



Australian Energy Market Commission (AEMC)  
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## National Electricity Amendment (Unlocking CER Benefits Through Flexible Trading) Rule

## National Energy Retail Amendment (Unlocking CER Benefits Through Flexible Trading) Rule

Thank you for the opportunity to provide feedback to the AEMC Flexible Trading Arrangements (FTA) rule change consultation paper.

This is a joint response on behalf of both Rheem Australia Pty Ltd (Rheem) and Combined Energy Technologies Pty Ltd (CET), as we have a complementary interest in the Consultation Paper due to the significant number of mixed BTM CER installations that we carry out every year across the NEM and the WEM.

As the largest Australian manufacturer of water heaters with products in over 4 million Australian homes, Rheem offers a wide range of traditional and renewable energy water heater models to the domestic and commercial water heating markets under the Rheem, Solahart, Vulcan, Aquamax & Everhot brands. Under our Solahart brand we are the third largest supplier of photovoltaic (PV) systems in the country. Over the last four years we have also commenced the manufacture and installation of smart electric water heaters, controlled remotely by our technology partner, Combined Energy Technologies.

Combined Energy Technologies is an Australian technology company specialising in energy management for residential, commercial, and microgrid systems. CET provides site energy management systems and has extensive experience in the integration and orchestration of systems with multiple Consumer Energy Resources (CER), including the integration of solar PV, batteries, water heating, electric vehicle chargers, pool pumps and A/C for the benefit of the homeowner, retailer, and the grid.

As Australian based manufacturers, we have made large R&D investments in bringing to market cost effective CER products and technology for the integration and orchestration of behind the meter CER.

Together Rheem and CET are already actively participating in the emerging CER market with thousands of online, mixed, orchestrated CER sites across the NEM and the WEM, with nearly 100% of our sites orchestrating one or more types of CER (generation and flexible load). Over the past decade we have identified and resolved many issues (at live field sites) to ensure that mixed, smart



CER sites can be orchestrated to achieve the best financial outcomes for consumers, whilst providing a foundation for grid support services and hence grid security of supply.

Our comments and recommendations are supported by empirical data from an existing fleet of thousands of consumer sites of mixed CER under orchestration across the NEM and WEM with further validation derived from our participation as an aggregator in AEMO's project EDGE. The data from our sites supports the technical, architectural, and commercial positions in our feedback to the AEMC FTA Consultation Paper, which we believe are in alignment with the principles of the National Electricity Objective (NEO), the CER Efficiency Objective, and a key Energy Security Board principle of no consumer lock-in.

We are generally in support of the goals of the proposed rule change, but only after certain fundamental prerequisites are met. Currently, we believe there is insufficient maturity and regulation in the CER market in terms of technical and regulatory foundational requirements. These need to be put in place before any rule change / proposed metering models can then be introduced. These prerequisites are needed to ensure the best outcomes for consumers in addressing the four key areas of the consultation to avoid consumer metering and CER lock-in (a significant and current issue), to promote competition in CER services, and to ensure firmness and predictability in the delivery of wholesale market and grid services.

We have therefore chosen not to respond directly to each of the consultation questions posed, but have instead drawn on our field experience in suggesting foundational technical and regulatory prerequisites that will need to be put into place prior to any FTA rule change proposal assessment.

Our response details how these missing foundational prerequisites are resulting in sub optimal outcomes for consumers. The issues raised (backed by empirical field data, including from our participation as an aggregator in AEMO's Project EDGE) are also currently impacting the use of CER in the provision of grid security of supply services (such as FCAS, DR and DOEs) and will only accelerate under any proposed FTA arrangements if these issues are not addressed as a prerequisite to any FTA rule change proposal.

We have summarised these issues as follows:

1. Site physical installation considerations
2. Metering and local access to real time power data
3. CER interoperability
4. BTM orchestration, DOE compliance, remote operators
5. Consumer churn of CER assets to another FRMP / Energy Market Service Provider
6. Removal of consumer inverter / metering lock-in ambiguity within AS4777
7. Policing and enforcement of standards

Further, we have dedicated a section of our response "Lessons Learned from the Field" which details the significant effect some of these missing prerequisites are having on the delivery of wholesale market and DOE services under AEMO's Project EDGE.

