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Subject: POST 2025 MARKET DESIGN CONSULTATION PAPER

Thank you for the opportunity to provide input into your consultation.

Rheem is the largest local manufacturer of domestic and commercial water heaters in Australia. As our products are clearly considered to be part of the future Australian Distributed Energy Resource (DER) market we have a significant interest in the outcome of your consultation.

Over the last 8 years we have expanded our traditional water heating business to include the supply of photo-voltaic and embedded storage battery systems. We have also undertaken the development, manufacturing and supply of "smart" remotely managed, grid interactive water heaters that interoperate in orchestration with a home's other DER under direction from an Energy Management System. At the time of writing we are managing the DER of over 1300 sites across Australia.

Given the impact that the post 2025 energy market will have on our products and our consumers, we welcome the opportunity to contribute to the discussion at an early stage of your work. Our considerable investments to date in the development of DER interoperable water heating products has been made on the basis that water heaters can become a major demand side component of any future two-sided market. This consultation is a welcome discussion on what this market may actually look like and how it may operate, with our hope being that your findings will allow us to ensure that our future R&D efforts align with the market vision.

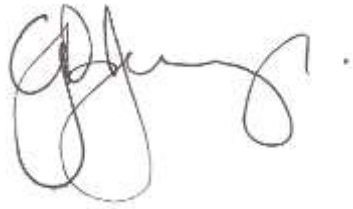
Rheem's growing experience of selling and orchestrating DER products indicates that there is a high level of enthusiasm amongst those consumers with knowledge in this area, and a typical Australian willingness to adopt new technologies. It is therefore incumbent on those energy market authorities designing the future market to ensure that the broader community can easily identify the benefits of being an active participant in the future market, and that their experience of doing so is a positive one. Any failure to meet these criteria will have the potential to undermine acceptance and participation across the community and slow the realisation of the benefits that a post 2025 market could deliver for Australia.

As you will see from the following responses to the consultation questions, Rheem supports the move to a market where the average consumer may be able to participate more fully in the energy market, by managing their behaviours and investing in appropriate smart DER technology. Encouraging this will require regulation that should be well considered, future proof, have a long-term horizon, and be signalled well in advance. With so many energy regulators operating in this space, we have long held concerns that a lack of co-ordination, coupled with the potential for regulatory overreach of mandated quick fixes, could create a market that treats the consumer as an afterthought. We are hopeful that this consultation ensures that this is not the case.

With regard to the specific questions raised within the issues paper, we have limited our responses to comments regarding sections 8 & 9, as these are most relevant to our business and our consumers.

If you have any queries regarding this response or our market, please don't hesitate to contact me per the contact details below.

Yours Sincerely



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Section 8 Two-Sided Markets – Market Design Initiative E

Q1 *What do you consider are the risks and opportunities of moving to a market with a significantly more active demand side over time? How can these risks be best managed?*

Rheem supports a move to active demand responsiveness, however is concerned that current plans to achieve this outcome are too short term in their focus and could lead to a significant waste of resources over the next decade.

More active response requires a greater penetration of appliances, devices and products that use a significant energy load that can be either time shifted and/or have their energy usage reduced without a significant impact on consumer amenity or safety. At the moment only connected PV inverters, connected batteries, a small number of connected (DRED enabled) air conditioners, and an even smaller number of smart water heaters are capable of operating in this way.

Clearly an increase in the availability of DR capable water heaters and air conditioners is required, however the short-term solution proposed by COAG in 2019 of mandating compliance to 4755.3 only goes part of the way to addressing the true needs of this market.

Rheem's experience suggests that two-way communication between DR devices such as smart DER, and Agent's such as Aggregators, provides the gold standard for interoperability. Such communications should also adopt internationally recognised standards such as IEEE2030.5. Standardised two-way communication is vital for both confirmation that a product has responded to a DR signal, as well as providing the visibility regarding the operation of various appliances on a single site, enabling better DER orchestration and management of consumer amenity.

Unfortunately, AS4755.3, scheduled to be mandated within the next 2 years, does not recognise the need for two-way communication, which makes it a fundamentally flawed solution for a range of DR. Conversely, AS 4755.2 (currently under development) is a significantly superior standard as it deals with a more sophisticated DER arrangement including two-way communication, cyber security, consumer control and greater interoperability. We are, however, concerned that lower cost 4755.3 appliances are set to dominate the market and are likely to undermine the uptake of superior 4755.2 appliances, especially where some form of 4755 compliance is mandated.

