Rheem Australia Pty Ltd ABN 21 098 823 511

Energy Security Board

By email: info@esb.org.au

09 June 2021

Subject: Rheem Australia Response to P2025 Market Design Consultation Paper

Thank you for the opportunity to comment on the Post 2025 Market Design Consultation paper published 30 April 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 ESB's consultation. We hope that this response will help inform the ESB's development of the post 2025 market, particularly as it relates to emerging DER devices such as water heating, and the orchestration of multiple DERs on any given site.

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 manufacture and installation of smart electric water heaters, controlled remotely by our technology partner, CET. Today Rheem has products in over 4 million Australian homes.

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.

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 are therefore encouraged by the ESB's focus in the current consultation on emerging DER such as water heaters. Our vision is to make smart water heating the dominant grid interactive DER resource given that its ubiquity (every home has a water heater) and the low-cost method it offers for time shifting energy use. Importantly, water heating represents an affordable entry point for consumers wishing to participate in the monetisation of demand management.

Our specific responses to the questions raised in the consultation in response are underpinned by our belief that water heaters have a significant role to play in the post 2025 energy market. Our recommendations are supported by empirical data from an existing fleet of thousands of NEM consumer sites of mixed DER.

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, if required, with the appropriate personnel within our organisations.

Yours Sincerely

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27. What are stakeholder views on the issues raised on supporting market participation for active DER? Are there other paths that could also be considered for different types of consumers?

Rheem is generally supportive on the key issues raised by the ESB. However, there are some areas in particular that would seem to require further consideration.

We are particularly concerned that there is the potential for DNSP's to use their position in the market to make commercial decisions that could unintentionally limit the growth of DER capability in the community. For example, DNSP's could make a commercially beneficial decision not to fund enhancements to their network even though the enhancements may support greater utilisation of DER, and despite the associated wholistic benefits to the community being greater than the costs. What appears to be lacking from the framework is an appropriate incentive or requirement that would force DNSPs to support investment in their networks that would accelerate DER growth. The current demand management innovation allowance (DMIA) does not seem to be delivering the required outcomes, and the hybrid model provides insufficient consideration of mechanisms to overcome this issue.

We support the concept of prioritising the reforms required under the maturity plan. We suggest that the industry needs to communicate to all stakeholders that, in relation to the DER transformation, "perfection is the enemy of good". The penetration of DER in Australia continues to be world leading, and the failure to accelerate the pace of reform risks inflicting knee jerk regulatory change in response to potential grid issues.

Transformational changes need to be communicated to all stakeholders with an acknowledgement that further refinements will be inevitable, and this needs to be part of an agile release process. For example, we support the approach that the market should develop appropriate consumer protection arrangements as they emerge, rather than trying to pre-empt all possible outcomes.

We do, however, believe that there are dangers in adopting solutions that are not fit for purpose. The South Australian Government proposal to mandate demand response from 2021 is a good example of this:

"Compliance with (AS/NZS 4755.3) demand response mode 1 (DRM1) to be required, for electric storage water heaters of 50 to 710 litres (inclusive) nominal capacity"

Whilst this proposal attempts to overcome looming grid issues, it fails to acknowledge the shortcomings of the decade old approach to demand response that is embedded in the called up standard, and the significant negative impacts that adoption of the standard will impose on consumers.

28. Is the unbundling of services delivered by active DER resources (e.g. solar PV, batteries or smart hot water appliances) from energy supplied by DER viewed as important to allow innovation and new business models? What might be the pros and cons of this approach?

While in theory the concept of greater unbundling of services promises greater innovation and competition, Rheem has a number of concerns about the existing barriers to realizing these benefits.