In summary, it is our recommendation that the FTA rule change proposal be delayed until the foundational technical and regulatory prerequisites are put into place. This will help ensure that



consumers retain flexibility in how they use their CER assets whilst avoiding CER lock-in under any future FTA rule change implementation.

If the energy market is to be truly democratised, it is extremely important that any changes to market rules and associated technical specifications are made with the consumer at the centre of the solution. 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 comments and the recommendations attached are underpinned by this approach.

As this submission has been prepared using the expertise of several 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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## Rheem & CET Detailed Response

We have chosen not to respond directly to each of the consultation questions posed, but rather to draw from our field experience from nearly a decade of development, deployment, and integration of BTM CER assets as support for our specific comments and recommendations. Our comments are further informed by both our nationwide deployments of orchestrated BTM CER and our findings to date as an Aggregator in AEMO's Project EDGE.

Rheem and CET are currently managing many thousands of consumer sites across the NEM and the WEM wherein we orchestrate BTM CER locally for the consumer's financial gain (solar PV self-optimisation, tariff arbitrage (e.g., varying and shifting load), learning heuristics etc). In aggregation these CER assets provide grid services including DOE and DR, with capability to provide security of supply services via contingency FCAS.

Whilst we applaud moves to give consumers more options of how and with whom they monetise their CER assets, at this time, we believe there is insufficient maturity and regulation in the CER market to support the rule change as proposed as there are technical and regulatory foundational requirements that need to be put in place before any rule change / proposed metering models can be assessed. Drawing on our field experience across many thousands of BTM CER sites, we have detailed seven prerequisites in our response that are needed to ensure the best outcome for consumers in addressing the four key areas of the consultation:

- to avoid consumer metering and CER lock-in (a significant and current issue),
- to promote competition in CER services,
- to ensure firmness and predictability in the delivery of wholesale market and grid services (e.g., DOE, FCAS, DR) by BTM CER assets.

Key to achieving these outcomes will be the removal of the current barriers that are preventing consumer CER assets from reaching their full potential and avoiding the introduction of new barriers that affect how and with whom a consumer monetises their CER assets. Unless this task is completed as a prerequisite to any FTA implementation, we see the current issues around consumer CER lock-in accelerating if proprietary metering and proprietary CER installations under secondary settlement point / metering arrangements are allowed to prevail. This will only enable further CER lock-in of consumers, both technically and commercially, fostering an environment whereby changes to a consumer's BTM CER assets and/or service provider will be expensive, labour intensive and time consuming.

The approach we have taken throughout this paper is that the consumer, as the owner of BTM CER assets, must be at the centre of all decisions. We have therefore identified seven key issues which, based on our experience (including participation in AEMO's Project EDGE), currently inhibit consumers from optimising their financial return on their CER assets. Further, our recommendations attempt to address the significant and growing issues that without regulatory intervention will grow to further impact grid security of supply and impact the firmness and predictability in the use of BTM CER (in aggregation) as grid assets. These concerns extend to the implementation of a DOE and flexible exports by DNSPs.



In making the following recommendations we believe:

- they are in alignment with the National Electricity Objective (NEO);
- with respect to metering arrangements, they can only be supported when tested to comply with the CER efficiency objective (see following); and
- we have assessed all our prerequisite recommendations as supporting a key Energy Security Board (ESB) principle of no CER lock-in.

We have also provided feedback on lessons learned from the field (including from AEMO Project EDGE).

We must first address and rectify the issues (as detailed) contributing to consumer metering / CER lock-in, if we are to assess any benefits to consumers and the grid that may arise from having multiple FRMPs, as a result of the FTA rule change proposal. We believe the Commission must take these issues into consideration when examining the overall costs and benefits of flexible trading against the stated four key areas being:

- retail energy market and competition
- network-related considerations, such as allocation of network tariffs and the implementation of Dynamic Operating Envelopes
- consumer risks and protections
- operational requirements and implementation

that the Commission has identified and detailed (Ref consultation section 20) within the AEMC FTA rule change consultation.