Rheem is also concerned that adoption of AS 4755 for demand response capable electrical products overlooks international standards such as CTA2045 and IEEE2030.5 that have the potential to deliver better outcomes for future DR markets and participants.

Rheem would therefore suggest that the ESB undertake a review of AS/NZS 4755 to confirm whether the proposed solution of 4755.3 will be fit for purpose for the market that they are developing.

Q2 What are the barriers preventing more active demand response and participation in a two-sided market? What are the barriers to participating in the wholesale central dispatch processes?

Active demand response participation relies on co-ordinated information flows to and from DERs to a remote agent or aggregator. This in turn relies on some level of commonality that allows the integration and interoperation of a range of DERs.

Rheem's experience to date has been that there is little commonality of control, or interoperability, between current DER devices on the market. For example, two major embedded storage battery manufacturers have adopted a "walled garden" approach that requires the battery (i.e. embedded generation) to be controlled ONLY from the manufacturer's cloud platform. This absence of a local control capability severely inhibits the orchestration of these batteries with all other smart DER devices within a home. This in turn financially impacts the consumer and locks the consumer's asset (i.e. the battery) such that the home owner wishing to accept a competitive offer from another Energy Market Service provider (without a relationship with the battery manufacturer) is precluded from controlling the battery asset of the home owner.

If vertical monopolies such as this were to become the norm, there is a risk that multiple smart DER devices would all be individually controlled from their own clouds, without local orchestration to optimise the best outcomes for the consumer and for the grid. This would also dilute the effectiveness of response of the individual DER devices. For example, a response to an FCAS event by a battery in isolation may cause an unwanted response by other DER under the control of a Home Energy Management System, effectively diluting or even negating the response of the battery.

Additionally, debates regarding future communication protocols (OpenADR, IEEE2030.5), and a general unwillingness of the industry and regulators to look to international standards (e.g. CTA 2045) for guidance has hindered penetration of the DER control solutions.

As smart DER continues to be deployed, in the absence of an immediate move to an overriding preferred architecture and standardised protocols, it is import that interim measures ensure that DER complies now with accepted, industry standard, local control interfaces and protocols, providing for a local control interface and published protocol to enable a site Energy Management Gateway to provide that standardised interface and local orchestration of site DER.

At least with the above approach, the integration of more than one smart DER appliance on a site (e.g. a home) under the control of a centralised standards compliant gateway (e.g. a HEMs gateway supporting an outbound IEEE2030.5 interface) ensures that disparate smart DER can be orchestrated locally on the site to deliver the best outcomes for both the consumer and the grid.

Q3 Do you think any other near-term arrangements or changes to the market design can be explored in this workstream?

a) DER Site Orchestration & Integration Capability

Also see our response to Q2 above. As the deployment of smart DER continues to accelerate we believe that most important issue to tackle is the local orchestration capability of smart DER. In the absence of the immediate adoption of an overriding preferred architecture and standardised protocols, it is important that interim measures ensure that smart DER (in particular embedded storage batteries) be required to integrate via accepted industry standard local physical control interfaces (without the requirement for "round trips" to cloud servers for control) and that control protocols (enabled via the local control interface) are published to enable a site Energy Management Gateway to provide that standardised interface. This control capability should of course incorporate security mechanisms such as certificates or equivalent.

One fast track approach to partial compliance would be to mandate the above as a requirement for participation of embedded storage battery systems in various Government sponsored battery rebate schemes, and other funding schemes as provided by agencies such as ARENA.

Under this proposed approach, the integration of more than one smart DER appliance on a consumer's site, under the control of a centralised standards compliant gateway (e.g. a HEMs gateway supporting an outbound IEEE2030.5 interface) will ensure that disparate smart DER can be orchestrated locally. This will deliver the best outcomes for both the consumer and the grid, even in the absence of a standardised across the board adoption of a single-entry point IEE2030.5 "whole of home" edge gateway DER orchestration approach.

b) Cloud Servers, DER Control and Grid Security of Supply

With the ever-increasing uptake of Solar PV Inverters/systems, and lately, the growing base of connected embedded storage systems (batteries), we believe that there is a growing potential grid security issue regarding the domicile of the control of the grid wide DER infrastructure. To date, there is no requirement that servers hosting control of this infrastructure be located within Australia, nor are there any NEM rules and regulations governing the access and control of the growing Giga Watts of aggregated DER's. We believe that this is an overlooked and significant area of concern.