Rheem currently controls the DER of thousands of homes across Australia via a Home Energy Management System (HEMS) at each site, that include a combination of DERs. These include Rheem's PowerStore Water Heaters, Solar PV, storage batteries, pool pumps, EV Charging etc. There is visibility, logging, individual and aggregated control over all sites (at the NMI) and appliance level site DER, with real time connectivity to our cloud / aggregation platform. This has given us a unique insight into the potential of DER control, and allows for continual refinement of algorithms, using site heuristics and A.I. to continually improve on our objective of maximising consumer benefits. Importantly, we take a "Whole of Home Approach" to site wide orchestration of DER whereby all DER on the site (both load and generation) are orchestrated by a HEMS gateway. This enables the home to be adjusted as required to turn up or turn down its footprint on the grid (i.e. dynamic control of the net flow of power to the site) with the HEMS making the necessary adjustment to DER (Solar, Batteries, Water Heating, air conditioning etc) to achieve the desired "Net Power Flow" at the NMI. The result is that the impact to consumer amenity is minimised and financial outcomes are maximised, all whilst maintaining grid support.

A number of these sites contain battery installations that are separately controlled by a different operator (ie – the batteries are NOT part of the HEMS site orchestration of DER). Based on our above experiences, we have direct examples showing how this inability to control the full suite of DER has resulted in sub-optimal financial outcomes for the consumer. We have provided a real-world example of this at Attachment A. This shows the battery diverting excess solar PV needed by the water heater, only to see the battery discharging back into the water heater, unnecessarily cycling the battery, reducing its life and incurring efficiency losses of power transfer in the process.

We are also concerned that direct grid services commands to individual DER that are not included in whole of house orchestration could create poor outcomes. For example, a remote command to discharge a battery for grid support, where that battery is NOT part of the DER orchestration by the HEMS, may immediately illicit a HEMS response to turn on water heating as the HEMS (wrongly) believes there is excess power flow to the grid that can be used. This has the result of cancelling the potential grid benefit from the battery.

Another issue arising from this type of individual appliance management is the requirement for the installation of a separate energy smart meter to the primary NMI revenue meter. This occurs because there is no interface for local data access to the primary NMI revenue meter. This situation will need to be repeated for further disaggregation by other providers. At some homes we have noted the installation of up to 4 power meters in addition to the site NMI revenue meter. The costs of this additional metering is ultimately borne by the customer, and reduces the net benefits to all parties. We would argue that a more efficient approach would be to enable qualified providers to gain direct access to the existing revenue meter. This may

require a modification to the current national smart meter specification. As the needed access would be local to the site and would require only read only access to the data, there should not be any commercial barriers to such an arrangement.

We note that AEMC's recent "Review of the Regulatory framework for metering services" is the appropriate forum to address site level access to metering data by authorised parties such as aggregators. Allowing this access will reduce costs associated with site orchestration of consumer DER, and is consistent with the stated outcome of the review:

> *"Consumer outcomes and experience will be a key consideration when making recommendations in the review."*

It is further understood that the review is to "determine whether the regulatory framework for metering services supports the implementation of other electricity sector reforms where metering services will play a key role". It would therefore appear to be the logical mechanism to address metering reform and to assist in reducing the implementation and operational costs of consumer DER and its orchestration.

Finally, Rheem believes that consumer adoption of DER will potentially be limited by customers' potential resistance to the concept of a separate retailer, DNSP and metering provider. There is no guarantee that further disaggregation will be actively understood by consumers, given their apparent preference for a "set and forget" approach to electricity. Consideration could be given to how retailers and DNSP's could be encouraged to partner with aggregators to better meet the needs of consumers without adding complexity. Our recommendation would be to approach this issue under the same style of maturity plan approach, with an initial development period where home orchestration is restricted to a single "whole of home" provider. As customers and industry become more familiar and confident with the cost/benefits of the remote operation of their DER, then consideration can be given to expanding this to multiple providers. The alternative, DER orchestration at scale with multiple providers, is unlikely to be unwound once established, and is likely to limit take up of DER management to only those customers confident and proficient in the technology.

29. What might be implications of a growing fleet of active batteries or electric vehicles? Are other pathways that need to be considered to reflect these needs?

Consideration needs to be given as to how integration of fleets of active batteries and electric vehicles are orchestrated locally with other smart DER such as smart water heaters, Solar PV HVAC and Pool Pumps. Please refer to our comments to Q28 in which we detail the effects of having DER that are independently controlled outside of the site wide orchestration. The opportunity and complexity for sub optimal consumer outcomes increases with each separately controlled DER on a site.