### **Recommended CER market prerequisites to any proposed FTA rule change assessment.**

#### **Issue 1: Site Physical Installation Considerations**

Under any FTA metering arrangement, a consumer changing their Financially Responsible Market Participant (FRMP) / Energy Market Service Provider (EMSP) (e.g., retailer or aggregator) for any settlement point should not incur unnecessary costs associated with physical wiring, metering, or other CER changes. Any changes should be capable of being completed remotely and via open access communications protocols.

This premise should extend to any change of home ownership (or new tenant) who should not inherit unreasonable technical or commercial arrangements (and associated costs to change / rectify) related to any installed CER / metering arrangements under any FTA rule change implementation.

#### **Recommendation:**

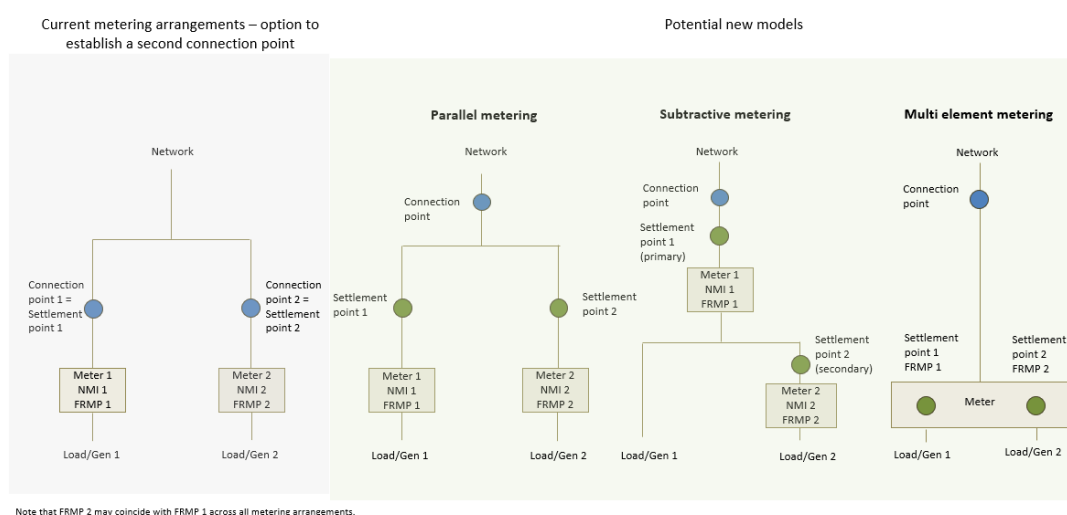
Regardless of the physical metering arrangement that may prevail under any future implementation of an FTA rule change, consumers must retain simple, no/minimal cost capability to reassign their CER asset(s) to another energy market service provider and



maintain flexibility to introduce further CER assets at their home/site that may require site wide orchestration of all CER assets (e.g. HEMS, maximising solar self-consumption, complying with a DNSP site wide DOE). These decisions should not require physical rewiring of the site nor stranding of existing assets due to proprietary metering or proprietary / closed CER, nor should the consumer be faced with locked assets, i.e., CER assets that are locked into a particular vendor, market participant, or physical site wiring. This can only occur if neither the CER assets nor any settlement / sub-metering are locked to a particular vendor. To ensure no lock-in, flexibility, and minimal cost impositions on consumers, all CER and metering arrangements should support local, standards based, accessible, physical communications ports and fully featured open communications control protocols (read only for metering). We address these requirements later in this response.

## **Issue 2: Metering and Local Access to Real Time Power Data**

In putting the consumer at the centre of any decision when analysing potential new metering models as shown in the consultation *Figure 1: Options to enable flexible trading* (reproduced below), consideration needs to be given to how consumers currently utilise their CER assets, in order to assess the proposed Parallel, Subtractive, and Multi-element metering arrangements to ensure the best outcomes for consumers and the grid.



Extract – Consultation Figure 1: Options to enable flexible trading.