This growing capability that is not domiciled in Australia, nor regulated under Australian law, NEM rules or regulations, will create a growing security/security of supply issue for the grid. Further, we believe that these foreign hosted and controlled DER servers may potentially include data that the CIC defines as 'Restricted Data' which cannot (should not) be hosted offshore.

Rheem's experience in the deployment of a number of brands of solar PV inverters and storage batteries suggests that the location of fleet controlling servers, personal information databases, site information, and software and firmware control and distribution are often located offshore in countries such as Israel, USA, Germany and China. The implications regarding the storage/access and distribution of customer/plant information being domiciled offshore, where Australian law has little or no reach, seems obvious. A further consideration is that the security and control of gigawatts of large and growing aggregations of DER from offshore locations, that can affect Critical Infrastructure in the Australian grid, could be deliberately manipulated by a malicious state actor and/or simply hacked.

On an operational level, Rheem has experienced the simultaneous disablement of large fleets of electricity generating plant across our customer sites, with rectification made difficult due to the offshore location of the manufacturers control over the electricity generating plant. To attempt to prevent this from occurring we now have a site gateway device that firewalls the connection between the electricity generating plant (Solar PV Inverters and Embedded Storage) and the respective manufacturers offshore control/database. This allows us to restrict the type of messaging and control actions that can be taken from offshore locations without our permission/knowledge, and provides us the tools to monitor, log and react instantly to any threats to the consumer or the grid's security of supply. Our overarching database and control server that implements this is fully and securely hosted in Australia under the control of an Australian domiciled and ASIC registered company operating to Australian standards and subject to Australian law.

We would therefore recommend that the Energy Security Board's review of DER governance should review the situation regarding the need for Australian based hosting and/or control of Australian DERs. This review should consider, at least in respect to any data gathered relating to the distribution network, the alignment of regulations with the Australian Critical Infrastructure Centre (CIC) requirements.

Q4 *What measures should be deployed to drive consumer participation and engagement in two-sided market offerings, and what consumer protection frameworks should complement the design?*

Rheem proposes two potential initiatives to drive consumer participation

1. Ensure that the introduction of any mandatory demand response requirements for appliances are fit for purpose and do not add cost for little consumer benefit;

2. Provide financial support to consumers to encourage the upgrading of appliances before normal end of life replacement. Rather than a rebate it may be possible to develop this as a RET style scheme, where the installation creates certificates, and there is an obligation on grid operators (who will

benefit from DER control) to purchase and surrender these certificates annually.

Regarding consumer protection, there will need to be some agreement between remote agents/aggregators and consumers regarding

- That DER controlling servers / databases are hosted in Australia, controlled by ASIC registered Australian Companies, and are hence subject to Australian law and the Australian privacy Act;
- That DER controlling servers / databases are regulated under the NEM rules and regulations to ensure security of supply;
- That the consumer has a right to opt in/out of participation for any period of their contract with an RA/aggregator;
- That the DER will be operated by the RA/aggregator in a way that does not impact the longevity of the device;
- That any update to operating firmware and software by either RAs/aggregators or equipment suppliers is validated by the regulator before updates are issued.

Q5 *What might principles or assessment criteria contain to help assess whether it is timely and appropriate to progress through to more sophisticated levels of the arrangements?*

As indicated above Rheem is concerned that introducing less sophisticated solutions now or in the early stages of the post 2025 market will lead to a large number of what will quickly become stranded assets being sold into the market, creating issues for regulators and RA/aggregators, and angering consumers. Rheem's preference is to instead target a range of sophisticated solutions for availability by 2025, then allow the market to control the pace of change thereafter.

Q6 The ESB is considering combining the DER integration (below) and two-sided markets workstreams, or elements thereof, do stakeholders have suggestions on how this should be done?

This issue of the two-sided market design, and what requirements will be placed on market participants, has been one of the greatest inhibitors to the development of smart DR capable technologies over the last 3-5 years.