We consider that the DER discussion to date has been heavily dominated by batteries and EV's. The socio-economic impacts and access to smart DER should be considered in any government support for smart DER. Otherwise many consumers who simply cannot afford batteries or EV's may be precluded from participating in schemes that reward consumers for grid services participation of their more ubiquitous DER.

Rheem considers that more attention should be given to the opportunities presented by other appliances such as water heaters, HVAC and pool pumps. Due to their broad penetration in Australian households, these appliances offer greater opportunities in the short to medium term to manage future grid constraints, especially in the maximising of self-consumption of household solar in a two-sided market. Water heaters in particular are an "essential service" and are found in every Australian household, regardless of their socio-economic status. With the expectation that natural gas water heating may be eventually phased out as a result of decarbonisation targets, electric water heaters are likely to play an even greater role in the grid in coming years.

We would therefore encourage the ESB to look beyond storage batteries and EVs, and to focus their support on the uptake of smart, cost effective DER solutions that will enable ubiquitous consumer participation in grid services. By doing so, the ESB will increase the opportunity for consumer participation in the future energy market, not just by those that can afford batteries and EV's, but also by those in non-solar homes across a far greater socio-economic spectrum.

When comparing the payback on batteries with "smart" electric water heaters, it is important to remember that the cost of the base water heater is a "sunk" cost for customers and one they will have to pay regardless of DER. It is only the cost of making the water heater "smart" that can be compared to other DER such as batteries. Given this small uplift in costs, the product's ubiquity, and the fact that storage water heaters represent the lowest cost method for storing energy, it is likely that smart water heating could quickly become the dominant grid interactive DER resource.

Importantly, water heaters represent an affordable entry point for consumers wishing to participate in the monetisation of demand management. Based on cost alone, Rheem believes that the deployment of smart water heating could rapidly accelerate and far exceed that of storage batteries (and will certainly exceed that of EV uptake) in the medium term for similar grid benefits at a fraction of the cost of storage batteries. A simple calculation shows that 6 million smart water heaters would provide circa 22 GW of load control and 90 GWh of flexible storage capacity across the NEM. This could be enabled as an uplift to the cost of a standard electric water heater at much lower cost and at significantly faster pace than an equivalent rollout of consumer storage batteries.

30. Are there constraints on switching providers with DERs today? Are constraints on switching likely to occur through standards being introduced now or expected, such as IEEE 2030.5?

In our experience, consumers are currently largely ill-informed at the point of purchase and do not have the in-depth technical knowledge to understand commercial and technical limitations in their purchase of smart DER assets.

As noted in our response to Question 28, one of the biggest issues we face in rolling out orchestrated services to customers is where we encounter separately managed battery systems that do not allow for any local control and orchestration from a site HEMs system, and utilise proprietary communications to the battery manufacturers cloud. Consumers are mostly unaware that they cannot churn these assets to another energy market service provider that may not have a commercial arrangement with the battery manufacturer. Hence, they are unwittingly "locked in" to the deal only with those organisations to which the battery manufacturer has allowed access.

There are already instances where household batteries face considerable costs or barriers to switch VPP providers, due to the use of proprietary technology. Rheem therefore considers it important to adopt open and nationally agreed standards. Where there are gaps in current standards, the migration to open standards should be made possible by mandating that all DER have remote software upgrade capability.

We also support international standards such as IEEE2030.5 in preference to any potentially conflicting Australian standards. We note that there is a risk of a greater potential exposure to cyber security attacks associated with broad standards. We therefore qualify our support that it is provided on the basis that mature national cyber security protocols for DER are established as the highest priority.

Standards such as IEEE2030.5, and specifically the Australian variant evolving as part of the ANU API working group, is certainly a step in the right direction. We also qualify this on the basis that this standard does NOT preclude multiple vendor remote DER control at the same household. We recommend against this approach, as we have detailed previously (including Q28 answers) in our response.

In this regard, consideration may be given to a requirement that:

- Each home or site can only have a single IEEE2030.5 compliant HEMs site edge gateway which enables a standardised communications entry point to the site. This could be compared to the current approach of having only one NMI / revenue meter serving a site (home).

