enhanced verification and thus options for participation of mixed DER sites.

From a consumer perspective, Rheem and CET are aware that any large scale adoption and control of DER assets will be based on both consumer reward for participation, and consumer assurance that their amenity will not be adversely impacted. Regardless of whether control and metering is conducted at either the site or device level, consumers will require smart DER assets that not only respond to control signals, but that are capable of opting in or out of events based on status knowledge (e.g. charge state, current kW, temperature etc). This will particularly be the case for active DER such as smart water heating and embedded battery storage. The development and deployment of smart assets such as these will become more and more prevalent, and a prerequisite is to ensure reliability of prediction and control as a grid asset.

It is therefore an imperative that market rules support local two-way interaction with smart DER appliances, and that they not encumber ubiquitous appliances such as water heating with additional physical control requirements such as AS4755.3 DRED interfaces. Whilst such DRED interfaces have a place in the control of generation sources such as solar and battery inverters for the protection of grid assets, the high capital cost of an inverter system (relative to the cost of a basic water heater) adds only a minor cost for those that can afford Solar and Battery inverter systems. Water heating is an essential service and not an optional choice for consumers. The cost impediment on water heaters of 4755.3 is not justified for the reasons given above, particularly when a smart option such as AS4755.2 enables other monetisation pathways for the asset owner and achieves a better outcome.

In the longer term, Rheem believes that DER assets such as water heaters may use technological advances to respond automatically to network changes (such as voltage) and adapt their behaviour accordingly. DER assets working individually, but in unison, may in the longer term displace the need for site orchestration. Unfortunately, this solution is some way off.

As a result of the above, we believe that consumer participation, and the growth of a successful competitive market for mixed, orchestrated DER at consumer sites, will be negatively impacted in the short term if FCAS delivery was to be measured at the device level.

Q8 Section 2.5

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 5MW? 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?

As outlined in our responses to earlier questions, we do not believe that Option 2 should be adopted at this time.