Whilst it has been obvious for many years that a two-sided market with a high level of DER penetration will become the norm in Australia and around the world, the lack of clarity regarding minimum product capabilities and sophistication has created rifts within industries and committees. Whilst some have argued for the cheaper solution of remotely managed "dumb" appliances as a means to get a faster rollout of product, others have argued that we should grasp the opportunity to develop smart appliances that will offer the best solution for consumers.

Obviously, the decision on which route to take will rely largely on the requirements that regulators put on those parties that will be remotely managing the appliances and

providing demand response services to the market. There are three examples that illustrate this point

- if an aggregator requires confirmation from the device that it was connected, operating, and had responded to a DR command, a level of sophistication above that envisaged by the "dumb" 4755.3 type product supporters would be required.
- if regulators decide that consumers need the ability to opt out one of their devices from participating in a DR event, even for a short time period, then smarter products allowing feedback to an aggregator would be essential.
- If regulators impose a standard communications protocol such as IEEE2030.5, then smarter devices will be required to manage this communications ability.

Given the above we believe that the ESB needs first to decide the level of sophistication of control, and the levels of data that will be required by remote agents and aggregators who operate the new two sided market, then to roll this requirement out to those industry bodies such as standards committees to ensure that appliances (DER) are designed to meet this need.

Section 9 Valuing Demand flexibility and Integrating DER – Market Design Initiative F

Q1 *Are there any key considerations for the incorporation of DER into the market design that have not been covered here? For DER to participate in markets, it needs to be responsive. How should the Post-2025 project be thinking about enabling responsive DER?*

It is Rheem's view that the development and rollout of smart versions of basic consumer appliances (such as air conditioners and water heaters) will allow aggregators to calculate in real time the demand response opportunity available to them across their fleet of DER. The addition of technology already found in PV inverters and batteries to these more basic appliances will allow aggregators to respond instantly to demand response opportunities whilst ensuring that individual consumer amenity is not sacrificed. Providing a financial benefit to consumers without impacting their amenity will provide the best possible justification for an investment by consumers in responsive DER.

Further for DER to be "responsive" it must be capable of local orchestration with other household DER. A market where disparate smart DER is individually controlled by vertical monopolies (such as that occurring with embedded storage – please see our previous question responses) will be to be detriment of the consumer and the grid. A whole of home approach to the orchestration of DER through integrated local control of DER resources in orchestration with each other will enable DR and other grid services to provide the best outcomes for the grid whilst having the minimal amenity impact on households.

If 2025 is a preferred date for the broad rollout of the two sided market, then decisions regarding the addition of sophisticated DER style technology to some common household appliances, and a standardised communication protocol that should be embedded in these appliances, needs to be made sooner rather than later.

Q2 *In the next phase of the project the ESB proposes to focus on development of a detailed DER market integration proposal. What are the most important priorities for DER market integration? The ESB is considering combining the DER integration and two-sided markets workstreams, or elements thereof, do stakeholders have suggestions on how this should be done?*

Rheem supports this proposal. One of the key inhibitors to our product development to date has been uncertainty regarding the structure and operation of the market in which our products will operate. Combining DER integration and the two-sided market should provide regulators with an ability to provide clarity for manufacturers and suppliers of DER.

Rheem believes there are two priorities that need to be addressed urgently

1) <u>Common Communications Standards and Device Level Interoperability</u>

Rheem is aware that there are two main models for communication with DERs in Australia including:

a) cloud to DER direct with backhaul being via direct cellular/proprietary wireless and/or homeowners internet connection, and
b) via the installation of standards-based gateway devices that can control and orchestrate locally all of the home's DER assets. A single point of backhaul can then be implemented to the gateway device via any industry standard communications methodology.

Rheem believes that a standardised gateway approach (i.e. b) above) that orchestrates all a households smart DER is essential, and that energy regulators must select a common communications protocol as soon as possible so that interoperability and the ability to change DER managers (energy market service providers) is built into the system, i.e. effecting "DER portability" through standards. Rheem's preference being for the adoption of IEEE 2030.5 which appears to be the emergent preference of Australian DNSP's, and the go to standard for similar markets such as California where it is being mandated.