- All DER assets should support industry standard communications interfaces, control protocols, and security overlays communicate such that all orchestration of the DER assets and communications go via a single IEEE2030.5 compliant HEMs site edge gateway.

This approach we believe would then protect consumers, support grid security of supply and promote competition by:

- Enabling a customer and/or site to churn to the energy market service provider of their choice, due to the availability of a standardised IEEE2030.5 compliant site entry point.

- Ensuring that a standardised site interface is in place whereby a DNSP (or other appointed entity) could temporarily "take over the site" in instances where needed. Examples of situations where this may be required include where a site aggregator goes into liquidation, or in an emergency where the aggregator was unable to act to assist with a network constraint etc.

- Enabling AEMO or their representative to have "override" control of the site in the event that a "bad actor" takes control of aggregated sites via a breach in security (see further comments on security at question 31).

31. What are stakeholder views on approaches outlined? What might be the advantages and disadvantages associated with each?

We generally agree on the approaches outlined, with the qualifications noted above in questions 28-30.

One major issue that has not been adequately addressed within the consultation is the large and growing number of PV Inverters, Battery Inverters and other DER assets that are ultimately controlled in aggregate via the DER device manufacturer's cloud platforms located outside of Australia. In these cases, both customer data and control is located in countries including Israel, Germany, Poland, USA, and China. These platforms are outside of the control of DNSP's and AEMO, and as such these DER devices (e.g. Solar PV Inverters or Batteries) could potentially be manipulated in aggregation to the detriment of the Australian energy grid. This concern extends to potential actions by foreign "state-based" actors to impact Australia's grid security.

We would therefore strongly recommend that this issue requires immediate attention from a governance and grid security perspective. This may include a requirement that all cloud-based control systems of DER assets on the Australian electricity grid should be domiciled in Australia with appropriate regulatory, cybersecurity and control / access protocols in place, to minimise risk to security of supply.

32. Are there other potential approaches that could be considered?

In the medium term, consideration might be given to addressing the potentially conflicting requirements for DER control by the various market participants (i.e. retailers, DNSP's, transmission operators and the network operator).

For example, one of the proposed "Open Energy Networks Project" platforms is the "Independent DSO Framework (IDSO)" which had the benefit of providing an independent market participant. This option may have been better positioned to address these conflicts.

If the IDSO concept is not currently deemed a potential option, then consideration may be given to a trading market for broader system benefits, to be valued in the medium term, as discussed at Question 36. This concept may help ensure that the DER activation is directed towards the participant that is able to realize the highest value for consumers.

33. Under what situations could the distribution network operator perform the role of the retailer / aggregator?

As noted in our response to questions 27 and 32, we are concerned about the potential for DNSP's to become further entrenched as gatekeepers to the grid, by imposing local limits on DER if there are no appropriate incentives provided to them to invest in greater DER capability.

Water heating control is a good example of this. Many DNSP's have historically used hot water to manage overnight minimum demand. This requirement is unlikely to disappear. Whilst Rheem's PowerStore water heater presents a low-cost opportunity for most Australian electricity consumers to access most of the other DER value streams, this access may be constrained with DNSP control.

Our experience to date in engaging DNSP's to trial non-network solutions has proven challenging. Whilst DNSP's recognise the benefits that behind the meter DER can provide to alleviate network constraints, reduce network peaks, and shift load into periods of grid minimum demand, there has been a reluctance to engage commercially, and to fairly value the contribution that can be made by aggregated smart behind the meter DER solutions. This in turn then places a very low value on the corresponding benefits that can be passed on to consumers, inhibiting uptake.

Rheem believes an independent market and Distribution Market Operator would remove this potential conflict of interest.

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34. How might DER assets be managed in a situation where no retailer / aggregator is nominated?

The basis for the installation of controllable DER assets in any situation should be that they demonstrate and deliver sufficient benefits to DER owners, such that a majority will seek to participate in their orchestration. This aligns with Australia's experience to date regarding solar PV ownership in that there are clear and demonstrable cost benefits associated with their installation.