On multi-CER sites orchestration is most effectively carried out by a site edge gateway, i.e., a HEMS. This approach is also consistent with implementation of the gateway model of CSIP-Aus on multi-CER sites. Under the gateway model all CER control decisions made by a HEMS require access to local real time power data (voltage, current, PF etc) for each CER asset and importantly for the small customer connection point power flow. Currently, BTM CER orchestration requires the installation of one or more additional third-party power meters at a significant and unnecessary cost to the consumer, as connection point smart meters do not allow open access to their real time power data locally. Further, the small customer (consumer) is not allowed (under the NER) to locally access their own real time power data or assign such access to a third party. This consumer cost imposition





is slowing and restricting the uptake of CER and would impose further significant restrictions and cost imposition under proposed flexible trading arrangement metering options, if not addressed.

In assessing this metering issue against the NEO and the CER efficiency objective, i.e.:

*“To increase energy efficiency and create cost savings for consumers from their CER through enhanced access to their own power data, and less cost and complexity in the metering arrangements required to support management and orchestration of CER by their representative.”*

Achieving these metering related cost and complexity reductions will require changes to the NER, the NERR and the metering specification. Settlement point smart meters should provide local real time (read only) power data for the control and orchestration of consumer CER assets. Changes required to the NER and the NERR would broadly include/require:

- A change to the NER to allow a small customer the rights to locally access (or assign their representative access) to their own power data (voltage, current, power factor etc).
- A definition of both “power data” and “real time” to be embedded in the NER.
- Clarification around ownership of the small customer power data and restrictions on the use of all small customer metering data to that required in the provision of an electricity delivery/billing service to the customer and the orchestration of their BTM CER, but not for the purposes of monetising the small customer power and other metering data without the express permission of the small customer. Meter data such as power data only exists due to the consumer’s own consumption and/or export at their site.
- Clarification as to the confidential nature of the small customer power and other metering data.
- Clarification as to whether consumers should pay for access to their own power data given that they already contribute to the cost of their smart meters via their retailer billing.
- Changes to the physical access (including authorisation requirements) to communications ports on smart meters as current access requires a Level 2 ASP (with metering coordinator permission) to break a seal.
- Changes / standardisation of communications protocols for the provision of read only real time access to the smart meter power data. SunSpec Modbus would be a logical contender here and already adopted by some metering companies. For instance, in embedded metering arrangements where the NER access rules do not apply and the Embedded Network Manager accesses the meters for the purposes of sub meter billing within the embedded network. Refer also <https://sunspec.org/sunspec-modbus-specifications/>

These prerequisite metering requirements to any FTA rule change implementation would need to include any settlement point metering and extend to any secondary (or subsequent) settlement point / sub-metering arrangement.

#### Recommendation:

Consumers should be protected from locking their CER in to any one technical / commercial metering arrangement. Further, to avoid the unnecessary costs of multiple additional third-party meters required for the control and orchestration of BTM CER, the small customer should be given the rights to locally access (or assign their representative access) to read only



real time power data. This will require changes to the NER, the NERR and the Metering Specification. Changes to the smart meter design will be required to ensure secure (e.g., certificate based) access to power data via standardised interfaces and open communications protocols (e.g., SunSpec Modbus) for authorised energy market services providers. A solution will also be required for similar access to smart meters that are currently deployed to solve the physical access (current communications ports are under a level 2 ASP physical seal), and communications protocol / access and security issues. We are happy to discuss this further with the AEMC.

Assuming that the above metering and all other prerequisites are met, in our opinion the subtractive metering option provides the least complexity, lowest implementation costs and the most flexibility. Our key reason for favouring the subtractive metering model is that the single connection point (to the site/home) with a single settlement meter ensures that netting / offsetting and hence optimisation of flexible load and generation (even if connected to a secondary Settlement Point) can still occur. Further, provided all prerequisites are met this configuration is workable in orchestrating CER for compliance with a DOE.

### **Issue 3: CER Interoperability**

As we have reinforced throughout our response, mandated support for CER asset interoperability must be a key foundational prerequisite requirement of any FTA rule change implementation. This will provide consumer confidence in their decision to participate in grid services and to derive value through optimisation. This will require flexibility in the control of consumer CER flexible load and generation assets so they [the consumer] can choose if and when they wish to respond to optimise their usage or generation and/or participate in grid services.