2) Third Party Control of Devices

Whilst we support open standards, Rheem has significant concerns regarding the potential for sub optimal operation of our water heaters by a third party, such as an aggregator or a remote agent. We are concerned that having handed over the "keys" to a product, that there is a potential for a third party to operate the product in a way that puts at risk product longevity, consumer safety, and consumer amenity.

We are also concerned that as the manufacturer of the product, we will be held to account by consumers for any loss of amenity or warranty issues that are caused by improper operation.

We would therefore like to see a focus regarding rules surrounding the selection of authorised third parties, and rules on how they will manage DER under their control. For example, a daily limit should be set on the number of demand response signals sent to water heaters, so that continuous switching (burst fire) strategies are not adopted. Continuous switching has the potential to quickly wear out electronic components within the water heater, which will in turn render the consumer warranty void. Similarly, consumer amenity considerations need to be addressed as "blind" switching can result in loss of amenity, i.e. cold water. And, on a more serious note, ensuring periodic sterilisation of the water heater in accordance with Australian Legionella growth inhibition standards must be maintained to ensure consumer safety. A consumer may not notice a storage battery inadvertently discharged, but running out of hot water, too many, would be a serious impact to their amenity.

Q3 *How can we ensure that owners of DER can optimise the benefits of their DER assets over time as technology and markets evolve? How do we time reforms to manage the costs and benefits for DER owners?*

The majority of DER assets have long lives. Photo-voltaic systems have a deemed life of 15 years, most batteries are warranted for 10, as are the majority of water heaters.

Air conditioners and pool pumps have shorter warranties but also continue to function beyond a decade in many cases. As a result, we can predict that considerably less than 10% of potential DERs will be replaced per year.

Whilst initiatives to mandate AS/NZS 4755.3 on all air conditioners and electric water heaters sold in Australia is under review, the Regulatory Impact Statement prepared as support for this initiative indicated low levels of connectivity to remote agents. This may have been due to the proposal relying on AS/NZS 4755.3, which requires products to be able to receive commands but not "report back" on their status, their response, or provide consumer amenity solutions. In fact, 4755.3 does not provide any feedback to confirm that the device is actually connected to a remote agent, allowing consumers to potentially "game" the market. Dumb DERs such as these are unlikely to provide much benefit to consumers, the grid, or aggregators seeking to monetise DER and share those financial benefits with consumers, so the RIS was most likely correct in predicting low connection rates.

Given the potential for Australia to experience both low replacement rates and low connectivity rates, it could take 20-30 years before the majority of consumers are fully participating in the proposed two-sided market.

Rheem proposes the following suggested initiatives to overcome this potential inertia

1. Provide financial support to consumers to encourage the upgrading of appliances. Rather than a straight rebate it may be possible to develop this as a RET style scheme, where the installation creates certificates, and there is an obligation on grid operators (who will benefit from DER control) to purchase and surrender these certificates annually. The quantum of installation certificates could be linked to the capabilities of the DER that contribute directly to its capability to participate in grid support services such DR, FCAS, the Wholesale Demand Response Market (WDRM), and like higher order monetisation capabilities that would encourage its connection/uptake by aggregators and consumers alike;
2. In line with the above is the necessity to develop a more sophisticated standard than AS/NZS 4755.3 for traditional appliances that provides greater potential benefits for consumers. This will incentivise consumers to connect their new appliances and become active participants in the market;
3. Key to a successful DER market will be the ability for consumers to have "DER portability" in that there should not be any roadblocks for consumers that want to accept a better offer from an energy market service provider in the control of their DER assets. This "portability" of DER assets will be critical to the successful uptake of DER and requires standards-based protocols and local interfaces for the orchestration of a consumers DER assets. Unfortunately, the lack of any regulation in this space is seeing vertical monopolies evolving, particularly in respect to storage battery VPP's whereby consumers are being unknowingly locked into manufacturers VPP's for control of their storage battery assets. A move to a standardised "whole of home" approach to DER orchestration supporting IEEE2030.5 would ensure a vibrant market for consumers and a better outcome for the grid.

4. A standardised approach to DER orchestration would also ensure grid security of supply and consumer protection as, should an energy market service provider fail, an interim provider can take control of the home's DER asset via a single IEEE2030.5 interface connection until such time as the home is transferred to another energy market service provider. Further, such a standardised connection ensures that AEMO can intervene and take control in situations whereby the grid security of supply is threatened by a rogue actor.