Rheem believes that the next stage of DER adoption will need to be focussed on low capital cost solutions that can be deployed in both solar and non-solar homes, and which will demonstrate the greatest potential to deliver both consumer financial savings and grid wide benefits. A focus on low cost DER should be supported to encourage mass market uptake and participation in the post 2025 market. As we have elucidated throughout our response, Rheem believes that electric water heaters that are smart grid enabled can play a key role in delivering a smarter active DER solution across a far greater socio-economic spectrum than can either solar PV or storage batteries alone.

To encourage optimal management of DER assets to the benefit of consumers and the grid, we believe that it is important to avoid the DNSP becoming the default DER aggregator. This clear delineation will allow equipment manufacturers and aggregators to invest in innovative technology and solutions without concern about having to compete with a large, government funded DNSP.

35. What are the issues surrounding connection agreements that can facilitate a retailer / aggregator for market participation and the delegation for the enforcement of limits to both DNSPs and AEMO?

Rheem has conducted a successful trial with a DNSP who provided us their whole network vector map in a format that was compatible with our database. The network elements were then updated in real time to show actual network operating parameters alongside which upper and lower limits were visible.

Based on this trial Rheem believes that rules (and commercial imperatives) can be agreed as to what actions to take with available orchestrated DER on customer sites (location based DER assets) when limits are breached. Real time feedback would be inherent in any changes made and time stamped exception reporting used as a verification tool between the aggregator and the DNSP. Rheem believes that this is a model that can be adopted universally in the post 2025 market.

Notionally any such interface should be an IEEE2030.5 interface. Rheem's experience includes a recently completed IEEE2030.5 interface with SA Power Networks. The above approach is consistent with DNSP desires to enable dynamic limits to be maintained at customer sites. However, commercial arrangements to reward and/or compensate a consumer for their DER participation in containing a network deviation/assisting in alleviating a constraint still remain an obstacle to the widespread adoption of this approach.

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36. Noting the differences in market arrangements between the WEM and the NEM, are there aspects of the WA DER Roadmap that could usefully inform how certain roles and responsibilities might evolve in the NEM?

The key statement from the WA DER roadmap is as follows:

> *"Because all markets cannot be participated in concurrently, a key challenge will be to optimise the services DER can provide across the supply chain."*

To this end the roadmap suggests a market should be administered by a Distribution Market Operator (DSO) who would administer:

> *"a market for the provision of network services, as well as system services, (including) administer platforms to enable access for aggregators to market trading for energy, capacity and ESS (such as voltage and frequency control)….*
>
> *… Importantly, a market operator is independent of any market participant, network or resource owners (suppliers) so that: the market is operated in a manner that is fair and impartial DER (and other resources) can be utilised in the most efficient and least-cost manner; and all trading (including any third-party activities and customer trading) at the distribution level is aligned with the market and power system security and reliability objectives."*

We support the above approach, and believe it is in alignment with the AEMC's view of a potential market trader participant category whereby an aggregator can offer up different market services at an NMI without the need to register for those services under the individual market categories.

37. What are stakeholder views on the approaches outlined? What are the potential advantages and disadvantages of each?

Rheem has concerns about Tariff reform being seen as a silver bullet to alter customer behaviour.

There are substantial examples where response to cost reflective pricing declines with customer apathy/inertia over time, and only benefits a small proportion of engaged users. We suggest that cost reflective pricing should only be implemented when customers are provided with sufficient tools to adapt their behaviour in a “set and forget” fashion.

We strongly believe that locally managed / orchestrated site DER under one point of site entry (e.g. an IEEE2030.5 compliant gateway as detailed previously), enabling site participation in grid services, in conjunction with an operating 2-sided market, is one such tool.

Regardless of the solution finally adopted, any major change to the market needs to be implemented with sufficient customer education, open standards, cybersecurity and protections to secure customer confidence. We would suggest that a “structured procurement with digital platform (flex market) design” offers a reasonable balance of flexibility and would support innovation from new providers as a first step. Consideration may be given to evolving to dynamic price signals in a mature DER market.

38. Are there alternative approaches that could also work to complement existing tariff reform processes that should also be considered? How might these work?

Rheem's position on this issue is expressed in our response to Question 36.

Additionally, we believe tariff reform alone cannot solve the grid issues, nor extract the greatest value from smart behind the meter DER, until the corresponding full complement of DER tools and a framework for a 2-sided market is established.