Whilst a consumer may choose to have multiple FRMP and aggregator relationships at times, the consumer must have flexibility to:

- Add CER assets such as flexible load and storage (batteries, smart water heaters, electric vehicle charging, pool pumps etc) that can share the site solar PV generation, even if the assets do not share the same sub metering arrangement.
- Add to their BTM CER assets under the hierarchal orchestration / control of a Home Energy Management System (HEMS).
- Engage in Whole of Home or individual CER assets control services and move easily between such control options without requiring changes to physical wiring, metering, embedded software etc. This is a requirement for the implementation of a DOE under the CSIP-Aus gateway model implementation.
- Change their retailer, aggregator, or other FRMP without facing restrictions and/or incurring costs because of proprietary cloud only control interfaces, lack of local control access, lack of local interoperability support, or commercial arrangements that restrict CER asset local control access, functionality, warranty etc - e.g., where the consumer's choice of energy market service provider does not have a commercial arrangement with the CER asset vendor. We note that these arrangements currently exist in the market and appear only to propagate consumer CER asset lock-in and non-competitive commercial practices.





If an FTA rule change occurs without the resolution of the issues outlined above, we are concerned that the proposed metering architectures will only serve to embolden vendors to install both proprietary metering and proprietary CER asset architectures that lock the consumer in both technically and commercially. Whilst this practice occurs in the market today, the proposed FTA CER and metering architectures (where metering and CER interoperability is not supported) will further restrict consumers. For example, a solar PV resource locked into an embedded battery (behind sub metering) will render the consumer unable to add further managed flexible load to use the solar PV resource. This is only one example of possible restrictive consumer outcomes.

Recommendation:

Should an FTA rule change come into effect, CER asset flexibility and no lock-in can only be achieved if:

- All consumer CER assets sold in Australia should support local, standardised control interfaces and fully featured locally accessible open control protocols. As all vendors seeking to deploy CER in California will be required to meet Californian interoperability standards (IEEE 1547.1-2020 clause 6 interoperability compliance testing), there is no technical excuse for locking out this capability in Australia. Please see: <https://sunspec.org/certification/> and <https://sunspec.org/sunspec-modbus-for-1547/>.
- Settlement point metering is open access (to the small customer or their representative) via standardised control interfaces and fully featured locally accessible open control protocols for the provision of real time, read only, power data. This mitigates the need to install additional third-party power meters for BTM CER orchestration or for the provision of grid services such as compliance with a DNSP issued DOE. (Noting that DNSPs will only issue one DOE per site irrespective of the metering arrangement).

**Issue 4: BTM Orchestration, DOE Compliance, Remote Operators**

A DOE can only be effectively implemented at a site where all flexible load and generation is orchestrated in unison to comply with the DOE. If there are multiple commercial arrangements for the individual remote control of various CER assets, then capability must also exist for overriding coordination of those assets at a site level (e.g. via an energy management system such as a HEMS in compliance with the CSIP-Aus gateway model) to ensure a control hierarchy that enables local override capability for those assets, for example to comply with a DOE.

A further benefit of this approach is that the consumer (e.g., via a site HEMS) with knowledge and control of all the CER assets, will be better placed (rather than one or more remote operator(s) of individual CER) to determine the best use of the site generation assets (solar PV, battery, V2G etc) at any one time. As we have previously stated, this requires that all CER assets have standardised local control interfaces and fully featured open control protocols such as Modbus (e.g. SunSpec) or other open control protocols.

In the case of compliance with a DOE, then control of all the site DER assets is required to maintain the DOE. Noting that this does not preclude a communications path for vendor CER asset



maintenance services, nor control signalling to a HEMS from a third party, such as for a specific price offer for a particular service (e.g. EV charging at a particular time). Other connections from remote parties may be required. e.g., for EV charging kWh information in the case of home charging of company / fleet vehicles.

Please also see our comments (within our response) in respect to DOE compliance of BTM CER assets derived from our field experience as an aggregator within AEMO's project EDGE.

### Recommendation

All CER assets (flexible load and generation) must support standardised local control interfaces and fully featured local control via open control protocols such as Modbus (e.g. SunSpec) or other CER specific open control protocols such as OCPP (e.g. for EVSE).