For example, consumers should retain the right to opt-in to TOU and cost reflective tariffs at the time of their choosing. At the same time, regulatory changes should be put in place to ensure retailers and aggregators are equipping consumers with the necessary smart DER and tools to realise the benefits that orchestration of their DER assets can bring them.

39. Do stakeholders have views on additional steps or information that should be considered in the proposed consumer risk assessment tool?

Rheem supports a risk-based approach for assessing the need for any additional customer protections.

We re-iterate our position that this needs to be undertaken in an agile manner. Full reform should not be allowed to delay the implementation of the full DER capability and framework for a 2-sided market. The cadence of customer reform should be frequent and responsive to the change rather than to try and pre-empt theoretical requirements.

40. Do stakeholders have views on the options outlined to address issues associated with falling minimum demand and increasing access to markets?

The management of Minimum Demand is an issue that is likely to grow quite rapidly, particularly given the accelerated take-up of household solar PV during 2021.

Rheem would suggest that more attention should be placed on the ESB's recognition of the untapped potential of "turn-up and turn-down services where flexible load can be made available to balance generation and demand." While media and industry often focus on the potential of batteries, this tends to ignore the immense role that controllable water heaters could play as a "turn up (or down) service" to mimic the storage capacity of a battery. Water heaters are an "essential service" and are found in every Australian household, regardless of their socio-economic status. With the expectation that natural gas water heating may be eventually phased out as a result of decarbonisation targets, electric water heaters are likely to play an even greater role in the grid in coming years.

In comparison to water heaters, conventional batteries are typically an additional outlay, and even with the subsidies offered in some jurisdictions, are only accessible to wealthier households.

Accordingly, we believe that industry focus should be on facilitating existing controllable appliances with flexible loads (such as water heating) as an accessible DER technology available to all Australian households. Rheem's PowerStore line of smart grid interactive storage water heaters has been developed specifically to address this need.

A key deliverable of the Rheem ARENA / SA DEM supported project currently underway in South Australia is to use smart grid interactive water heaters to provide variable aggregated load in alleviating the minimum demand issue. Our calculations show that an investment in this technology to shift water heating load into the minimum demand period will be significantly cheaper (up to 10 times) and faster than that which could be achieved through a rollout of battery technology alone.

Under the conditions of the trial consumers are being paid for the utilisation of their water heater asset to support the grid, whilst sophisticated heuristics, charge state monitoring and advanced A.I. control is maintaining amenity in available hot water, and safety in the control of legionella. Beyond grid support to alleviate the minimum demand issue, the water heaters will modify their operation, also taking into account the underlying SAPN tariff, the wholesale market price and any localised demand constraints on the SAPN network.

Regardless of the above trial, it is clear that aggregated water heaters CANNOT work in isolation at any given site. Orchestration of all the DER at a given site is key to consumer financial reward and supportive grid services. Please see our answers to Q30 where we detail a "whole of home" approach to orchestration of DER and the use of the IEEE2030.5 to enable standardised site (home) churn capability, such that consumers are free to use the energy market service provider of their choosing.

41 What are other options to consider that might deliver better outcomes for consumers?

A focus on existing household appliances is likely to make the benefits of DER more accessible to the average consumer. In this context consideration should be given to encouraging the take-up of DER by providing mechanisms that realise DER benefits.

The key feature of our technology is to ensure that the customers hot water system will only participate in a turn up or turn down service if a minimum viable hot water amenity is maintained. Sophisticated algorithms calculate the fleet wide available power turn up and turn down and the sustain time based on sensing of water heater charge state, household heuristics and other factors such as forward weather prediction. This ensures a predictable grid asset whereby the fleet of water heaters can be scheduled, their contribution accurately predicted, verified in real time and, as required, geospatially activated whilst maintaining consumer amenity and safety.

Rheem's responses to previous questions have covered most of the issues and potential solutions. In summary we recommend.

- All smart DER must support interoperability with standardised interfaces, protocols and security measures. This should be an immediate priority.
- Product standards should outlaw the approach of some DER manufacturers that require the customer to connect to their aggregation platform to secure the full warranty benefits. This may automatically place limits on all future DER participation by the customer and reduce competition.
- The explicit permission of the customer/site owner should be required prior to 3rd parties taking control of any site DER assets.
- The preferred site configuration is a single point of entry to the site (home) via an IEEE2030.5 HEMS edge gateway.
- IEEE2030.5 HEMS gateway devices should connect to other smart DER on the site (e.g. Solar Inverter, Battery Inverter, Smart Water Heater, Air Conditioning, EV Chargers etc) via industry standard open interfaces, protocols and security measures as per 1) above.
- The open access standardised interface to the site (i.e. the IEEE2030.5 Gateway) should enable the site owner to "churn" their orchestrated site DER assets to the energy market service provider of their choosing, supporting innovation and competition.
- There should be metering reform implemented to enable local "read only" real time access to the site NMI revenue meter. Multiple metering devices for each piece of installed DER create an unnecessary cost imposition on the consumer and is an unnecessary barrier to cost effective, mass market uptake by consumers of smart DER.

- Providers should be required to advise consumers of the impact of having multiple control pathways into a site (home) enabling the disparate control of individual smart DER devices. This arrangement leads to sub-optimal outcomes for the consumer, most of whom would not be aware of the issues associated with this arrangement.
- We support the concept of a separately metered DER (for example batteries and Hot Water) as long as the single control pathway is retained. We believe this will bring additional innovation to the market. Per Part B of this paper (Section 3.3 flexible trading arrangements) where multiple flexible trading models are considered, our preference is not for a separate connection point due to the time, cost and complexity of this approach. Rather the alternative "flexible trader model 2 (sub-meter connection point)" which we see as the preferred option to bypass many pf the concerns inherent that the multiple connection approach and agree with the ESB's view that the sub-metering approach will promote innovation and competition.

The above approach will enable site orchestration to deliver the best benefits to consumers whilst providing supportive grid services that are predictable in their responses as the volume of connected smart DER grows over the coming years.

42. Do stakeholders have views on the proposed principles? Are there other principles that should be considered to deliver benefits for consumers?

We strongly support the AEB's principals outlined for interoperability and communications. Specifically, with regards to interoperability, we would recommend using international standards such as IEEE2030.5 in preference to any potentially conflicting local standards.

Standards such as IEEE2030.5, and specifically the Australian variant evolving as part of the ANU API working group is certainly a step in the right direction. However, this standard does NOT preclude multiple vendor DER control pathways to individual consumer DER appliances on the same site. As Rheem has detailed in responses to earlier questions, our experience is that this is a major issue. Ideally, based on Rheem's field experience from thousands of mixed DER sites across the NEM and WEM, we believe that a "whole of site (home)" approach is required to enable site orchestration of smart DER to deliver the best outcomes to the consumer and to the grid.

Many of the international inverter manufacturers are already compliant with IEEE2030.5 as a result of the Rule 21 in California. We are aware that there are some major industry participants who are resistant to a standards-based approach. Some of their concerns are valid and focus needs to be made on addressing these concerns. However, we believe well thought through standards are essential to ensure the lowest barriers to customer churn, and the associated competition this brings. In this instance the benefits to customers should override providers' concerns.

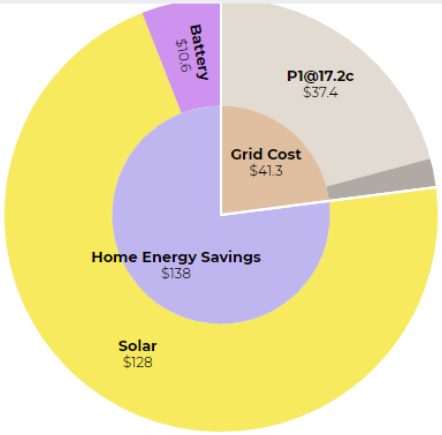
If proprietary solutions are to be accepted, then we would suggest those DER providers be required to provide no cost licensing, and access to published API's to allow certified providers with gateway style access. In this instance the onus would be on the provider of non-standard technology to demonstrate that the API's can allow a minimum standard of interoperability.