### **Issue 5: Consumer Churn of CER Assets between FRMP / Energy Market Service Providers**

Our experience is that many consumers are uninformed regarding the potential limitations embedded in their CER asset at the point of purchase. Many are not aware that their new CER asset only supports a proprietary connection to the vendor's cloud control platform. This applies particularly to embedded storage battery systems.

Our experience is that many embedded storage battery systems have no local standards-based control interfaces and hence do not support locally accessible open control protocols. As such, these CER assets cannot be orchestrated behind the meter (for the benefit of the consumer), nor can they be coordinated with other BTM CER assets to ensure predictability and firmness of response in the provision of grid services such as DOE, FCAS and wholesale market participation. If multiple flexible load and generation CER assets cannot be coordinated behind the meter, such as when aggregated as part of a VPP, then this will severely diminish the ability of a VPP to provide grid stability services, DOE, and other consumer benefits including financial benefits.

Further, proprietary CER enables consumer lock-in to the vendor / the vendor's technical architecture and limits the ability to orchestrate their CER asset BTM with other CER assets they purchase. It also restricts the consumer from churning their CER asset(s) (that they own) to another energy market service provider of their choosing, where that provider is not aligned with / licensed by the CER asset vendor.

### Recommendation

Any FTA rule change should actively discourage an environment where a consumer is locked in technically or commercially to proprietary metering and/or proprietary CER asset arrangements. Where the CER asset has been purchased by the consumer, the consumer should not be limited (commercially, technically or via features and performance) in granting local, open access control of their CER asset to the energy market service provider of their choosing.

### **Issue 6: Removal of Consumer Inverter / Metering Lock-in Ambiguity within AS4777**



The latest version of AS4777 can be interpreted to ban the use of 3rd party metering devices that are not tested/certified with the specific inverter series from being installed. This ambiguity could have a direct impact on an open competitive market for any FTA rule change, and for DNSP export limiting / DOE services at consumer sites.

This is quite a complex topic and as such we have chosen not to include an in-depth technical discussion within this submission. We have raised this as an example of a situation where a vendor may choose to specify proprietary metering to gain a commercial advantage resulting in consumer lock-in. We are aware that most DNSPs are unlikely to enforce the requirement of AS4777 to pair and test inverter / metering combinations where the Generation Control function of an inverter is used to implement compliance with an export limit or a DOE. It is likely that DNSPs will continue to allow the use of any third-party external metering device for compliance (which will ensure that consumers have access to competitive market offerings), noting that this is also the view of ARENA DEIP:

*“It appears more likely that DNSPs will provide multiple mechanisms through which an inverter can provide export or generation limiting capabilities”.*

#### Recommendation

Despite the above assurances, we believe that this ambiguous language should be resolved in AS4777 as matter of urgency to ensure clarity of interpretation, continued access to competitive market offerings, and to protect consumers from questionable commercial practices that we are aware of happening in the market today. We would also suggest that governance arrangements within Australian Standards committees should be reviewed and strengthened, to avoid vendor representative committee members actively drafting and voting for proposed standards changes that provide the vendor with unreasonable competitive advantage. We are happy to discuss this further with the AEMC.

#### **Issue 7: Policing and Enforcement of Standards:**

Changes to rules, regulations and standards for CER and Metering outlined in this submission will require a comprehensive policing and enforcement mechanism to ensure compliance.

For example, the AEMC would be aware of a significant CER standards compliance issue raised with multiple stakeholders including the AER, CEC and various state based regulatory bodies, with no resolution to date, as to the who has the responsibility to police and enforce CER standards such as AS4777. This particular issue relates to all inverter-based CER (solar PV and battery inverters) shipped and deployed in Australia which are required to comply with their supplied Certificate of Compliance to AS4777.2:2020.

Currently no robust mechanism for policing and enforcing product compliance with AS4777.2:2020 exists. In this particular example, the inverter grid-disconnect (on/off local control) interface requirement (per the AS4777.2:2020) which is a mandatory requirement for inverter-based CER to support Demand Response Mode Zero (DRM0), cannot be relied upon, as some manufacturers do not support/include DRM0 in their shipped product despite the mandatory requirement in the standard.