ATTACHMENT A - Warrandyte Victoria – Hot Water data for 6 months to 27 May 2021

This home has a HEMS system that is provided by Rheem. The DER capability of the home includes: 5kW solar system, 3.6kW Power Store Hot Water and a 14kWh battery which is NOT controlled by the Rheem HEMS. You will note that over this 6 month period they have used 948 kWh of electricity for water heating. However 53.5 kWh of the water heating has come from the battery. The home energy savings of $138 have been reduced due to the battery charging from solar energy at a time when the hot water heater should have been using that energy.

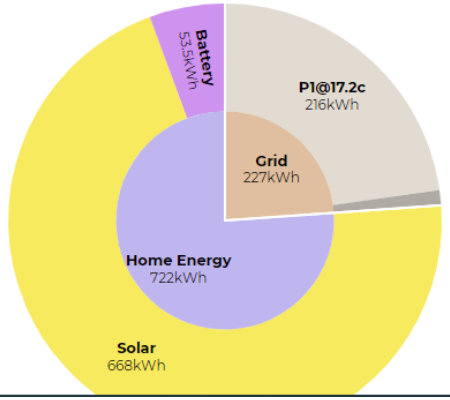
Water Heater

Tariff | 6 Months | 3 Months



Cost Analysis

	169 days	Daily avg
Grid Cost	$41.3	$0.24
- P1	$37.4	$0.22
- P2	$3.85	$0.02
Home Energy Savings	$138	$0.82
- Solar	$128	$0.76
- Battery	$10.6	$0.06



Energy (kWh)

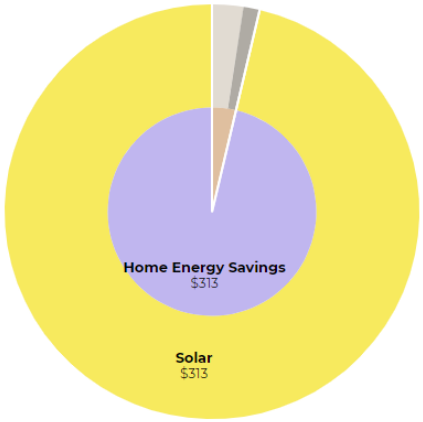
	169 days	Daily avg	%
From Grid	227	1.34	23.9%
- P1	216	1.28	22.8%
- P2	10.8	0.06	1.13%
From Solar	668	3.95	70.5%
From Battery	53.5	0.32	5.64%
Total	**948**	**5.61**	

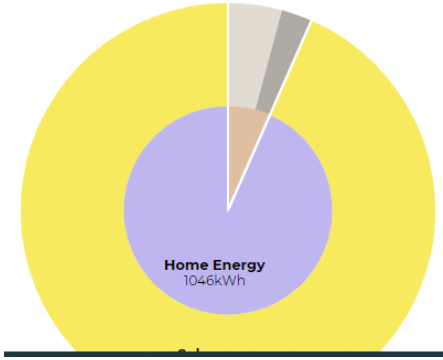
Vermont Victoria – Hot Water data for 6 months to 27 May 2021

This home ALSO has a HEMS system that is provided by Rheem. The DER capability of the home includes: 3.5kW solar system, 3.6kW Power Store Hot Water and a 9kWh battery which are ALL controlled by the Rheem HEMS. You will note that over this 6 month period they have used 1120 kWh of electricity for water heating. In contrast to the uncontrolled battery above, none of the energy for hot water has come from the battery . The home energy savings over the period are much higher from hot water at $313 for the period.

Water Heater

Tariff | 12 Months | 6 Months | 3 Months





Cost Analysis

	181 days	Daily avg
Grid Cost	$12.0	$0.07
- P1	$7.91	$0.04
- P2	$4.11	$0.02
Home Energy Savings	$313	$1.73
- Solar	$313	$1.73
- Battery	$0.02	$0.00

Energy (kWh)

	181 days	Daily avg	%
From Grid	73.9	0.41	6.60%
- P1	47.0	0.26	4.20%
- P2	26.8	0.15	2.40%
From Solar	1046	5.78	93.4%
From Battery	0.08	0.00	0.01%
Total	1120	6.19	