Further, there is no enforcement mechanism to rectify the many thousands of consumer sites that have CER installed without this capability. In the absence of this minimum on/off control capability it is impossible for a consumer's HEMS (CSIP-Aus Gateway Model) to orchestrate proprietary cloud only controlled CER on a multi-CER site for compliance with a Flexible Export Limit / DOE. Further, from a safety perspective an AC coupled inverter-based battery storage system cannot be integrated into a home/building management system to remotely shut down the battery (via the DRM0 interface) in the event of a fire/smoke detection system alarm.

### Recommendation

As a matter of urgency, a robust mechanism for policing and enforcing compliance with AS4777.2:2020 (and other associated CER / metering standards) is required prior to assessing any FTA rule change proposal. Without this, even if all the prerequisites we have suggested (to any FTA rule change implementation) are adopted, there is still no disincentive (e.g., fines, product recalls etc) for vendors who choose to delete / deny access to standards based mandatory product functionality (despite supplying certificates of compliance) where it gives them a commercial advantage to do so.

### **Lesson learned from the field (including from AEMO Project EDGE)**

As we have stated previously, Rheem and CET have many thousands of consumer sites across the NEM and the WEM where we orchestrate the consumer's BTM CER both locally for the consumer's financial gain (solar self-optimisation, tariff arbitrage, learning heuristics etc) and in aggregation for the provision of grid services including DOE and DR, with capability to provide security of supply services such as FCAS. Further, we are an Aggregator in AEMO's Project EDGE. In support of our recommendations outlined above, we thought it may be useful to understand some of our experiences from the CER "coal face" to date.

At many consumer sites where we install HEMS systems orchestrating CER assets (such as variable power, solar self-optimising water heaters and EV chargers), we are encountering proprietary, (i.e. closed, direct cloud-based controlled) CER, predominantly embedded storage batteries. These batteries have no local control capability, that is, there are no locally accessible standardised control interfaces nor fully featured, locally accessible, open control protocols to allow the battery to be locally orchestrated with other CER by a site edge gateway (e.g., a HEMS).

In our experience, consumers are for the most part, largely unaware / uninformed that they have been locked in to the particular CER asset, and that the CER asset cannot be orchestrated with other CER when the consumer wishes to expand their BTM CER assets. Nor can the Consumer churn those closed CER assets to the Energy Market Service Provider of their choosing despite owning the asset. Upon realisation, usually when attempting to add CET, the typical reaction from the consumer is one of anger and frustration.

When we introduce other CER under the control of a HEMS, the result is the closed CER (e.g. battery) and the site edge gateway (HEMS) orchestrated CER "fight" for excess solar PV generation, perform sub-optimally in tariff arbitrage (e.g. load shifting is sub optimal) and, in the case of closed



batteries, unnecessarily cycle (as they cannot be HEMS controlled) into loads such as pool pumps and water heaters. This increases the cycle count, affecting ROI and warranty.

A further significant and growing area of concern is where the consumer site CER assets are under the control of a HEMS (e.g., CSIP-Aus gateway model) that is providing grid services, such as FCAS, DR (minimum demand mitigation) or DOE services and the site also includes a proprietary (i.e., closed, direct cloud-based controlled) battery system. Here the CER assets fight each other resulting in the grid service being negated. This impact works both ways as the closed battery system may be in a VPP for contingency FCAS and when discharging (for a frequency raise) this is mistaken for excess solar export and the HEMS turns load on, negating the FCAS response.

Within AEMO project EDGE, the above field experiences have necessitated us to modify how we utilise sites with closed battery systems in simulating wholesale market and DOE services as an aggregator under AEMO's project EDGE. Briefly, the impacts identified in project EDGE are consistent and as expected from our collective deployed site experience. These include:

- A reduced ability to maximise wholesale bidding (net NMI and Flex BOFFER) for those sites with a closed architecture, proprietary cloud controlled embedded battery system. This impacts the ability of the site to participate to its full potential on the wholesale market. It also reduces any possible financial benefit for the consumer.
- In the case of a DOE, the affected sites cannot reliably implement a DOE as the uncontrolled closed battery system reacts to negate the HEMS attempt to modify controlled flexible load and generation to meet the DNSP issued NMI/connection point DOE restrictions.

